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YEAR 2009

ONONDAGA LAKE

AMBIENT MONITORING PROGRAM

Onondaga County
Department of Water Environment Protection
Syracuse, New York

May 2009

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APPENDIX A

2009 Non-Event Water Quality & Biological Sampling Schedule (April 2009 - March 2010)

DATE /DAY	PROGRAM	EVENT	APPENDIX
April 2009			
April 1/Wedesday	Onondaga Lake	Lake Special Weekly	F
April 7/Tuesday	Onondaga Lake	Double Lake (South & North Deep) (w/Lake Special Weekly)	D & F
April 13/Monday	Onondaga Lake	Lake Special Weekly	F
April 14/Tuesday	Tributary	Biweekly	C
April 21/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
April 27/Monday	Onondaga Lake	Lake Special Weekly	F
April 28/Tuesday	Tributary	Biweekly	C
May 2009			
May 5/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
May 11/Monday	Onondaga Lake	Lake Special Weekly	F
May 12/Tuesday	Tributary	Biweekly	C
May 19/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D &F
May 26/Tuesday	Onondaga Lake	Lake Special Weekly	F
May 27/Wednesday	Tributary	Biweekly	C
June 2009			
June 2/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
June 8/Monday	Onondaga Lake	Lake Special Weekly	F
June 9/Tuesday	Tributary	Quarterly Extended	C
June 16/Tuesday	Onondaga Lake	Double Lake (South & North Deep) (w/Lake Special Weekly)	D & F
June 22/Monday	Onondaga Lake	Lake Special Weekly	F
June 23/Tuesday	Tributary	Biweekly	C
June 30/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
July 2009			
July 6/Monday	Onondaga Lake	Lake Special Weekly	F
July 7/Tuesday	Tributary	Biweekly	C
July 9/Thursday	River*	Monthly	H
July 14/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
July 20/Monday	Onondaga Lake	Lake Special Weekly	F
July 21/Tuesday	Tributary	Biweekly	C
July 28/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
August 2009			
August 3/Monday	Onondaga Lake	Lake Special Weekly	F
August 4/Tuesday	Tributary	Biweekly	C
August 6/Thursday	River*	Monthly	H
August 11/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
August 17/Monday	Onondaga Lake	Lake Special Weekly	F
August 18/Tuesday	Tributary	Biweekly	C

APPENDIX A (Continued)
2009 Non-Event Water Quality & Biological Sampling Schedule (April 2009 - March 2010)

DATE /DAY	PROGRAM	EVENT	APPENDIX
August 25/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
September 2009			
September 1/Tuesday	Onondaga Lake	Lake Special Weekly	F
September 2/Wednesday	Tributary	Biweekly	C
September 8/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
September 10/Thursday	River*	Monthly	H
September 14/Monday	Onondaga Lake	Lake Special Weekly	F
September 15/Tuesday	Tributary	Quarterly Extended	C
September 22/Tuesday	Onondaga Lake	Double Lake (South & North Deep) (w/Lake Special Weekly)	D & F
September 28/Monday	Onondaga Lake	Lake Special Weekly	F
September 29/Tuesday	Tributary	Biweekly	C
October 2009			
October 6/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
October 12/Monday	Onondaga Lake	Lake Special Weekly	F
October 13/Tuesday	Tributary	Biweekly	C
October 20/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
October 27/Tuesday	Tributary	Biweekly	C
November 2009			
November 3/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
November 9/Monday	Tributary	Quarterly Extended	C
November 17/Tuesday	Onondaga Lake	Double Lake (South & North Deep) (w/Lake Special Weekly)	D & F
November 24/Tuesday	Tributary	Biweekly	C
December 2009			
December 1/Tuesday	Onondaga Lake	Lake South Deep	D
December 8/Tuesday	Tributary	Biweekly	C
December 22/Tuesday	Tributary	Biweekly	C
January 2010			
January 5/Tuesday	Tributary	Biweekly	C
January 12/Tuesday	Onondaga Lake	Winter**	E
January 19/Tuesday	Tributary	Biweekly	C
February 2010			
February 2/Tuesday	Tributary	Biweekly	C
February 9/Tuesday	Onondaga Lake	Winter**	E
February 16/Tuesday	Tributary	Biweekly	C
March 2010			
March 2/Tuesday	Tributary	Biweekly	C
March 9/Tuesday	Onondaga Lake	Winter**	E
March 16/Tuesday	Tributary	Biweekly	C
March 31/Tuesday	Tributary	Quarterly Extended	C

*** River sampling events to target low flows (at or less than 500 cfs at Baldwinsville). Sampling event dates may be altered.**

**** Lake Winter dates are tentative and will depend on weather conditions/extent of ice cover on lake.**

APPENDIX A (Continued)

Non-Event Water Quality & Biological Sampling Schedule (April 2009 - March 2010)

DATE /DAY	PROGRAM	EVENT	APPENDIX
April 2009			
Week of April 27th [1]	Fish Community	Pelagic Larval	K
May 2009			
Week of May 11th	Fish Community	Pelagic Larval	K
Week of May 25th	Fish Community	Pelagic Larval	K
June 2009			
Month of June [4]	Macrophyte	Aerial Flight	L
Month of June [4]	Macrophyte	Field Species Verification	L
Week of June 1st [2]	Fish Community	Electrofishing	K
Week of June 1st [5]	Fish Community	Nesting Survey	K
Week of June 8th	Fish Community	Pelagic Larval	K
Week of June 8th [3]	Fish Community	Adult Fish Profundal Zone (Gill Nets)	K
Week of June 22nd	Fish Community	Pelagic Larval	K
Week of June 22nd	Fish Community	Juvenile Seines	K
July 2009			
Week of July 6th	Fish Community	Pelagic Larval	K
Week of July 13th	Fish Community	Juvenile Seines	K
Week of July 20th	Fish Community	Pelagic Larval	K
August 2009			
Week of August 3rd	Fish Community	Pelagic Larval	K
Week of August 3rd	Fish Community	Juvenile Seines	K
Week of August 24th	Fish Community	Juvenile Seines	K
September 2009			
Week of September 7th	Fish Community	Juvenile Seines	K
Week of September 14th [2]	Fish Community	Electrofishing	K
Week of September 21st [3]	Fish Community	Adult Fish-Profundal Zone (Gill Nets)	K
Week of September 28th	Fish Community	Juvenile Seines	K

[1]Pelagic Larval sampling events will begin in April when the water temperatures are 7-8°C; all events are weather dependent.

[2]Electrofishing events are night events; dependent on weather conditions and water temperatures of 15-20°C; (Tentative back-up events: week of June 8th/September 21st)

[3]Gill Nets are done during the day within one week of littoral electrofishing; (Tentative back-up events: week of June 15th/September 28th).

[4]Field Species Verification will take place within one week of Aerial Photography; Aerial photography is dependent upon water clarity (secchi disk transparency approximately >2.5 meters) and weather (wind and cloud cover/rain).

[5]Nesting Survey event occurs once in June dependant upon water temperatures of 15-20°C, clarity, and peak spawning of select gamefish.

NOTE - Macroalgae Are Surveyed Each Time Lake Weekly Is Scheduled (Appendix F).

APPENDIX B

2009 Event-Based Water Quality Sampling Schedule

Ambient Monitoring Program
Onondaga County, New York

PROGRAM/EVENT(S)	FREQUENCY	PARAMETERS	LOCATIONS
I. ONONDAGA LAKE TRIBUTARIES 1. High-Flow	Minimum 5 times/year.	APPENDIX C	All Tributary Monitoring Sites.
II. ONONDAGA LAKE 1. Winter	Once per month January, February, March (Weather Permitting).	APPENDIX E	North or South Deep (sampling station depends on extent of ice cover).
2. Fall Monitoring	Weekly sampling and field data more frequently.	APPENDIX G	Onondaga Lake
III. RIVER MONITORING 1. Annual River Monitoring Program	Three times per year. Once per month July-September. (Target Low-flows).	APPENDIX H	1 River Monitoring Station.
IV. STORM-EVENT MONITORING	Onondaga Creek – Two times. Onondaga Lake – Two times.	APPENDIX I	Onondaga Creek Onondaga Lake

APPENDIX C
2009 Tributary Sampling Program

Ambient Monitoring Program
Onondaga County, New York

Sampling site numbers correspond to the following sites:

1 Nine Mile Creek at Lakeland (Route 48)
2a Harbor Brook at Hiawatha Blvd.
2b Harbor Brook at Velasko Road
3a Onondaga Creek at Kirkpatrick Street
3b Onondaga Creek at Dorwin Avenue
3c Onondaga Creek at Spencer Street
4 Ley Creek at Park Street
5 Tributary 5A at State Fair Boulevard[1]
6 Metro Effluent[2]
7 Allied East Flume
8a Onondaga Lake Outlet at Long Branch Road - 2 feet (0.61 meters)
8b Onondaga Lake Outlet at Long Branch Road - 12 feet (3.66 meters)
9a Bloody Brook at Old Liverpool Road[5]
9b Bloody Brook at Onondaga Lake Parkway[5]
10 Sawmill Creek at Onondaga Lake Recreational Trail[6]

PARAMETER/ FREQUENCY	SAMPLING SITES														
	1	**2a**	**2b**	**3a**	**3b**	**3c**	**4**	**5**	**6**	**7**	**8a**	**8b**	**9a**	**9b**	**10**
Cd, Cr, Cu, Ni, Pb, Hg, Zn, As, K/ Quarterly	X	X	X	X	X	X[4]	X	X	X	X	X	X	X	X	X
CN/ Quarterly	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Ca, Na, Mg, Mn, Fe/ Biweekly	X	X	X	X	X	X[4]	X	X	X	X	X	X	X	X	X
TP, SRP, TDP/ Biweekly	X	X	X	X	X		X	X	X	X	X	X	X	X	X
BOD_5, TSS, TDS, Cl, SiO_2, SO_4, TOC, TOC-F, TIC, Turbidity/ Biweekly	X	X	X	X	X	X[4]	X	X	X	X	X	X	X	X	X
TKN, NH_3-N, NO_3, NO_2, Org-N/ Biweekly	X	X	X	X	X		X	X	X	X	X	X	X	X	X
ALK-T/ Biweekly	X	X	X	X	X	X[4]	X	X	X	X	X	X	X	X	X
Fecal Coliform/ Biweekly	X	X	X	X	X		X	X	X	X	[3]		X	X	X

APPENDIX C (Continued)

2009 Tributary Sampling Program

PARAMETER/ FREQUENCY	1	2a	2b	3a	3b	3c	4	5	6	7	8a	8b	9	10	11
In-situ: pH, Temperature, Salinity, Conductivity, Redox Potential, Dissolved Oxygen/ Biweekly	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X[7]
Equipment Blank 1 – Dunker-Churn (Churn A) BOD5, TSS, TOC, TDS, TOC-F, TIC, SO_4, NO_3, NO_2, TP, Cl, SiO_2, NH_3-N, TKN, Org-N, Na, Ca, Mg, Mn, Fe, SRP, TDP, ALK-T, Turbidity/ Biweekly															
Equipment Blank 1 – Dunker-Churn (Churn A) BOD5, TSS, TOC, TDS, TOC-F, TIC, SO_4, NO_3, NO_2, TP, Cl, SiO_2, NH_3-N, TKN, Org-N, Na, Ca, Mg, Mn, Fe, As, Cd, Cr, Cu, Hg, K, Ni, Pb, Zn, SRP, TDP, CN, ALK-T, Turbidity/ Quarterly															
Equipment Blank 2 – Churn (Churn B) BOD_5, TSS, TOC, TDS, TOC-F, TIC, SO_4, NO_3, NO_2, TP, Cl, SiO_2, NH_3-N, TKN, Org-N, Na, Ca, Mg, Mn, Fe, SRP, TDP, ALK-T, Turbidity/ Biweekly															
Equipment Blank 2 – Churn (Churn B) BOD_5, TSS, TOC, TDS, TOC-F, TIC, SO_4, NO_3, NO_2, TP, Cl, SiO_2, NH_3-N, TKN, Org-N, Na, Ca, Mg, Mn, Fe, As, Cd, Cr, Cu, Hg, K, Ni, Pb, Zn, SRP, TDP, CN, ALK-T, Turbidity/ Quarterly															

[1]Tributary 5A flow will also be monitored quarterly (during the Quarterly Extended Tributary sampling events, which includes the quarterly and biweekly parameters).
[2] Metro Effluent sampled biweekly for all parameters. If any flow is bypassed on tributary sampling date, this water is sampled for the same parameters as all other tributaries.
[3] The Fecal Coliform sample will be collected at the surface (0m) for the Lake Outlet sampling site.
[4] Includes only the parameters K, Ca, Na, Mg, Cl, SO_4.
[5] Bloody Brook at Old Liverpool Road and Onondaga Lake Parkway will be sampled biweekly from April 1 during each of the Tributary sampling events.
[6] Sawmill Creek at Onondaga Lake Recreational Trail will be sampled biweekly from June 1 – September 30 during the Tributary sampling events.

Note: A minimum of 5 tributary sampling events will be conducted for predetermined high flow conditions [defined as one standard deviation above the long-term monthly mean flow value based on the USGS gage height at Onondaga Creek (Spencer Street site)].

APPENDIX D

2009 Onondaga Lake Sampling Program

Ambient Monitoring Program

Onondaga County, New York

	METERS							
PARAMETER	**0**	**3**	**6**	**9**	**12**	**15**	**18**	**FREQUENCY[1]**
	UML[2]			LWL[2]				
Cd, Cr, Cu, Ni, Pb, Zn, As, Se, K	Composite			Composite				Quarterly
Hg[3]		X					X	April, August, October (post-turnover)
Ca, Na, Mg, Mn, Fe	Composite			Composite				Biweekly
Cl, SO_4	Composite			Composite				Biweekly
TS, TSS, TDS, SiO_2, TOC, TOC-F, TIC	X		X		X		X	Biweekly
Turbidity	Composite							Biweekly
BOD_5	Composite			Composite				Biweekly
TP[4], SRP, TDP	X	X	X	X	X	X	X	Biweekly
NO_3, NO_2	Composite			Composite				Biweekly
TKN, NH_3-N, Org-N, F-TKN	X	X	X	X	X	X	X	Biweekly
ALK-T	Composite			Composite				Biweekly
Fecal Coliform, E. Coli	X							Biweekly
CHLOR-A[5], PHAEO-A	Composite							Biweekly
Sulfide[6]					X	X	X	Biweekly
Temperature, pH, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential	Measured every half-meter from 0- to 18-meter depth							Biweekly
Underwater Illumination profile, Secchi Disk Transparency	Recorded at each site							Biweekly
Phytoplankton[7]	Composite							Biweekly
Zooplankton[8]	Composite			X				
Equipment Blank 1 – Pump TS, TSS, TDS, SiO_2, TOC, TOC-F, TIC, TP, SRP, TDP, TKN, NH_3-N, Org-N, F-TKN								Biweekly

APPENDIX D (Continued)
2009 Onondaga Lake Sampling Program

Equipment Blank 2 – Dunker-Churn (Churn Blank) Ca, Na, Mg, Mn, Fe, Cl, SO_4, NO_3, BOD_5, NO_2, ALK-T, Turbidity		Biweekly
Equipment Blank 2 – Dunker-Churn (Churn Blank) Cd, Cr, Cu, Ni, Pb, Zn, As, Se, K, Ca, Na, Mg, Mn, Fe, Cl, SO_4, NO_3, NO_2, ALK-T		Quarterly

[1] Samples are taken at the South Deep Station, which is representative of the lake conditions.
Additional quarterly sampling is conducted at the North Deep Station (during Double Lake sampling events).
[2] Please note that "UML" (Upper Mixed Layer) and "LWL" (Lower Water Layer) composite samples collected during the sampling events will be made by mixing samples from each depth according to the following field protocol:

(a) Late fall, winter, and early spring (October 1 – May 31) when the lake waters are not strongly stratified.
   i. The default UML during this period of the year is 0, 3, 6m.
   ii. The default LWL during this period of the year is defined as 9, 12, 15 and 18m.

(b) Summer stratification period (June 1 – September 30)
   i. The UML composite shall always include samples collected at 0 and 3 m depths. Inclusion of water collected at 6 m in the composite shall be evaluated based on the temperature profiles measured during the sampling event.
   ii. The composite sample of the LWL will typically include water collected at depths of 12, 15 and 18 m during this period. The inclusion of the 12 m depth in the composite of the lower waters should be reviewed during each sampling event. Because the 9m depth is consistently in the metalimnion during this period, water from this depth will not be included in either composite sample.

[3] Hg - Special low-level Hg (total and methyl Hg analysis by Contract Laboratory) at the Lake South and North Deep stations. A duplicate sample will be collected at the 18m depth at the South and North Deep station during each sampling event. Also, a separate equipment rinseate blank will be collected for special low-level Hg analysis.
[4] A "Special" TP 500 ml sample to be collected during the South Deep biweekly sampling events at 1m depth between June 1 - September 30, 2009.
[5] The Chlorophyll-*a* tube composite sample has been standardized to a depth of 0-3m year round.
[6] Sampling of sulfides only if anoxic conditions are determined through the YSI profile (to be completed prior to sampling).
[7] Phytoplankton tube composite sample has been standardized to a depth of 0-3m year round.
Frequency of Phytoplankton samples will be:
South Deep station: biweekly from April - November and monthly January, February, March, December.
[8] Zooplankton will be collected as follows:
i) a net tow through the UML during the thermally stratified period; and
ii) a 15 meter vertical net haul during the unstratified period.
Frequency of Zooplankton samples will be:
South Deep station: biweekly from April - November and monthly January, February, March, December.
North Deep station: quarterly (during the Double lake sampling events).

APPENDIX E

2009 Onondaga Lake Winter Sampling Program

Ambient Monitoring Program
Onondaga County, New York

	METERS							
PARAMETER	**0**	**3**	**6**	**9**	**12**	**15**	**18**	**FREQUENCY[1]**
Ca, Na, Mg, Mn, Fe, Hardness	Composite[2]			Composite[2]				
Cl, SO_4	Composite			Composite				
TS, TSS, VSS, TVS, TDS, SiO_2, TOC, TOC-F, TIC	X		X		X		X	
Turbidity	Composite							
BOD_5	Composite			Composite				
TP, SRP, TDP	X	X	X	X	X	X	X	
TKN, NH_3-N, Org-N, F-TKN	X	X	X	X	X	X	X	
NO_3, NO_2	Composite			Composite				
ALK-T	Composite			Composite				
CHLOR-A, PHAEO-A	Composite							
Fecal Coliform, E. Coli	X							
Sulfide[3]					X	X	X	
Temperature, pH, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential	Measured every half-meter from 0-to 18-meter depth							
Underwater Illumination profile[4], Secchi Disk Transparency	Recorded at site							
Phytoplankton [5]	Composite							
Zooplankton [6]	Composite			X				
Equipment Blank 1 – Pump TS, TSS, VSS, TVS, TDS, SiO2, TOC, TOC-F, TIC, TP, SRP, TDP, TKN, NH3-N, F-TKN								
Equipment Blank 2 – Dunker-Churn (Churn Blank) Ca, Na, Mg, Mn, Fe, Cl, SO_4, BOD5, NO_3, NO_2, ALK-T, Turbidity								

2009 Onondaga Lake Winter Sampling Program

[1] Samples are taken at the South Deep Station, which is representative of the lake conditions. Sampling will be conducted at North Deep Station if sampling during ice cover.
Frequency is once per month during January, February, and March (as weather allows).

[2] As the lake waters are not strongly stratified in the winter:

i) The default UML during this period of the year is 0, 3, 6 m.

ii) The default LWL during this period of the year is defined as 9, 12, 15 and 18 m.

Composites are made by mixing samples from each depth.

[3] Sampling of sulfides only if anoxic conditions are determined through the YSI profile (to be completed prior to sampling).

[4] Underwater Illumination profile only recorded at South Deep station when lake is ice free.

[5] Phytoplankton tube composite sample has been standardized to a depth of 0-3m year round.

[6] Zooplankton will be collected as a 15 meter vertical net haul when lake is ice free. When sampling over ice for a qualitative assessment, a special zooplankton sample will be collected using an 8 inch diameter net (with 80 um mesh through the UML and poured into a 1-liter container and preserved according to the Field Preservation Guide).

APPENDIX F

2009 Onondaga Lake Special Weekly Sampling Program

Ambient Monitoring Program
Onondaga County, New York

PARAMETERS	FREQUENCY	LOCATIONS
Fecal Coliform E. Coli Turbidity Secchi Disk Transparency[2] Temperature	Weekly sampling (5 x month) April 1 – October 15	Onondaga Lake (Nearshore sites)[1] (See Figure 1) GPS Coordinates: Site 1 – Ninemile Creek 43° 05.477' N; 76° 13.650' W Site 2 – Harbor Brook 43° 03.877' N; 76° 11.043' W Site 3 – Metro 43° 03.937' N;76° 10.931' W Site 4 – Ley Creek 43° 04.407' N; 76° 10.768' W Site 5 – Eastside 43° 06.529' N; 76° 13.598' W Site 6 – Willow Bay 43° 06.873' N; 76° 14.156' W Site 7 – Maple Bay 43° 06.732' N; 76° 14.713' W Site 8 – Bloody Brook 43° 05.720' N; 76° 12.225' W Site 9 – Wastebeds 43° 04.880' N; 76° 12.620'W Site 12 – Onondaga Creek (GPS coordinates TBD)
Chlorophyll-*a*[2] Fecal Coliforms E. Coli Turbidity Secchi Disk Transparency In-situ field data (measured every half-meter from 0- to 18-meter depth) : pH, Temperature, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential	Weekly sampling (5 x month) April 1 – October 15	Onondaga Lake South Deep station – Site 10 43° 04.670' N 76° 11.880' W
Fecal Coliforms E. Coli Turbidity Secchi Disk Transparency In-situ field data (measured every half-meter from 0- to 18-meter depth) : pH, Temperature, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential	Weekly sampling (5 x month) April 1 – October 15	Onondaga Lake North Deep station – Site 11 43° 05.930' N 76° 13.730' W

[1] The nearshore sampling stations are standardized to water depths of 4-5 feet of water. Samples will be collected from the water surface (<1m).

[2] Chlorophyll-*a* composite samples will be collected at the South Deep station weekly from May – September only, to a standardized depth of 0-3m year round.

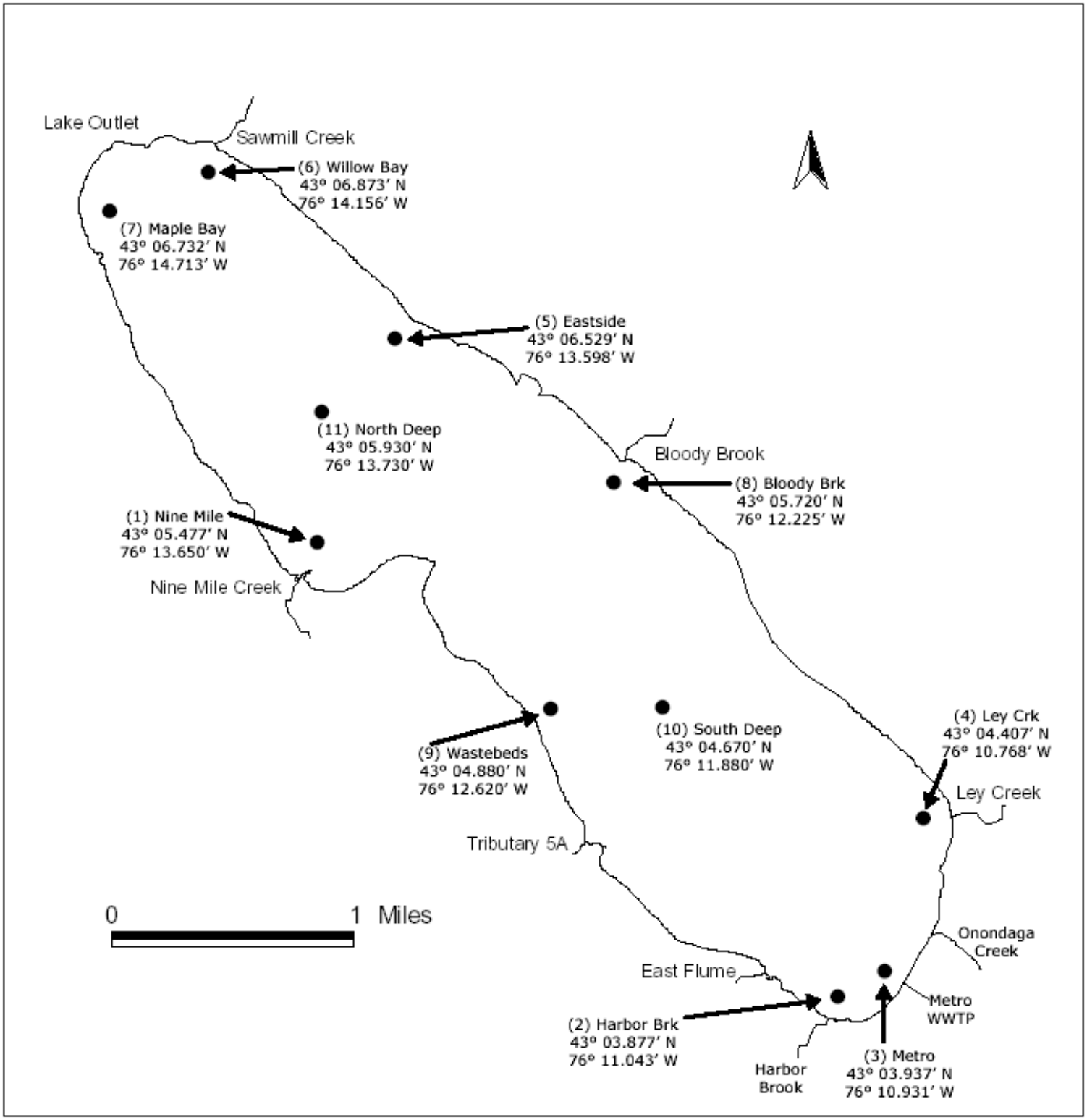


Figure 1 Onondaga Lake Near Shore Sampling Locations

APPENDIX G

2009 Onondaga Lake Fall Turnover Sampling Program

Ambient Monitoring Program
Onondaga County, New York

PARAMETER	METERS							FREQUENCY
	0	**3**	**6**	**9**	**12**	**15**	**18**	
Cl, NO_3^*, NO_2^*	Composite			Composite				Weekly[1] (During Fall Turnover)
TDS, SiO_2	X		X		X		X	
TP, SRP, TDP	Composite			Composite				
NH_3-N*, TKN*, F-TKN				Composite				
ALK-T	X		X		X		X	
CHLOR-A[2]	Composite							
Temperature, pH, Dissolved Oxygen, Specific Conductance, Salinity, Redox Potential	Measured every half-meter from 0- to 18-meter depth (South & North Deep)							More frequently. Every effort made to collect daily profiles during the first three days of fall mixing.
Secchi Disk Transparency								During each event.
Equipment Blank 1 - Pump TDS, SiO_2, ALK-T								Weekly (during Fall Turnover)
Equipment Blank 2 - Dunker-Churn (Churn Blank) - Cl, NO_3, NO_2, TP, SRP, TDP, NH_3-N, TKN, F-TKN								Weekly (during Fall Turnover)

[1] Samples are taken at the South Deep Station, which is representative of the lake conditions.
[2] The Chlorophyll-*a* tube composite sample has been standardized to a depth of 0-6m year round.

APPENDIX H

2009 River Sampling Program

Ambient Monitoring Program
Onondaga County, New York

Buoy Location: Seneca River: Buoy # 316
(43° 07.249' N Latitude, 76° 14.938' W Longitude)

Frequency: Monthly sampling event from July – September 2009

The following table summarizes the field data to be collected typically at 15-minute intervals over a 24-hour period at Buoy 316 by installing two (2) YSI data-loggers (one in the upper and one in the lower waters) during the monthly sampling events from July through September 2009.

FIELD DATA*	FREQUENCY/TIMING
pH, S.U.	Monthly (July – September) Target low stream flows.
Specific Conductance, mS/cm	
Temperature, Deg C	
Dissolved Oxygen, mg/l	
Salinity, ppt	
Oxidation-Reduction Potential, mV (ORP)	
Underwater Illumination Profile ($\mu mol\ s^{-1}\ m^{-2}$)	
Secchi Disk Transparency (m)	

APPENDIX H (Continued)
2009 River Sampling Program

The following table summarizes the parameters for analysis. One set of samples will be collected at 2 depths for Buoy 316 (1-meter below the water surface and 1-meter above the river sediments) during the 24-hour period, during each of the monthly sampling events from July – September 2009.

Analytical parameters		
PARAMETER	**NO. OF SAMPLES PER EVENT (2 SAMPLES)[3]**	**FREQUENCY/TIMING**
TOC	2	Monthly (July – September) Target low stream flows.
TDC	2	
TKN	2	
NO_2	2	
NH_3	2	
F-TKN	2	
NO_3	2	
Chlorophyll-*a*[1]	2	
SRP	2	
TDP	2	
TP	2	
TSS	2	
Cl	2	
BOD_5 [2]	2	
Turbidity	2	
Equipment Blank 1 – Dunker-Churn TOC, TDC, TKN, NO_2, NH_3, F-TKN, NO_3, SRP, TDP, TP, TSS, Cl, BOD_5, Turbidity		Monthly

[1] Chlorophyll-*a* will be collected at Buoy 316 from the 2 depths (1-meter below the water surface and 1-meter above the river sediments) during each of the sampling events.
[2] BOD_5 will be field composited from the 2 depths for the buoy location (1-meter below the water surface and 1-meter above the river sediments for one composite sample for analysis) during each of the sampling events.
[3] Field duplicates will be collected at Buoy 316 (1-meter below the water surface and 1-meter above the river sediments) during each of the monthly sampling events for each parameter.

APPENDIX I
Year 2009 Storm-Event Sampling Program

Ambient Monitoring Program
Onondaga County, New York

Tributary	Locations	Parameters	Frequency/Type of sample
Onondaga Creek	• Rte. 20 • Dorwin Avenue	TP, SRP, TDP, TKN, Cl, TSS, Fecal Coliform, Turbidity, Temperature	2 times in Year 2009. Sampling will be initiated within 2 hours of a storm event.[1] Sample[2] every 4 hours for 1st day (24 hours); every 6 hrs for 2 consecutive days (48 hours) thereafter.
Onondaga Creek	• Spencer Street • Hiawatha Blvd. Bridge[3]	TP, SRP, TDP, TKN, Cl, TSS, Fecal Coliform, Turbidity, Temperature	2 times in Year 2009. Sampling will be initiated within 2 hours of a storm event.[1] Sample[2] every 2 hours for 1st day (24 hours); every 4 hrs for 2 consecutive days (48 hours) thereafter.
Onondaga Lake	• Onondaga Lake Sites 1-11[4] (See Figure 1) Site 1 – Ninemile Creek 43° 05. 477'N; 76° 13. 650'W Site 2 – Harbor Brook 43° 03. 877'N; 76° 11. 043'W Site 3 – Metro 43° 03. 937'N; 76° 10. 931'W Site 4 – Ley Creek 43° 04. 407'N; 76° 10. 768'W Site 5 – Eastside 43° 06. 529'N; 76° 13. 598'W Site 6 – Willow Bay 43° 06. 873'N; 76° 14. 156'W Site 7 – Maple Bay 43° 06. 732'N; 76° 14. 713'W Site 8 – Bloody Brook 43° 05. 720'N; 76° 12. 225'W Site 9 – Wastebeds 43° 04.880' N; 76° 12.620'W Site 10 – South Deep 43° 04.670' N; 76° 11.880'W Site 11 – North Deep 43° 05.930' N; 76° 13.730'W	Fecal Coliform, E. Coli, Turbidity Secchi Disk, Temperature	2 times in Year 2009. Once per day for 3 consecutive days per storm event.
Equipment Blank 1 - SS Pail TP, SRP, TDP, TKN, Cl, TSS, Turbidity			Once per sampling event.

[1] To target storms with rainfall intensities of 0.35"rain per hour.
[2] Sample from stream.
[3] Duplicate samples will be collected at the Onondaga Creek Hiawatha Blvd. location (during every other cycle).
[4] Onondaga Lake samples collected from the surface (to be collected within 24 hours of storm-event initiation).

APPENDIX J
2009 Water Quality Monitoring Programs
Summary of Modifications

Appendix A: Year 2009 Non-Event Sampling Schedule (April 2009 - March 2010)

As required by Appendix D of the Amended Consent Judgment, included is an annual sampling schedule for the 2009 non-event related sampling, specifying dates, locations, and parameters. In the event of a need to alter the schedule due to unforeseeable circumstances, NYSDEC and ASLF shall be notified *via fax only* as soon as practicable prior to the event.

Appendix B: Year 2009 Event-Based Sampling Schedule

The monitoring program for event related sampling specifies the number of annual activities.

Appendix C: Year 2009 Tributary Sampling Program

Modifications:

- Chlorophyll-a: Based on QEA's review of the bi-weekly Chlorophyll-a (chla) data measured at the Onondaga Lake Outlet from 2003 to 2007 and given how the TRWQM and OLWQM projects have progressed since these data were first collected, Chlorophyll-a data are not specifically needed to support the modeling since the lake boundary condition in TRWQM is now calculated by OLWQM.
- Added Bloody Brook at Old Liverpool Road (Site 9a) biweekly from April 1, 2009, through April 1, 2010.
- Footnote 5:
  Changed Bloody Brook (at Onondaga Lake Park) biweekly sampling from June 1 through September 30, 2009 (summer recreational period), to biweekly from April 1, 2009, through April 1, 2010. In order to evaluate the nature and sources of bacterial contamination in Bloody Brook, increase in sampling frequency is proposed and will focus during both periods of dry/wet weather conditions during the year (Site 9b).
- Footnote 7:
  Deleted Onondaga Creek Salt Spring (Spence-patrick Spring wellpoint) sampling for the parameters Cl, Ca, Na, Mg, K, SO_4, Fe, Mn, Alk-T, pH, Temperature, Dissolved Oxygen, Redox, Salinity and Conductivity (not part of the approvable AMP).

Appendix D: Year 2009 Onondaga Lake Sampling Program

Modification:

- VSS, TVS: Delete these parameters, as there is no regulatory basis or ambient water quality standard for including these parameters. TS, TSS and TDS will be continued as there is a NYSDEC ambient water quality standard for Dissolved Solids.

Appendix E: Year 2009 Onondaga Lake Winter Sampling Program

Modification:

- Added new Footnote 4: Underwater Illumination profile only recorded at South Deep station when the lake is ice free.

Appendix F: Year 2009 Onondaga Lake Special Weekly Sampling Program

Modification:

- Extended the frequency (5 x month) of the weekly sampling of the nearshore, South and North Deep sites from April 1 – November 30 in order to continue evaluating compliance with the NYS water quality Fecal Coliform monthly geometric mean from a minimum of five samples, standard of 200 colonies per 100 mL to be met during all periods when disinfection is practiced (to coincide with the Metro Effluent disinfection period).
- Added Lake nearshore site at the mouth of Onondaga Creek. GPS coordinates to be determined.

Appendix G: Year 2009 Onondaga Lake Fall Turnover Sampling Schedule

Modification:

- Deleted Footnote 3: YSI field data will be collected at the mouth of Onondaga Lake Tributaries (included Sawmill, Bloody Brook, East Flume, Tributary 5A, Ley Creek, Onondaga Creek, Harbor Brook, Ninemile Creek, Metro Outfall), North Deep station and Onondaga Lake Outlet once during turnover".

  Since 2003, Onondaga Lake has been in compliance with NYS Ambient Water Quality Standards for DO (daily average DO > 5mg/l has been met in upper waters (0-3m) during fall turnover). The in-situ spatial assessment of DO variability in the lake during the critical period of fall turnover is no longer considered necessary.
- Added North Deep station for in-situ monitoring to be measured every half-meter from 0- to 18-meter depth more frequently. Every effort made to collect daily profiles during the first three (3) days of fall mixing.

Appendix H: Year 2009 River Monitoring Program

Modification:

- No change.

Appendix I: Year 2009 Storm-Event Monitoring Program

During 2008 the Midland Avenue Regional Treatment Facility was completed. Two (2) of the three (3) storm events planned for Onondaga Creek were completed in 2008.

Modifications:

1. Conduct two (2) additional storm events for Onondaga Creek to continue the assessment of water quality improvements in Onondaga Creek realized by the Midland Avenue Regional Treatment Facility becoming operational.
2. Changed the high frequency sampling at the Onondaga Creek @ Hiawatha Boulevard location. Reduce the frequency of sampling at the two (2) upstream sites at Dorwin Avenue and Route 20 for Day 1 from every 2 hours to every 4 hours and for Day 2 & Day 3 from every 4 hours to every 6 hours.

APPENDIX K

Onondaga Lake Fish Community Sampling Plan 2009

Ambient Monitoring Program
Onondaga County, New York

Component	Methodology/Gear	Sampling Objectives	Location and Number of Samples	Timing	Changes
Pelagic Larvae	Modified double oblique Miller high-speed trawl, with flow meter attached, collected during the day in the pelagic zone.	Determine species richness.	- 4 double oblique tows in each basin (North and South) per event. -Tows will sample water depths from the surface to 5.5 meters. -Total No. of events =8 -Total No. of samples =64	-Daytime -Bi-weekly. -April (when water temps. are 7-8 ºC) through end of July.	-No Change from previous year.
Juvenile Fish	50' x 4' x 1/4" bag seine swept into shore in the littoral zone.	Determine community structure and species richness.	-5 strata with 3 sites in each strata and 1 sweep at each site. -No. of Sites = 15 -Total No. of events = 6 -Total No. of samples = 90	-Daytime -Every 3 weeks. -July - October.	-No Change from previous year.
Nesting Fish	Lake wide nest survey.	Document spatial distribution and species composition	-Entire perimeter of lake divided into 24 equal length sections. -Total No. of events = 1 -Total No. of samples = 24	-Once in June when water temperature is between 15° and 20 °C.	-No Change from previous year.
Adult Fish-Littoral Zone	Boat mounted electrofisher in the littoral zone at night.	Determine community structure, species richness, CPUE, and relative abundance.	-Entire perimeter of lake shocked in 24 contiguous transects. -Alternating all-fish/gamefish transects. -Total No. of events = 2 -Total No. of samples = 48	-Night-time. -Twice per year; Spring and Fall. -Spring and Fall. -Water temp. between 15º and 21 ºC.	-No Change from previous year.
Adult Fish-Profundal Zone	Experimental gill nets of standard NYSDEC dimensions.	Determine community structure, and species richness.	-One net per strata. -Nets set on bottom, parallel to shore at a water depth of 4-5m for two hours. -Total No. of events = 2 -Total No. of samples = 10	-During the day. -Twice per year, within one week of littoral electrofishing.	-No Change from previous year.
Angler Census	Angler diary program.	Determine catch rates, species composition. Attitudes and opinions over the AMP.	-Recruit diary participants at fish & game clubs and fishing organizations.	-Issued annually and collected at end of fishing season (fall).	-Dropped tagging at fish tournament weigh-in.

APPENDIX L

Onondaga Lake Macrophyte Assessment Program 2009

Ambient Monitoring Program
Onondaga County, New York

Component	Methodology/Gear	Sampling Objectives	Location and Number of Samples	Timing	Change
Onondaga Lake Aerial Photography	Program utilizes plane with belly mounted 9x9 camera. 60% forward overlap, 30% side overlap.	Determine annual percent of littoral zone with macrophytes.	-Three (3) flight lines full lake coverage.	-June or July when water clarity is approximately 3-meters on the secchi disk. -Early morning or early evening with low sun angle.	-No change from previous year.
Field Species Verification of Aerial Photography	Visual identification.	Determine species.	-Two (2) sites in each of the five (5) strata for a total of ten (10) sites.	-Within 1 week of the aerial photos.	-No change from previous year.
Macroalgae	At nine (9) near shore locations using a laser range finder to estimate distance from shore and visual percent cover estimate.	Document percent cover and annual proliferation of littoral zone macroalgae.	-Survey once per week at nine (9) near shore buoy locations.	-May through September.	- No change from previous year.

APPENDIX M

Onondaga Lake and Tributary Macroinvertebrate Assessment Program 2009

Ambient Monitoring Program
Onondaga County, New York

* No Lake Macroinvertebrate Monitoring Scheduled in 2009. Next event scheduled for 2010.

ATTACHMENT 1

QUALITY ASSURANCE PROGRAM PLAN
FOR THE 2009 WATER QUALITY MONITORING PROGRAM

AMBIENT MONITORING PROGRAM

Prepared for the NYSDEC

by:

Onondaga County
Department of Water Environment Protection

February 2009 (Draft)

QUALITY ASSURANCE PROGRAM PLAN

YEAR 2009 WATER QUALITY MONITORING PROGRAM
(AMBIENT MONITORING PROGRAM)
Onondaga County
Syracuse, New York
TABLE OF CONTENTS

I. PROGRAM DESCRIPTION

Onondaga Lake is an urban lake located in Onondaga County, New York. The lake has several natural tributaries and receives overflow from combined sewers in the City of Syracuse, treated effluent from the Metropolitan Syracuse Wastewater Treatment Plant (Metro) as well as non-point runoff from a mix of urban, residential, and agricultural areas.

Onondaga Lake is located immediately northwest of the City of Syracuse in Onondaga County, New York, USA (43° 06' 54" N, 76° 14' 34" W). The outlet of Onondaga Lake flows into the Seneca River, which joins with the Oswego River which eventually flows into Lake Ontario. The Onondaga Lake drainage basin encompasses approximately 700 km^2 and with exception of 2 km^2 in Cortland County lies almost entirely in Onondaga County. The tributary drainage basins include six natural sub-basins: Ninemile Creek, Harbor Brook, Onondaga Creek, Ley Creek, Bloody Brook, and Sawmill Creek. Although much of the lake watershed is agricultural, the lake itself is surrounded by urban and suburban development.

Since 1968, the water quality of Onondaga Lake and its tributaries have been monitored to meet the objectives of assessing: trophic status, compliance with New York State ambient water quality standards and guidance values, external loading of pollutants to Onondaga Lake through its tributaries, and trends in water quality in response to major pollutant abatement activities at Metro and the CSOs.

The annual lake monitoring program was originally implemented to comply with a special federal grant condition for the major upgrade of the Metro facility completed in the early 1970s. The scope of the annual monitoring program has expanded over the years in response to the enhanced understanding of the complex interactions between pollutant inputs and lake response. In 1998, the monitoring program was modified to provide specific data and information needed to assess the effectiveness of another round of improvements to the wastewater collection and treatment system. The Year 2009 Onondaga Lake Ambient Monitoring Program (AMP) is designed to determine whether planned controls on point and nonpoint source pollution loading will be sufficient to bring the lake, the lake tributaries, and a segment of the Seneca River into compliance with state and federal standards.

Trophic status of the lake will be assessed by monitoring Secchi disk transparency, major nutrient concentrations, chlorophyll-*a*, phytoplankton abundance and species composition, zooplankton species composition and abundance, the fish community, hypolimnetic dissolved oxygen, and accumulation of reduced species.

Compliance of the lake and tributary waters with the New York State ambient water quality standards will be evaluated. The lake is Class B and Class C; tributaries are Classes B, C, or C (T). Numerical standards exist for dissolved oxygen, ammonia, nitrite, and nitrate nitrogen, bacteria, pH, dissolved solids, and a large number of other organic and inorganic parameters. Narrative standards are in effect for several water quality parameters of Class B and C waters (including Onondaga Lake and its tributaries)."

As detailed in Section 703.2 of the New York State Environmental Conservation Law, parameters regulated by a narrative standard include:

Taste-, color-, and toxic and other deleterious substances	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special, GA, GSA, GSB	None in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages.
Turbidity	AA, A, B, C, D, SA, SB, SC, I, SD	No increase that will cause a substantial visible contrast to natural conditions.
Suspended, colloidal and settleable solids	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.
Oil and floating substances	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease.
Phosphorus and nitrogen	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.
Thermal discharges	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	See Part 704 of the NYS ECL

External annual loadings (concentration and flow) to Onondaga Lake through its tributary streams of oxygen demanding materials, sediments, bacteria, metals, dissolved salts, plant nutrients are monitored. Monitoring is conducted throughout the year and the program is designed to capture high flow and storm events along with baseline conditions. These data are also used for general surveillance to evaluate compliance with the County's pretreatment program. The trends in Onondaga Lake and Tributary water quality over time and in response to major reductions in point source loadings will be assessed through statistical evaluations of the long-term data set developed for this system. An annual report summarizing the results of the current year's data acquisition program and the statistical analyses of trends in external loading and lake response is prepared each year. Data are archived in a database.

The annual Onondaga Lake Monitoring program was expanded in 1994 to include water quality sampling at key locations in the Seneca/Oneida/Oswego river system. The purpose of the County's river monitoring program is to define ambient water quality conditions in the River system, between Cross Lake and Three Rivers, determine compliance with the water quality standards, evaluate the assimilative capacity of the Seneca River, and identify the impacts of the Baldwinsville Seneca-Knolls WWTP, Wetzel Road WWTP, Oak Orchard WWTP and the Onondaga Lake Outlet on River water quality.

In January 1998, Onondaga County signed an Amended Consent Judgment (ACJ) committing to a phased 15-year program of upgrades and improvements to the County's wastewater collection and treatment system. The County's long-term monitoring program was evaluated and modified to ensure that the data collected would be adequate to evaluate the response of the lake, streams, and river to the planned improvements to the Combined Sewer Overflows (CSOs) and Metro. This process of evaluation and modification was a collaborative effort of Onondaga County, its technical advisors, New York State Department of Environmental Conservation (NYSDEC), the Environmental Protection Agency (EPA), and Atlantic States Legal Foundation (ASLF). Modifications were made to focus the monitoring program on a series of hypotheses related to the effectiveness of the County's improvements to the wastewater collection and treatment system. A revised monitoring program, known as the Ambient Monitoring Program (AMP) was initiated in August 1998.

The effectiveness of the improvements to the County's wastewater system can be measured in terms of (1) compliance with water quality standards and guidance values, and (2) restoration of a balanced ecological community of plants and animals. A significant change in the annual monitoring program was the greatly expanded focus on the biology of the aquatic system including the status of the fish community, macroinvertebrates, rooted aquatic plants, algae, and zooplankton, in addition to tracking the physical and chemical variables.

II. TECHNICAL DESIGN

The monitoring program described above discusses the full matrix of water quality issues and parameters of concern to Onondaga County.

A. INTRODUCTION

The Onondaga County Department of Water Environment Protection (OCDWEP) has monitored the water quality of Onondaga Lake and its tributaries since 1970.

Refer to Appendix A Year 2009 Water Quality Program-Ambient Monitoring Program (non-event sampling schedule).

Water samples for analysis will be collected and analyzed according to EPA requirements for Water Planning and Management (40 CFR 136, 1991 or latest version) and EPA 600/4-82-029. Sampling and analysis will be consistent with New York State's Environmental Laboratory Approval Program (ELAP). The OCDWEP Environmental Laboratory is certified by New York State (ELAP #10191) and the National Environmental Laboratory Accreditation Conference (NELAC).

B. ONONDAGA LAKE

Onondaga Lake will be sampled from April 1 through December 1, 2009, according to the calendar included in Appendix A Year 2009 Ambient Monitoring Program (non-event sampling schedule). The parameters to be sampled and their schedules are also detailed.

Samples will be collected from the locations identified as "South Deep" and "North Deep" stations. The exact sampling location will be at the mooring buoys deployed at the South and North Deep stations as listed below.

The coordinates of the monitoring stations are as follows:

South Deep:	43° 04.670' N	Latitude
	76° 11.880' W	Longitude
North Deep:	43° 05.930' N	Latitude
	76° 13.730' W	Longitude

Studies have shown that sampling from these basins will reflect the condition of the remainder of the lake.

In-situ data for pH, Dissolved Oxygen (DO), Temperature, Specific Conductance, and Oxidation-

Reduction Potential (ORP) will be collected at half-meter intervals throughout the water column using either a YSI 600 or a YSI 6600 in-situ monitoring sonde. Calibration and instrument calibration drift checks will be conducted before and after each sampling event.

Samples will be collected using a submersible pump and a Wildco Beta sampler, depending on the sample parameter. However, samples of bacteria will be collected in sterile containers. When pumping, sufficient time will be allowed in order to evacuate the pump lines of all previous samples. In addition, all sample containers will be rinsed with sample water, unless they are pre-preserved. Composite samples will be collected on a volumetric basis (i.e., the proportions of samples collected at the series of depths are composited equally using a Wildco Beta sampler). Compositing will be accomplished using a sample-splitting churn. Samples will be thoroughly mixed and poured-off from the churn. All sampling equipment used on Onondaga Lake is dedicated for this purpose only.

Other field data to be collected include Secchi disk transparency and light availability. Light availability data are collected at 20-cm intervals from the water surface to a depth at which light is 1% of surface illumination, as noted during the sampling event, using a LiCor datalogger.

In addition to the above, OCDWEP partially funds the gauging stations on Onondaga Lake and its tributaries in conjunction with the United States Geological Survey. Flow data are used to calculate loading rates.

C. TRIBUTARIES

Onondaga Lake tributaries are sampled throughout the year, according to the calendar included as Appendix A Year 2009 Ambient Monitoring Program (non-event sampling schedule). The parameters to be sampled and their schedules are detailed in Appendix C Year 2009 Ambient Monitoring Program (Tributary Sampling Program).

In-situ data for pH, Dissolved Oxygen, Temperature, Specific Conductance, and Oxidation-Reduction Potential will be collected using a YSI sonde. Calibration and calibration drift checks will be conducted before and after each sampling event.

Tributary samples will be collected using the depth-integrated sampling technique from each location, except for at the Allied East Flume, Sawmill Creek, Onondaga Lake Outlet, Harbor Brook at Hiawatha Boulevard, and Ley Creek monitoring sites. The Allied East Flume, Bloody Brook and Sawmill Creek samples are taken as described in Attachment A, sections 9, 13, 14, and 15 respectively. A vertical Kemmerer Bottle sampler will be used at the Onondaga Lake Outlet, Harbor Brook at Hiawatha Boulevard, and Ley Creek monitoring sites. Samplers and sample containers are rinsed prior to dispensing sample water for analysis into the sample containers. Bacteria samples will be collected in sterile containers. All sampling equipment used on the tributaries is dedicated for this purpose. Stage gauge measurements will be taken to record the water surface elevation during each sampling event.

D. RIVER

River samples will be collected using grab techniques from Buoy 316 as part of the AMP. A separate A Three Rivers Water Quality Monitoring Program at select sites between Cross Lake and the Three Rivers Junction will be conducted in 2009 to gain additional data to support further calibration and validation efforts of the Three Rivers Water Quality Model. The Supplemental Workplan is not

included with the Year 2009 AMP submittal, as it is not part of the approvable program.

A Beta sampler will be utilized for sample collection. Samplers and sample containers are rinsed prior to dispensing sample water for analysis into the sample containers.

The station will be sampled for analytical parameters at 1-meter below the water surface and 1-meter above the channel bottom in order to evaluate density stratification effects on water quality.

Measurements taken during the sampling events will also include vertical profiles of the field parameters to define possible stratification. In-situ data for pH, Dissolved Oxygen, Temperature, Specific Conductance, and Oxidation-Reduction Potential will be collected at half-meter intervals throughout the water column using a YSI sonde. Calibration and calibration drift checks will be conducted before and after each sampling event. Samples will be collected for laboratory analysis in accordance with Appendix H of the Year 2009 Ambient Monitoring Program.

III. PROGRAM ORGANIZATION AND RESPONSIBILITY

The responsibilities and qualifications of the key Program Team members are discussed below. Members of this Team have the experience and capabilities to conduct all aspects of the program and to effectively interact and communicate with NYSDEC staff.

A. RESPONSIBILITIES AND QUALIFICATIONS

Mr. Joseph J. Mastriano, Program Manager

Joseph J. Mastriano will serve as Program Manager and will be responsible for the management of program activities. Mr. Mastriano will be responsible for monitoring program budgetary control, coordinating field activities and lab analysis, coordinating and overseeing the work of program sub-contractors including report preparation.

Mr. Mastriano has over 29 years experience in the field of water and wastewater resources and has been intimately involved in several projects related to Onondaga Lake. Specifically, Mr. Mastriano has:

- Conducted field monitoring of Onondaga Lake and its tributaries from May 1978 until Spring 1985.
- Served as the Department's primary contact responsible for coordinating departmental efforts associated with Dr. William Walker's compilation and validation of the 24-year database.
- Designed and administered special studies to determine the effects of atypical conditions on receiving water. Examples of these efforts include: monitoring conducted in response to failures in the collection/treatment system infrastructure, and monitoring the effect of wet weather conditions on the lake and its tributaries.

Other examples of Mr. Mastriano's work experience include:

- Administration of the County's industrial pretreatment and other source control programs including: review and approval of treatment system design, permitting, monitoring, enforcement, and cost recovery activities.
- Serves as the County's primary on-call contact for directing the response to uncontrolled discharge of materials to the sanitary sewer system and those sections of lake tributaries maintained by the County.
- Administration of special studies conducted by the County including projects such as tracer/dye studies of lake tributaries, the collection system, and treatment plant unit processes; and studies to evaluate the source, effect and fate of materials entering the wastewater treatment system.

Mr. Jeff Noce, Laboratory Director

Mr. Noce will be responsible for the general administration of the analytical elements of the program. He will assist other members of the team on analytical issues and ensure compliance with proper analytical protocol. He will also ensure dissemination of analytical results in a timely and efficient manner to facilitate completion of schedule work tasks.

Mr. Noce has 29 years of experience in analytical chemistry with OCDWEP. For 22 of those years as a supervisor in charge of nutrient, organic and solids analysis with the Department. Since 2003, Mr. Noce has been involved in the administrative aspects of the lab, first as Senior Chemist and then as Laboratory Director.

Representative examples of Mr. Noce's work experience include:

- Environmental Laboratory supervisor responsible for nutrient, organic and solid waste analysis for 22 years.
- Responsibility for the collection and analyses of surface water, wastewaters, and solid/hazardous wastes utilized in a variety of programs by the Department of Water Environment Protection.
- Laboratory Director for Water Environment Protection responsible for administration of analytical service and compliance mandated by the National Environmental Laboratory Accreditation Program. Responsibilities include operation of lab facility and general supervision of 19 analysts.'

Ms. Janaki Suryadevara, Sanitary Engineer II

Ms. Suryadevara has worked as a Sanitary Engineer for the County since 1993. Ms. Suryadevara coordinates the County's water quality programs and will be responsible for scheduling the Onondaga Lake, tributary and river sampling events and developing QA/QC procedures for sample collection. Ms. Suryadevara will be responsible for coordinating the review and preparation of the Annual Lake Ambient Monitoring Program Report, oversight and design of the field program, coordinating field and laboratory efforts, and for supervision of the technician staff performing field sampling.

Mr. David Snyder, P.E., Sanitary Engineer II

Mr. Snyder coordinates the County's biological monitoring programs, which include monitoring of the fishery, macroinvertebrates, macrophytes, and zebra mussels on Onondaga Lake, its tributary streams and the Three Rivers system. He is also responsible for biological program design and implementation.

Mr. Antonio D. Deskins, Sanitary Engineer I

Mr. Deskins will be responsible for the initial data review, compilation and maintenance of the database. Mr. Deskins also participates in Lake/Tributary/River sampling events and performs field audits as necessary. Mr. Deskins' computer skills are utilized in evaluating and presenting AMP field/analytical data and in generation of the Annual Lake Ambient Monitoring Program Report. Mr. Deskins will also utilize his data-processing experience in order to maintain the AMP databases and produce the tabular and graphical summaries, which are necessary to analyze trends and tributary loading computations.

Onondaga Lake Technical Advisory Committee (OLTAC):

In addition to the team referenced above, the County will utilize a Technical Advisory Group composed of experts in several disciplines to discuss results and implications of the annual program. Current members, their areas of technical expertise, affiliation, and addresses are as follows:

1. Dr. Charles T. Driscoll - Aquatic Chemistry
   Department of Civil and Environmental Engineering
   220 Hinds Hall
   Syracuse University

Syracuse, NY 13244

2. Dr. James Hassett - Engineering Hydrology; Water Pollution Engineering; Water Quality Modeling
   SUNY College of Environmental Science and Forestry (ESF)
   122 Bray Hall
   Syracuse, NY 13210

3. Dr. Edward L. Mills - Aquatic Food Web; Zebra Mussel Dynamics
   Cornell University Biological Field Station
   900 Shackelton Point Road
   Bridgeport, N.Y. 13030-9747

4. Dr. Elizabeth Moran - Limnology
   EcoLogic, LLC.
   Atwell Mill Annex, Suite S-2
   132 ½ Albany Street
   Cazenovia, N.Y. 13035

5. Dr. Lars Rudstam - Fisheries
   Cornell University Biological Field Station
   900 Shackelton Point Road
   Bridgeport, N.Y. 13030-9747

6. Dr. Kenton Stewart - Physical Limnology
   University of Buffalo
   199 Crown Royal Drive
   Williamsville, N.Y. 14221

7. Dr. William Walker, Jr. - Limnological and Statistical Modeling
   1127 Lowell Road
   Concord, MA 01742

B. SAMPLING SCHEDULE

2009 Non-Event Water Quality & Biological Sampling Schedule (April 2009 - March 2010)

DATE /DAY	PROGRAM	EVENT	APPENDIX
April 2009			
April 1/Wedesday	Onondaga Lake	Lake Special Weekly	F
April 7/Tuesday	Onondaga Lake	Double Lake (South & North Deep) (w/Lake Special Weekly)	D & F
April 13/Monday	Onondaga Lake	Lake Special Weekly	F
April 14/Tuesday	Tributary	Biweekly	C
April 21/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
April 27/Monday	Onondaga Lake	Lake Special Weekly	F
April 28/Tuesday	Tributary	Biweekly	C
May 2009			
May 5/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
May 11/Monday	Onondaga Lake	Lake Special Weekly	F
May 12/Tuesday	Tributary	Biweekly	C
May 19/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D &F
May 26/Tuesday	Onondaga Lake	Lake Special Weekly	F
May 27/Wednesday	Tributary	Biweekly	C
June 2009			
June 2/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
June 8/Monday	Onondaga Lake	Lake Special Weekly	F
June 9/Tuesday	Tributary	Quarterly Extended	C
June 16/Tuesday	Onondaga Lake	Double Lake (South & North Deep) (w/Lake Special Weekly)	D & F
June 22/Monday	Onondaga Lake	Lake Special Weekly	F
June 23/Tuesday	Tributary	Biweekly	C
June 30/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
July 2009			
July 6/Monday	Onondaga Lake	Lake Special Weekly	F
July 7/Tuesday	Tributary	Biweekly	C
July 9/Thursday	River*	Monthly	H
July 14/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
July 20/Monday	Onondaga Lake	Lake Special Weekly	F
July 21/Tuesday	Tributary	Biweekly	C
July 28/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
August 2009			
August 3/Monday	Onondaga Lake	Lake Special Weekly	F
August 4/Tuesday	Tributary	Biweekly	C
August 6/Thursday	River*	Monthly	H

APPENDIX A (Continued)
2009 Non-Event Water Quality & Biological
Sampling Schedule (April 2009 - March 2010)

DATE /DAY	PROGRAM	EVENT	APPENDIX
August 11/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
August 17/Monday	Onondaga Lake	Lake Special Weekly	F
August 18/Tuesday	Tributary	Biweekly	C
August 25/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
September 2009			
September 1/Tuesday	Onondaga Lake	Lake Special Weekly	F
September 2/Wednesday	Tributary	Biweekly	C
September 8/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
September 10/Thursday	River*	Monthly	H
September 14/Monday	Onondaga Lake	Lake Special Weekly	F
September 15/Tuesday	Tributary	Quarterly Extended	C
September 22/Tuesday	Onondaga Lake	Double Lake (South & North Deep) (w/Lake Special Weekly)	D & F
September 28/Monday	Onondaga Lake	Lake Special Weekly	F
September 29/Tuesday	Tributary	Biweekly	C
October 2009			
October 6/Tuesday	Onondaga Lake	Lake South Deep (w/Lake Special Weekly)	D & F
October 12/Monday	Onondaga Lake	Lake Special Weekly	F
October 13/Tuesday	Tributary	Biweekly	C
October 20/Tuesday	Onondaga Lake	Lake South Deep	D
October 27/Tuesday	Tributary	Biweekly	C
November 2009			
November 3/Tuesday	Onondaga Lake	Lake South Deep	E
November 9/Monday	Tributary	Quarterly Extended	C
November 17/Tuesday	Onondaga Lake	Double Lake (South & North Deep)	D
November 24/Tuesday	Tributary	Biweekly	C
December 2009			
December 1/Tuesday	Onondaga Lake	Lake South Deep	D
December 8/Tuesday	Tributary	Biweekly	C
December 22/Tuesday	Tributary	Biweekly	C
January 2010			
January 5/Tuesday	Tributary	Biweekly	C
January 12/Tuesday	Onondaga Lake	Winter**	E
January 19/Tuesday	Tributary	Biweekly	C
February 2010			
February 2/Tuesday	Tributary	Biweekly	C
February 9/Tuesday	Onondaga Lake	Winter**	E
February 16/Tuesday	Tributary	Biweekly	C
March 2010			
March 2/Tuesday	Tributary	Biweekly	C
March 9/Tuesday	Onondaga Lake	Winter**	E
March 16/Tuesday	Tributary	Biweekly	C
March 31/Tuesday	Tributary	Quarterly Extended	C

*** River sampling events to target low flows (at or less than 500 cfs at Baldwinsville). Sampling event dates may be altered.**
**** Lake Winter dates are tentative and will depend on weather conditions/extent of ice cover on lake.**

C. DATA VALIDATION

1. Results of laboratory analyses are submitted to the program team members Janaki Suryadevara and Antonio Deskins within four weeks of collection.

2. Interim product: monthly data summaries (paper and diskette) will be compiled with codes flagging any limitations to data usability identified during the data validation process. Data validation will occur within four weeks of receipt of laboratory data.

D. DATA SUMMARIES

Data summaries: within three months of receipt of a complete set of validated data, a data summary will be compiled.

1. Calculate means, medians and averages of lake data.

2. Compare measured lake concentration to ambient water quality standards.

3. Calculate means, medians of concentrations of tributary water quality data.

4. Compare measured tributary concentration to compliance with ambient water quality standards.

E. ANNUAL REPORT PREPARATION

The "draft" report will be compiled within five months of receipt of complete set of validated data.

Annual Results -

1. Tables of Year 2009 results (concentrations and loads in lake and tributaries).

2. Statistical comparisons of Year 2009 results to the long-term data set.

Trend Analysis -

3. The trend analysis for the tributary and lake data, which is an important step in tracking progress towards lake restoration, using the most recent ten years of data, will be completed. The standard methodology developed by Dr. William Walker, Jr. will be used to apply the seasonal Kendall test to the lake datasets.

Compliance -

4. The report will include a section on the water quality conditions and compliance with the ambient water quality standards for the water body segment measured in the tributaries, Onondaga Lake, and the Seneca River. The report will include a summary analysis of the Metro discharge with the SPDES permit.

Loading -

5. External loading of materials to the lake will be calculated once USGS discharge records are received. In mid-2004, Dr. William Walker, Jr. refined his program used to estimate loading to Onondaga Lake. The improved estimation technique, called "Method 5", was developed in conjunction with the compilation of the OCDWEP long-term integrated water quality database and supporting software. The new technique was developed to support estimation of daily loads, to support development of monthly and seasonal lake mass balances, and to improve the accuracy and precision of the annual load estimates. Method 5 differs from AUTOFLUX Method 2 in several ways. Data are stratified by flow regime (similar to AUTOFLUX Method 2) and are also stratified by season using a multiple regression technique. Conditions during the unmonitored period are projected using a residual interpolation method that includes a flow derivative term.

Lower Trophic Levels -

6. Phytoplankton identification and enumeration will be completed and key findings of the lower trophic levels analysis will be evaluated and included as part of the integrated assessment of water quality conditions and ecosystem response.

7. Zooplankton density, species composition, size, and biomass will be determined and evaluated.

IV. FIELD SAMPLE COLLECTION & PRESERVATION

A. Field sampling techniques are consistent with those described in the following U.S. Government publications:

1. EPA 600/4-82-029 (September 1982)

2. 40 CFR 136 (March 1991)

3. EPA 821-R-95-034 (Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Criteria Levels).

B. Field QC consists of replicates and equipment rinsate blanks as specified in ELAP protocol.

C. Sample preservation requirements:

Due to the variety of possible sample types, only generalizations can be made. Preservatives are added in compliance with the analytical protocols (reference Attachment C – Analytical Methodologies). Analysis begins as soon as possible. A complete chain-of-custody record is maintained on each sample to provide a history of sample handling from collection to analysis.

Table 1 indicates the criteria for sample collection and preservation. All samples are aqueous.

TABLE 1 - SAMPLE COLLECTION AND PRESERVATION				
ANALYTE	**VOLUME**	**CONTAINER**	**PRESERVATION**	**MAXIMUM HOLDING TIME**
Biological				
Coli, Fecal	125ml	P	Cool 4° C	6 Hrs.
E. Coli	125ml	P	Cool 4 ° C	6 Hrs.
Chlorophyll a	2000ml	P	Cool 4 ° C	
Phaeophytin a	2000ml	P	Cool 4 ° C	
Phytoplankton	500ml	P	Lugol's solution, Cool 4 ° C	
Zooplankton	1000ml	P	Ethanol (70% by Volume), Cool 4 ° C	
Inorganic Tests				
Biochemical Oxygen Demand	1/2 Gallon	P	Cool 4 ° C	48 Hrs.
Cyanide, Total	1000ml	P	Cool 4 ° C, NaOH to pH > 12, 0.6g ascorbic acid	14 Days
Kjeldahl and Organic Nitrogen	1000ml	P	Cool 4 ° C, H_2SO_4 to pH < 2	28 Days
Total Phosphorus	1000ml	P	Cool 4 ° C, H_2SO_4 to pH < 2	28 Days
Soluble Reactive Phosphorus	125ml	P	Cool 4 ° C	24 Hrs.
Total Dissolved Phosphorus	125ml	P	Cool 4 ° C, H_2SO_4 to pH < 2	24 Hrs.
All Metals				
Arsenic	1000ml	P	HNO_3 to pH<2	6 Months
Cadmium	1000ml	P	HNO_3 to pH<2	6 Months
Calcium	1000ml	P	HNO_3 to pH<2	6 Months
Chromium (GFA)	1000ml	P	HNO_3 to pH<2	6 Months
Copper	1000ml	P	HNO_3 to pH<2	6 Months
Iron	1000ml	P	HNO_3 to pH<2	6 Months
Lead (GFA)	1000ml	P	HNO_3 to pH<2	6 Months
Magnesium	1000ml	P	HNO_3 to pH<2	6 Months
Manganese	1000ml	P	HNO_3 to pH<2	6 Months
Nickel	1000ml	P	HNO_3 to pH<2	6 Months
Potassium	1000ml	P	HNO_3 to pH<2	6 Months
Sodium	1000ml	P	HNO_3 to pH<2	6 Months

TABLE 1 - SAMPLE COLLECTION AND PRESERVATION

ANALYTE	VOLUME	CONTAINER	PRESERVATION	MAXIMUM HOLDING TIME
Zinc	1000ml	P	HNO_3 to pH<2	6 Months
Mercury	1000ml	P	HNO_3 to pH<2	28 Days
Organic Carbon, Total	1/2 Gallon	P	Analyze within 24 hours or Cool 4 ^oC H_3PO_4 to pH < 2	28 Days
Organic Carbon, Filtered Total	1/2 Gallon	P	Analyze within 24 hours or Cool 4 ^{o} C H_3PO_4 to pH < 2	28 Days
Inorganic Carbon, Total	1/2 Gallon	P	Cool 4 ^oC	48 Hours
Phenols	1000ml	G	Cool 4 ^oC, H_2SO_4 to pH < 2	28 Days
Solids, Total	1/2 Gallon	P	Cool 4 ^oC	7 Days
Solids, Total Suspended	1/2 Gallon	P	Cool 4 ^oC	7 Days
Solids, Total Volatile	1/2 Gallon	P	Cool 4 ^oC	7 Days
Solids, Total Suspended	1/2 Gallon	P	Cool 4 ^oC	7 Days
Volatile	1/2 Gallon	P	Cool 4 ^oC	7 Days
Solids, Total Dissolved	1/2 Gallon	P	Cool 4 ^oC	7 Days
Silica	1/2 Gallon	P	Cool 4 ^oC	28 Days
Sulfate	1/2 Gallon	P	Cool 4 ^oC	28 Days
Sulfide	300ml	G	Cool 4 ^oC, add zinc acetate plus sodium hydroxide to pH > 9	7 Days
Specials				
T-Alkalinity	500ml	P	Cool 4 ^oC (no air bubbles present)	14 Days

All samples are aqueous.
Containers: P = Plastic; G = Glass

V. FIELD SAMPLING PROCEDURES

A. ONONDAGA LAKE

1. Metals

i. Samples are collected as grabs and composited volumetrically.

ii. The Wildco Beta sampler is used for sample collection. The sampler is rinsed in lake water prior to use in order to ensure cleanliness. Samples are mixed in a churn, which has also been rinsed in lake water. The sample bottle is rinsed with the composite sample prior to pouring-off from the churn into the one-liter plastic bottle, and filled to the shoulder.

iii. Parameters to be analyzed biweekly include:

Ca, Na, Mg, Mn, Fe

iv. Parameters to be analyzed quarterly include:

Cd, Cr, Cu, Ni, Pb, Zn, As, K

v. Quarterly metals samples will be collected using modified trace metals sampling techniques for sample collection. This sampling methodology is described in EPA Method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria). The sample crew incorporates as much of this procedure as possible given the field conditions during the sampling event.

vi. All samples are preserved by adding Nitric Acid to pH < 2, and cooling to 4°C.

2. Mercury

i. Special samples for Total and Methyl Mercury will be collected at 3m and 18m depths in 500-ml Teflon bottles using the "clean hands-dirty hands" technique for sample collection. The Teflon® Dunker used shall be pre-cleaned and stored in accordance with the procedures contained in the OCDWEP SOP titled "Onondaga Lake Sampling Preparation", document number 00077. Use of the Teflon® Dunker will be in accordance with the procedures contained in the OCDWEP SOP titled "Onondaga Lake Sampling Methodology", document number 00085. The dirty hands sampling technician will be responsible for handling the Teflon® Dunker and pouring the sample. The clean hands sampling technician shall only touch the sample container and cap.

ii. A separate equipment rinseate blank for the Teflon Kemmerer Water Sampler will be collected for special low-level mercury analysis.

iii. A field blank will also be collected at the sampling site, prior to sample collection. This will consist of reagent water, supplied by the contract laboratory,

processed through the sampling device.

iv. The analysis of samples for the determination of Total Mercury will be achieved by Cold Vapor Atomic Fluorescence (CVAFS) Spectrometry. The methodology is described by Fitzgerald and Gill (1979), Bloom and Crecelius (1983), Gill and Fitzgerald (1985); Bloom and Fitzgerald (1988), Method 1631 (USEPA, 1995).

3. Conventionals

i. "Conventional" discrete samples are collected at 0m, 6m, 12m, and 18m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water collected from the appropriate depth prior to filling.

iii. One gallon plastic or gallon sample bottles are filled to the shoulder and then cooled to 4°C (no further preservation is required).

iv. "Conventional" parameters include:

TS, TSS, TDS, SiO_2, TOC, TOC-F, TIC

v. A second "conventional" composite sample for both the upper mixed layer (UML) and the lower water layer (LWL) is collected as grabs and composited volumetrically. (See Page 22 - **Composite Sample collection**).

vi. The Wildco Beta sampler is used for sample collection. The sampler is rinsed in lake water prior to use in order to ensure cleanliness. Samples are mixed in a churn, which has also been rinsed in lake water. The sample bottle is rinsed with the composite sample prior to pouring-off from the churn into the half-gallon plastic sample bottles filled to the shoulder and then cooled to 4°C (no further preservation is required).

vii. Composite Parameters include:

BOD_5, NO_2, NO_3, Cl, SO_4, Turbidity (UML only).

4. Soluble Reactive Phosphorus (SRP)

i. SRP samples are collected at 0m, 3m, 6m, 9m, 12m, 15m, 18m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water at the appropriate depth prior to filling.

iii. The sample will be filtered on site.

iv. Collect sample in a new disposable container.

v. Place a previously washed 0.45-micron filter into filter apparatus.

vi. Filter sample into the SRP container (250-ml plastic disposable) leaving a small airspace.

vii. Discard filter and rinse apparatus.

NOTE: When sample turbidity prevents using one filter to fill container; remove clogged filter, replace with another washed filter and continue filtration. Under extreme conditions of algal density (i.e., when filter clogs yielding less than 20 ml filtrate) sample may be pre-filtered using a washed glass-microfiber filter, and filtered into a clean container before final filtration with a 0.45 micron filter.

viii. The 250-ml plastic disposable sample bottles are then cooled to 4°C (no further preservation is required).

5. Total Dissolved Phosphorus (TDP)

i. TDP samples are collected at 0m, 3m, 6m, 9m, 12m, 15m, 18m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water at the appropriate depth prior to filling.

iii. The sample will be filtered on site.

iv. Collect sample in new disposable container.

v. Place a previously washed 0.45-micron filter into filter apparatus.

vi. Filter sample into the TDP container (250-ml plastic disposable) leaving a small airspace.

vii. Discard filter and rinse apparatus.

NOTE: When sample turbidity prevents using one filter to fill container; remove clogged filter, replace with another washed filter and continue filtration. Under extreme conditions of algal density (i.e., when filter clogs yielding less than 20 ml filtrate), sample may be pre-filtered using a washed glass-microfiber filter, and filtered into a clean container before final filtration with a 0.45 micron filter.

viii. Preservation: Adjust pH < 2 with H_2SO_4.

ix. The 250-ml plastic disposable sample bottles are then cooled to 4°C.

6. Chlorophyll-*a*

i. Chlorophyll-*a* samples are collected as depth-integrated tube samples through the standard depth of 0-3m of the water column year round. A 3/4" tygon tubing is used as the sample collection device.

ii. Samples are analyzed for chlorophyll-*a* and phaeophytin-*a* content.

Equipment Requirements: 3/4" Tygon Tube compositing apparatus
Chlorophyll Bottle
YSI Unit
Secchi disc

Bottle Requirements: (1) 2 liter Amber Bottle

iii. Lower the tube sampler to the 3m depth (Step 1). Place a stopper in the end of the tube (Step 2). Rinse the sample bottle with the sample water and pour out (Step 3). Repeat Steps 1 and 2 pull the tube from the water and pour the entire tube contents into the dedicated carboy. Repeat tube composites until sufficient volume is collected. Use only a full tube composite. Thoroughly mix sample prior to pouring off into container.

7. Net Haul

i. A net haul sample is obtained for zooplankton analysis.

Equipment Requirements: 0.5 Meter Wildco Beta Plankton Net with 80 um mesh 80 um sieve and Mechanical flowmeter (RIGO Type 5571-A)

Bottle Requirements: (1) 1000-ml bottle
(2) 500 ml containers of 95% Ethanol/Alka-Seltzer

Collect samples as follows: 0-15 Meters (during unstratified periods)
UML (during the thermally stratified period)

ii. Record the flowmeter dials, and place the net into the water to allow the sample bucket to fill with water. Allow the net to sink to a depth of 15 meters. Draw the net to the surface at a rate of 0.5 meter per second or less and record the final flowmeter dials. Carefully wash all the residual sample clinging to the net into the quick disconnect bucket. Filter as much water as possible. Pour the entire sample into the 80 um sieve and filter further until you have a slurry of sample. Pour the entire sample into the 1000-ml plastic jar and rinse any residual into the jar with wash bottle. Place a quarter tablet of Alka-Seltzer into the jar and wait for zooplankton movement to stop. Add 70% by volume of 95% reagent grade non-denatured ethanol. (More ethanol is better.) Example: 150-ml sample requires 350-ml ethanol. The same procedure should be followed for the sample to be collected at the UML depth. Record the UML depth and flowmeter reading on the chain of custody form.

An "efficiency" reading will be recorded two times per year. This will entail performing a vertical tow with a netless ring and flowmeter at a known depth (Note: a netless ring will be kept in the boat at all

times). This will also ensure that the depth being sampled is accurately being sampled by the net tow. Extreme caution should be used for samples collected during conditions of strong winds and high current, to minimize the error in the flowmeter readings and to prevent the net from floating to the surface.

Refer to the flowmeter Standard Operating Procedure (SOP) for flowmeter operation and calibration checks.

Note: The UML composite depth shall be determined by the temperature profile.

8. Phytoplankton

i. Phytoplankton samples are obtained by OCDWEP for analysis.

Equipment Requirements:	(1) 500 ml Bottle Dedicated Carboy 3/4" Tygon Tube Secchi Disk YSI Unit
Sampling Requirements:	0-3 meter Composite

ii. Record a Secchi Disk Reading. The composite sample is collected using the tube composite sampler from 0-3 meters in the water column.

iii. Preserve the samples with enough Lugols Solution to turn the sample iodine color (maroon in Color), approximately 5 to 7 mls. per 100-mls of sample.
Note: The UML composite depth shall be determined by the temperature profile. Should no distinct thermocline profile be present, use 0-6 meters in depth as the UML default.

9. Sulfide

i. Samples for analysis of sulfide ion content are collected from 12m, 15m, 18m depths only when anoxic conditions are present at these depths. The Wildco Beta sampler is used in order to ensure minimum mixing and air entrainment into the sample.

ii. Samples are poured from the Wildco Beta sampler into a rinsed Boston round clear glass jar (8-oz capacity) with a conical insert screw closure and low-density polyethylene poly-seal liner. Samples are poured down the side of the bottle to minimize turbulence. The bottle is filled to the top and then stopped, being careful not to enclose any air bubbles.

iii. Preservation: 2 ml of Zn acetate is added to the bottle prior to the addition of sample. After sample addition, pH is adjusted to >9 with NaOH, container is topped off with sample to exclude air from the container, then cooled to 4°C.

10. TKN, NH_3-N & TP

i. Samples are collected in one liter disposable plastic bottles from 0m, 3m, 6m, 9m, 12m, 15m, and 18m depths. Samples are collected via the submersible pump, in a manner consistent with that described above for "conventionals."

ii. Determine Cl_2 residual with a LaMotte Test Kit. If Cl_2 residual is measured, add 30% Sodium Thiosulfate drop-wise; 1 drop/1 ppm Cl_2, then add 1 drop excess.

iii. Preservation: Adjust pH < 2 with H_2SO_4, cool to 4°C.

Example: Cl_2 measures 2.5 ppm - add 4 drops Sodium Thiosulfate - then H_2SO_4 to pH 1.5 - 2.0.

iv. Org-N results are calculated by subtracting the results of analyses of samples for Total Kjeldahl Nitrogen (TKN) and Ammonia Nitrogen (NH_3-N).

v. This sample will also be analyzed for Total Phosphorus (TP).

11. T-Alk

i. T-Alk samples are to be analyzed for Total Alkalinity as $CaCO_3$.

ii. T-Alk samples are collected as UML and LWL composites as described above for metals samples.

iii. T-Alk samples are poured-off from the churn into a rinsed 500-ml plastic bottle. The bottle is carefully stopped in order to exclude air and then cooled to 4°C.

12. Fecal Coliform

i. A Fecal Coliform sample is collected at 0m. Two sterile 125-ml plastic containers will be used.

The first container will be filled from the source (at 0m). The second container (disposable), pre-preserved with Sodium Thiosulfate crystals will be filled from the first container leaving a small airspace to enable the sample to be shaken, and then cooled to 4°C. This is the sample to be delivered to the laboratory for analysis. Samples will be checked for residual chlorine using a LaMotte "DPD Chlorine Test Kit."

******Sample volumes for this parameter are crucial. Fill the bottle to just above the shoulder of the bottle leaving a small (approximately 2.5 cm) airspace to enable sample to be shaken. Do no allow the water to rise above the threads of the bottle. Samples will be analyzed for E. Coli and Fecal Coliform.***

Composite Sample collection:

The "UML" (Upper Mixed Layer) and "LWL" (Lower Water Layer) composite samples collected during the sampling events will be made by mixing samples from discrete depths according to the following field protocol:

(a) Late fall, winter, and early spring (October 1 - May 31) when the lake waters are not strongly stratified.

i. The default UML during this period of the year is 0, 3, 6-m.

ii. The default LWL during this period of the year is defined as 9, 12, 15, and 18-m.

(b) Summer stratification period (June 1 - September 30)

i. The UML composite shall always include samples collected at 0 and 3-m depths. Inclusion of water collected at 6 m in the composite shall be evaluated based on the temperature profiles measured during the sampling event.

ii. The composite sample of the LWL will typically include water collected at depths of 12, 15, and 18-m during this period. The inclusion of the 12-m depth in the composite of the lower waters should be reviewed during each sampling event. Because the 9-m depth is consistently in the metalimnion (or "transition zone") during this period, water from this depth will not be included in either composite sample.

- The Thermocline is the area at which the temperature gradient is steepest during the summer; usually this gradient must be at least 1°C per meter. A rule of thumb is that the Thermocline exhibits a temperature change of approximately 1°C per meter.

- Record the field YSI profile to define depths of UML, Transition zone, and LWL prior to composite sample collection.

- Once the Thermocline depth is determined, samples are collected as grabs from the discrete sample depths, 0m, 3m, 6m, 9m, 12m, 15m, and 18m depths using a Wildco Beta sampling device. The Thermocline depth should not be included with either composite sample (UML or LWL). The Wildco Beta sampler is rinsed in lake water prior to use in order to ensure cleanliness. Samples are mixed in a churn, which has also been rinsed in lake water. The sample bottle is rinsed with the composite sampler prior to pouring-off from the churn into the sample bottle.

B. ONONDAGA LAKE TRIBUTARIES

The procedures used for the collection of samples from Onondaga Lake Tributaries are as follows:

1. All tributaries are sampled using the depth-integrated sampling technique, except the

   Allied East Flume, Sawmill Creek and Bloody Brook monitoring stations. For streams with low velocity and depositional conditions, the vertical kemmerer water

sampler is used (Ley Creek @ Park Street and Harbor Brook @ Hiawatha Boulevard sampling sites) – Refer to Attachment A - Tributary Field Sampling Procedures.

2. The Onondaga Lake Outlet is sampled at depths of 2 feet and 12 feet using the Kemmerer tube-sampling device from mid-channel. The sample for Fecal Coliform will be collected from mid-channel at the surface.

3. All sample bottles are rinsed in sample water prior to filling, and preserved according to the instructions detailed above.

   Depending on the depth of water at each station, a suspended (deep water) or hand-held sampler (wadeable) may be used. The depth-integrated sampling device is designed to accumulate a water-sediment sample from a stream vertical at such a rate that the velocity in the nozzle is nearly identical with the stream velocity. Judgment will be used to select the number and location of transects. The sampling procedures for this monitoring program will follow the protocol outlined in the New York State DEC Division of Water Bureau of Watershed Assessment & Research Program Plan for Rotating Intensive Basin Studies Water Quality Section (1997-1998). Procedures by sampling site are outlined in Attachment A.

   NOTE: A dedicated dunker with only silicone end seals will be utilized for the trace metals quarterly sampling events.

C. STORM-EVENT

1. The storm-event monitoring program is summarized in Appendix I of the Year 2009 Ambient Monitoring Program.

2. Tributary sampling will be initiated within 2 hours of a storm event. Samples will be collected as grabs from mid-stream of Onondaga Creek. Tributary storm-event sampling will include the parameters TP, SRP, TDP, TKN, Cl, TSS, Turbidity and Fecal Coliform.

3. Bacteria samples from the ten (10) Onondaga Lake stations will be collected from the surface, within twenty-four hours, once per day for 3 consecutive days. Analysis will include F. Coliform, E. Coli, Secchi Disk, Turbidity and Temperature. GPS coordinates will be recorded for the sampling sites during each sampling event.

4. Rainfall data will be collected at the Metro WWTP.

D. RIVER

1. The River samples are collected using a rinsed Wildco Beta sampler at 1 meter below the water surface and 1 meter above the sediment at each of the buoy stations.

2. All sample bottles are rinsed in sample water prior to filling, and preserved according to the instructions detailed above.

VI. QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

A. FIELD DUPLICATES

1. One field duplicate will be collected by using a separate sample collected for each parameter analyzed for Onondaga Lake, its tributaries, and the Seneca River. These are collected as separate samples taken from the same site at the same time. These provide a check on sampling equipment and precision techniques.

2. For Onondaga Lake, all field duplicates will be collected at the 6m sampling depth except for F. Coli (0m), and Sulfide (15m).

3. For the Onondaga Lake Tributaries, the sampling site for field duplicate sample collection is rotated for the different sampling events.

4. For the Seneca River, two field duplicates will be collected at Buoy 316 during each sampling event (at the 1-meter below the water surface and 1-meter above the river sediment depths).

5. Some field duplicates are identified only as quality control “blind” duplicate samples, which are unknown to laboratory personnel. These “blind” duplicate samples will be collected four times a year for the Onondaga Lake and Tributary sampling events.

B. EQUIPMENT RINSEATE BLANKS

1. Equipment rinseate blanks will be collected for the submersible pump and churn used on Onondaga Lake. Blank samples will be collected prior to collecting water quality samples from Onondaga Lake and analyzed for all parameters. This schedule complies with the minimum frequency of one field blank per 20 samples.

2. Equipment rinseate blanks will be collected for the churn and dunker used for the Onondaga Lake Tributaries and analyzed for all parameters. Blank samples will be collected prior to the collection of water quality samples from any of the tributaries. This schedule also complies with the minimum frequency of one field blank per 20 samples.

3. Equipment rinseate blanks will be collected for the stainless-steel pail used for the storm event monitoring program and analyzed for all parameters. Blank samples will be collected prior to the collection of water quality samples from any of the sample sites.

C. SAMPLE CONTAINERS:

1. The containers currently used for metals are certified as Class 3000 bottles washed under EPA protocol "C". In addition to receiving a Certificate of Analysis for each bottle lot, all pre-cleaned sample containers will be checked by our laboratory by lot to insure that they are clean. This will be performed by delivering a minimum of (1) one, but as many as five (5), randomly selected containers from each lot received by

the OCDWEP Lab. These containers will be empty with an appropriate label, Chain -Of-Custody form and copy of the sample container lot Certificate-Of-Analysis. The laboratory will fill the container with deionized water, preserve the sample with nitric acid and analyze it immediately for total cadmium, chromium, copper, nickel, lead, zinc, arsenic, mercury, manganese, and iron. All results must be less than or equal to the Minimum Reportable Limit (MRL). If the results meet this criteria, the sample containers in the lot will be released for use in AMP sampling events. If results do not meet this criteria, an additional sample container will be checked for each container that failed. If these results meet the criteria, the sample containers in the lot will be released for use in AMP sampling events. If there is a second failure, the sample containers in the lot will not be used for AMP sampling events.

2. Each sampling event (Lake or Tributary), will use containers from one specific lot (i.e., sample containers from different lots will not be mixed during each sampling event). The sample lot # will be recorded on the C-O-C forms for the respective samples to insure this.

VII. SAMPLE CUSTODY

A. FIELD SAMPLE CUSTODY

When samples are delivered to the OCDWEP Laboratory for analysis following sample collection, the original C-O-C forms are submitted to the Laboratory.

For samples sent to a contract laboratory for analysis, three copies of an Engineering and Laboratory Services (ELS) Contract Laboratory C-O-C form will be used. The original C-O-C form will be maintained by the OCDWEP Laboratory, two copies will be shipped to the contract laboratory with the samples, for analysis. The contract laboratory will retain one copy and return a signed copy to the OCDWEP laboratory.

Attachment B is a typical example of a C-O-C form. The "Remarks" area is used to record specific considerations associated with sample acquisition such as sample type, container type, sample preservation methods, and analyses to be performed. The original copy of this record follows the samples to the laboratory. The laboratory maintains the completed original and also scans the record into a computer.

B. LABORATORY SAMPLE CUSTODY

The field team leader notifies the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be delivered as well as the anticipated date and time of arrival.

The laboratory sample program meets the following criteria:

1. The laboratory has designated a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.

2. Upon receipt of the samples, the custodian will check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The pH of preserved samples is checked at the time of sample receipt. The sample custodian signs the chain-of-custody record and records the date and time received.

3. Care is exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact the field team leader as part of the corrective action process. A qualitative assessment of each sample container is performed to note any anomalies, such as broken or leaking bottles. This assessment is recorded as part of the incoming chain-of-custody procedure.

4. The samples are stored in a secured area at a temperature of approximately 4°C until analyses are to commence.

5. A laboratory chain-of-custody record accompanies the sample or sample fraction through

final analysis for control. These forms are scanned by the lab into the computer (Adobe PDF format) and placed in a centrally located directory.

6. A copy of the chain-of-custody form will accompany the laboratory report and will become a permanent part of the program records.

C. FINAL EVIDENCE FILES

Final evidence files include all originals of laboratory reports and are maintained under documented control in a secure area.

A sample or an evidence file is under custody if:

- it is in your possession;
- it is in your view, after being in your possession;
- it was in your possession and you placed it in a secure area; and
- It is in a designated secure area.

VIII. FIELD EQUIPMENT CALIBRATION PROCEDURES/MAINTENANCE

A. YSI SONDES

1. Calibration procedures for the YSI 600 & 6600, which are used to monitor water quality parameters in Onondaga Lake, are included as Attachment D. Calibration data including the date of calibration, the results of calibration, the technician's initials, and the results of the post-use instrument calibration for drift checks are maintained in a bound notebook.

2. The YSI units (sondes) are calibrated no more than 24-hours prior to each day of use. If the DO membrane is replaced, the unit is allowed to stabilize overnight. Calibration is typically performed in the morning before use. A calibration check is performed after use to ensure that calibration drift is acceptable.

3. Temperature calibration is set by the factory and, reportedly, does not require frequent recalibration.

4. Depth is calibrated in air, just above the water surface, as 0 meters.

5. Preventative Maintenance:
   i. Dissolved oxygen membranes are checked and replaced as needed after each use.

   ii. The pH reference probe and the temperature probes are cleaned with 1:1 HCl and a cotton swab after each use.

   iii. The pH probe calibration solution is replaced once per day.

   iv. For long term storage, the sondes are stored clean and dry in a case in order to prevent physical damage. For short term storage, the sondes are stored in a calibration cup with tap water.

   v. Watertight connectors are lubricated when necessary in order to ensure a waterproof connection, which will prevent faulty readings.

B. SECCHI DISK

1. Taped depth markings for the Secchi disk are calibrated annually.

C. UNDERWATER ILLUMINATION

1. Data on Light attenuation are collected at 20-cm intervals from water surface to the depth at which light is 1% of surface illumination, as noted during the sampling event, using a LiCor datalogger, to provide sufficient detail.

D. WILDCO BETA SAMPLE TUBES

1. The Wildco Beta sample tubes are cleaned in DI water after each use. Prior to use, the tubes are rinsed in Onondaga Lake water.

2. Depth markings are calibrated annually.

E. SUBMERSIBLE PUMP

1. The submersible pump is cleaned using DI water after each use. Prior to use, the pump and hoses are rinsed in Onondaga Lake water.

2. Hoses for the submersible pumps are replaced annually or as needed.

3. Depth markings are calibrated annually.

IX. ANALYTICAL PROCEDURES

A. INTRODUCTION

Appropriate use of analytical data generated under the great range of analytical conditions encountered in environmental analyses requires reliance on the quality control practices incorporated in the methods and procedures used by the Onondaga County Department of Water Environment Protection Environmental Laboratory (OCDWEP). Attachment C lists the methodologies utilized for the analysis of water quality samples. As a participating member of the New York State Department of Health Environmental Laboratory Approval Program (ELAP), this laboratory uses only those methods and equipment certified by NYS to generate data. Inaccuracies can result from many causes, including unanticipated matrix effects, equipment malfunctions, and operator error. Therefore, the QA/QC aspects of this laboratory are indispensable. The data acquired from QA/QC procedures is used to estimate and evaluate the information content of analytical data and to determine the necessity of corrective action procedures. The means used to estimate information content are also an important part of the ELAP program to which we adhere.

This section defines the QA/QC procedures and components that are mandatory in the performance of analysis performed by the OCDWEP laboratory, and indicates the QA/QC information which must be generated with the analytical data.

B. CHEMICALS AND REAGENTS

1. Reagent grade water

1. Reagent grade water in the OCDWEP environmental laboratory consists of DI water purified by means of mixed bed deionization. The processed water is required to attain a minimum resistivity of 10 mSiemen. A final pass through another mixed bed deionization filter at point of use maintains the highest quality possible (18 mS output). Actual Conductivity is determined daily. The date, conductivity @ 25°C, and analyst's initials are recorded in a tabular format in a bound notebook.

2. To monitor the quality of reagent grade water for bacteriological use, the following tests are performed:

TABLE III - REAGENT GRADE WATER TESTS

Parameter	Frequency	Acceptable
Free Residual Chlorine	Monthly	None acceptable
Standard Plate Count	Monthly	<500 colonies/ml
Heavy Metals (Pb,Cd,Cu,Cr,Ni,Zn)	Yearly	<0.05 mg/l per metal <0.1 mg/l total
Suitability Test	Yearly	Ratio between 0.8-3.0

2. Reagents

Only American Chemical Society (ACS) grade or better chemicals are used. Chemicals are discarded within manufacturer's expiration date or 3 years, whichever comes first. Date of receipt is recorded on each container.

3. Standard Solutions/Titrants

Anhydrous reagent chemicals are oven dried @ 100-105°C for at least 2 hours. Standard solutions or titrants not prepared from a primary standard are standardized against a primary standard at the frequency specified by the method or every 6 months if no frequency is specified. Standard solutions or titrants are not kept longer than 1 year. The date prepared and the expiration date appear on the container, along with title of standard or titrant, concentration, and preparer's initials. In a bound notebook, the preparation date, title of solution, concentration, manufacturer and lot number of reagent grade chemical(s) used, quantity prepared, expiration date, preparer's signature and, if appropriate, drying times & temperatures, tare and net weight, citation of preparation of primary standard, standardization titers and calculations are recorded.

4. Bench or Shelf Reagents

These are non-standardized solutions prepared by laboratory personnel. All of the pertinent information listed for standard solutions is recorded on both bottle label and in a bound notebook.

C. MICROBIOLOGY: CHEMICALS AND REAGENTS

1. Bacteriological Media

Dehydrated media is discarded within six months when opened and stored in a dessicator, or within manufacturer's expiration date, if unopened. If opened, each new lot is compared to an existing lot that has been found acceptable. The date, name of media, lot #'s of control and test media, results of comparison, and analyst's initials are recorded in a tabular format in a bound notebook. On each bottle of media, dates of receipt and opening and discard date are recorded. Media is prepared according to method instructions. Sterilized glassware is used in the

preparation of media. Date, name of medium, gross, tare, and net weights, volumes used, quantity prepared, pH of finished medium, and preparer's initials are recorded.

2. Autoclaving

The appropriate sterilization times @ 121°C and a pressure of 15-pounds per square inch for various materials are determined as follows:

Membrane filters and pads	10 min.
Carbohydrate containing media (Lauryl tryptose, BGB broth, etc.)	15 min.
Contaminated material, discarded cultures	45 min.
Membrane filter assemblies (wrapped to include all glass/plastic ware used to filter samples)	45 min.
Dilution water in screw-cap bottles	30 min.
Rinse water (200-1000-ml)	≥ 30 min.

3. Bacti Glassware

Every batch of glassware is checked after washing for detergent with 4-5 drops of bromthymol blue indicator, added to 4-ml of final rinse water from randomly chosen items of glassware; a neutral indication allows glassware use. The date, description of glassware, indicator reaction and analyst's initials are recorded in a tabular format in a bound notebook.

Each batch of sterilized bacti sample bottles is checked for sterility by aseptically adding 25-ml of tryptic soy broth into a randomly chosen sample bottle. After 24 hrs. of incubation @ 35°C +/- .5°C, the sample is checked for growth. The date, batch identifier, turbidity check, disposition of the batch, and analyst's initials are recorded in tabular form in a bound notebook.

4. Prepared Media Shelf Life

The following table indicates the holding times for bacteriological media prepared in advance:

TABLE IV - HOLDING TIMES BACTERIOLOGICAL MEDIA

Medium	Holding Time
MF Agar in screw-caps flasks	@ 4°C 96 Hrs.
Broth in capped tubes	@ Room Temperature for 3-months
Poured agar plates with tight-fitting Covers in sealed plastic bags	2 Weeks @ 4°C

5. Membrane Filter Sterility Blanks

a. The sterility of each lot number of membranes is verified by checking for growth after 1 membrane is placed in 50-ml of tryptic soy broth for 24 hrs. @ 35°C+/- 0.5°C incubation. The date, lot number, check for turbidity, and analysts initials are recorded.

b. At the beginning and end of each membrane filter series, a sterility check is performed. The date, # of samples analyzed during run, counts for blanks and analyst's initials are recorded in a tabular format in a bound notebook.

6. Negative and Positive Controls

a. Prior to the first use of a medium, each prepared, ready-to-use lot of medium and each batch of medium prepared in the laboratory shall be tested. Tests will consist of using at least one pure culture of a known positive reaction and at least one negative culture control, as appropriate to the method.

D. CALCULATIONS AND CHARTS

1. Reference Sample

A chart is constructed as follows:

a. The measured values and dates of analysis of the reference sample are tabulated;

b. When at least 20 reference samples have been tabulated, compute the mean: x;

c. Using the mean, compute the standard deviation (SD), as in the following example using the formula:

$$SD = \sqrt{\frac{\Sigma (x - \overline{x})^2}{N-1}}$$

Where: x = the measured value of an individual reference sample

$\overline{x}$ = the mean of the measured values

N = the number of data points

$(x - \overline{x})^2$ = the sum of the squares of all the differences of the mean and measured values.

Example:

	Date	X	$(X - \overline{X})$		$(X - \overline{X})^2$	
1.	4-25-96	207	(207 - 207 = 0)	0	(0 x 0 = 0)	0
2.	5-03-96	214	(214 - 207 = +7)	+7	(7 x 7 = 49)	49
3.	5-10-96	200	(200 - 207 = -7)	-7	(7 x 7 = 49)	49
4.	5-17-96	210	(210 - 207 = +3)	+3	(3 x 3 = 9)	9
5.	6-10-96	219	(219 - 207 = +12)	+12	(12 x 12 = 144)	144
6.	6-10-96	190	(190 - 207 = -17)	-17	(17 x 17 = 289)	289
7.	6-18-96	203	etc.	-4	etc.	16
8.	6-27-96	210	"	+3	"	9
9.	7-03-96	204	"	-3	"	9
10.	7-11-96	207	"	0	“	0
11.	7-19-96	207	"	0	"	0
12.	8-01-96	201	“	-6	“	36
13.	8-10-96	204	“	-3	“	9
14.	8-17-96	200	“	-7	“	49
15.	8-27-96	221	“	+14	"	196
16.	9-03-96	205	"	-2	"	4
17.	9-11-96	210	"	+3	"	9
18.	9-20-96	201	“	-6	“	36
19.	9-30-96	217	"	+10	“	100
20.	10-10-96	210	“	+3	“	9

N=20 Total X = 4140 = 1022

Example

N = 20

$\sum (X - \overline{X})^2 = 1022$

$SD = \sqrt{(X - \overline{X})^2 / N-1}$

$SD = \sqrt{1022 / 19}$

SD= 7.33

2. Determine the warning limits

Determine the warning limits (WL), and the control limits (CL) as in the following example using the formulas:

WL = $\overline{X} \pm 2SD$

CL = $\overline{X} \pm 3SD$

Where $\overline{X}$ = the previously computed mean

SD = the standard deviation

WL = 207± (2 x 7.33)

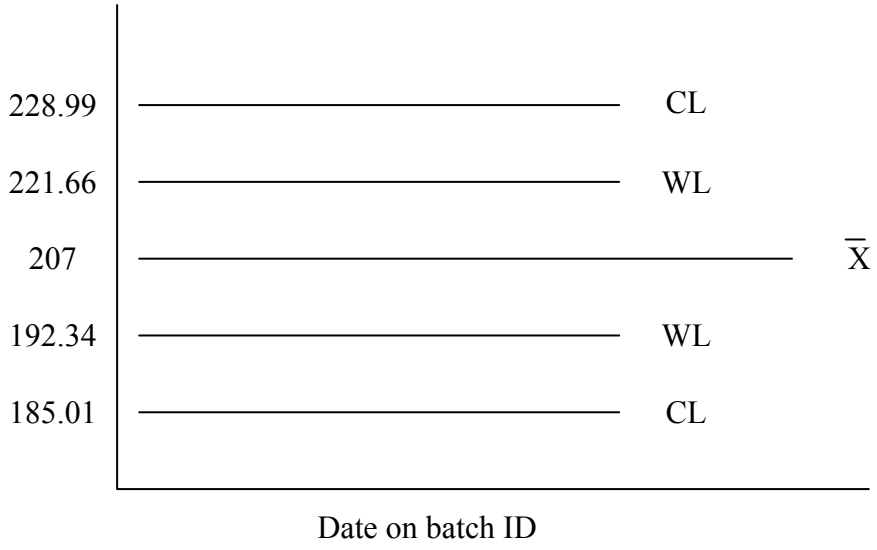
The warning limits (WL) in the example, are 221.66 for the upper warning limit and 192.34 for the lower warning limit.

CL = 207± (3 x 7.33)

The control limits (CL) in the example are 228.99 for the upper control limit and 185.01 for the lower control limit.

3. Construct a control chart

Construct a control chart as done below for the example. The measured values of the reference samples are then plotted in the chart.



4. Percent Recovery

The percent recovery, P is calculated as follows:

$P = 100 (M - B)/T$

Where: T = the target value, i.e. the known concentration of analyte spiked into the sample aliquot.

M = the measured concentration of analyte in the spiked sample aliquot.

B = the background concentration of the unspiked sample aliquot.

The percent recovery data are used to construct a control chart with control limits with acceptance limits as follows:

a. The percent recoveries and analysis dates of the spiked samples are tabulated.

b. When a minimum of five percent recoveries have been tabulated, compute P (the mean percent recovery).

c. Compute SD, the standard deviation (see section on reference standard for example).

5. Surrogate Standard

The percent recovery, P, is calculated as follows:

$$P = 100 (M/T)$$

Where: M = the measured value

T = the target value, (i.e. the known value of surrogate spiked into the sample)

A tabulation of percent recoveries is maintained for each surrogate. The tabulation includes the analysis date, the percent recovery and the control limits for P. Control limits, using a minimum of 5 data points for each surrogate standard are calculated as follows:

$$CL = X \pm 3SD$$

Where: CL = the control limits

X = the mean percent recovery

SD = the standard deviation (see section on reference standard for example)

Compute WL, the warning limits, and CL, the control limits as follows:

$$WL = X \pm 2SD$$

$$CL = X \pm 3SD$$

The computed limits are recorded on the tabulation or control chart.

6. Duplicate Analysis

The difference (i.e. range) between duplicate analyses is determined as follows:

R = the difference (or range)

X_1 = the greater of the measured values

X_2 = the lower of the measured values

A tabulation of duplicates is maintained for each analyte listing dates of analysis, X_1, X_2, R, and the acceptance limit for R. The acceptance limit is established using the following equation:

$$UCL = 3.27 R$$

Where: UCL = the acceptance limit

R = the average range for a minimum of 5 sets of duplicates in a specified concentration range.

X. LABORATORY CALIBRATION/EQUIPMENT MAINTENANCE PROCEDURES

A. LABORATORY EQUIPMENT

1. Analytical Balance

a. Analytical balances are serviced and calibrated internally by a qualified service organization 1/year and a dated certification sticker is provided.

b. Analytical balances are checked daily in two ranges with Class S weights. The ranges selected reflect the routine use of the balance. For example, the analytical balance used principally for evaporating dishes and aluminum dishes would need Class S weights having target values of bracketing the expected weights of the dishes. The date, target reading, actual reading, and analyst's initials are recorded in a bound notebook.

2. pH meter

pH meters are calibrated daily using standard buffers and a two point calibration. This consists of creating a slope using standard pH buffers of pH 4.0 and 10.0. The slope is then checked using a standard buffer of pH 7.0, with an acceptable reading of + /- 0.05 pH units. The date, pH buffer target values, set points, actual readings, and analyst's initials are recorded in a tabular format in a bound notebook.

3. Conductivity meter and cell

a. The conductivity cell constant is determined annually using a 0.01-M potassium chloride solution. The date, resistance readings, average resistance, temperature, calculations, and analyst's initials are recorded in a bound notebook.

b. The conductivity meter and cell is calibrated daily with a 0.001 M potassium chloride solution. An acceptable reading is +/- 20% of target value. The date, target value, actual reading, temperature, and analyst's initials are recorded in a tabular format in a bound notebook.

4. Dissolved Oxygen Meter

The dissolved oxygen meter and probe is calibrated daily using air calibration. The calibration is checked against the Winkler method. This consists of filling two bottles with aerated distilled water; checking the DO value of each bottle using the calibrated DO meter, and then determining the DO value of each bottle using the Winkler method. The DO values of the two methods are then compared. The dates, titers, DO values, average DO, and analyst's initials are recorded in a tabular format in a bound notebook.

5. Turbidimeters

The turbidimeter is calibrated per manufacturer's recommendation using a certified secondary gelex standard with each use. The date, target and observed values, and the analyst's initials are

recorded in a tabular format in a bound notebook.

6. Thermometers

a. The OCDWEP environmental laboratory possesses an NIST (National Institute of Standardized Temperature) traceable, factory-certified thermometer, which is checked at the various temperatures required by a variety of analytical requirements. Correction factors and adjustments to correction factors, new correction factors and analysts initials are recorded in a tabular format in a bound notebook.

b. Each working thermometer has a dedicated use, and is calibrated annually at the temperature of interest using the NBS thermometer. The date, thermometer designation, calibration temperature, correction factor, and the analyst's initials are recorded in a bound notebook.

7. Refrigerators

Laboratory refrigerators maintain a temperature of 1° to 5°C. These temperatures are checked once daily. An NIST certified thermometer with 1°C graduations is used. The date, times, temperature readings and analyst's initials are recorded in tabular format in a bound notebook.

8. BOD Incubator

The BOD Incubator maintains a temperature of 20°, +/- 1°C. Temperature readings are taken twice a day. This thermometer has graduations of 0.2°C. The same data is recorded as for refrigerators.

9. Bacteriological Incubators

a. The air bath incubators maintain a temperature of 35°+/- 0.5°C. A thermometer with graduations of 0.1°C is used. Temperatures are taken twice a day and the same data is recorded.

b. The water bath incubator maintains a temperature of 44.5°+/- 0.2°C. A thermometer with graduations of 0.1°C is used. The same temperature reading schedule and data recording is used as for the air bath incubator.

10. Ovens

Ovens are maintained at the target temperature of interest during use. Temperatures are checked at the beginning and end of each use. A dedicated thermometer with graduations of 1°C is used. The date, target temperature, time and temperature at the start and end of each cycle, oven use, and analysts initials are recorded in a tabular format in a bound format.

11. Autoclave

Autoclave maintains sterilization temperature and pressure during the sterilization cycle and completes the entire cycle within 45 minutes when a 10-12 min. sterilization period is used. A separate calibrated thermometer is used in combination with a sterilization indicator. The date,

time material is placed in autoclave, time of sterilization period, time material was removed, description of sterilized material and analyst's initials are recorded.

12. Automated Ion Analyzer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

13. Atomic Absorption Spectrophotometer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

14. Inductively Coupled Plasma (ICP) Spectrophotometer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

15. TOC Analyzer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily

operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

B. LABORATORY QUALITY CONTROL DOCUMENTATION REQUIREMENTS

1. Standard Curves

Standard curves are prepared as specified in QA/QC manuals. All standard curves are dated and labeled with method, analyte, standard concentrations, and instrument responses.

A best-fit, straight line is drawn on graphed curves: the axis is labeled. The correlation coefficient is calculated. An acceptable correlation coefficient is 0.995 or greater.

Instrument response for samples is less than the highest standard. The lowest standard is near the detection limit.

If a specific method does not provide guidance in the preparation of a standard curve, the following guidelines are followed. For manual colorimetric methods, a blank and five standards that lie on the linear portion of the curve are used. A new curve is prepared each time an analysis is run. At each use, the curve is checked with a blank and a high standard. The high standard selected is greater than the expected sample concentrations. For automated colorimetric methods, a blank and a minimum of five standards are used. A new curve is prepared for each run. Instrument response is checked with a QC reference sample after each 10 samples. Low level standards are freshly prepared for each run.

2. Method Blank

A method blank consists of laboratory-pure water, which is processed and analyzed as if it were a sample. A method blank is run daily or with each batch of samples. Samples are related to the method blank by means of a date or batch identifier. Where applicable, the blank is calculated as a sample and a tabulation of blank results for each analyte with the date run and its appropriate acceptance criteria is maintained. Acceptance criteria for a method blank is a result less than the Minimum Reportable Limit (MRL) only.

3. Instrument Blank

An instrument blank consists of laboratory water, which is analyzed without adding reagents, filtering, etc. It is used for instrument set-up and no readings are recorded.

4. Trip Blank - Special

Trip blanks are required when analyzing volatile compounds in water. A trip blank is a sample of laboratory-pure water contained in a sample bottle appropriate to the analyte to be determined.

Trip blanks are present but unopened at the sampling site and shipped to the laboratory with the environmental samples taken. A trip blank is included with samples collected at each sampling site. The trip blank is analyzed only when samples from a specific sampling site are positive for the analyte of interest. If reportable levels of the analyses of interest are demonstrated to have contaminated the field blank, resampling is required.

5. Reference Sample

A reference sample is prepared by spiking a known amount of analyte into an appropriate solvent. The concentrate or quality control sample is preferably obtained from an external source. When necessary, a sample prepared in-house is prepared independently of the calibration standard. A reference sample is analyzed with every tenth sample or monthly samples if fewer than ten samples per month are analyzed. Environmental samples are tied to the reference standard by means of a date or batch identifier.

Data generated by the analysis of reference standard are used to construct a control chart and control limits established. Instructions for constructing a control chart and computing limits are to be found later in this section.

Should a result fall outside the control limits, the analysis is out of control and immediate action is taken to determine the cause of the outlying result. Data generated on the same day as the outlying result are regarded as unreliable and the analyses repeated after corrective action has been taken and the procedure is back in control.

A new control chart with freshly computed control limits is generated annually. The last 20 reference standard data points for the previous year are used to compute the new control limits.

6. Spiked Recovery

Spiked recovery for an environmental sample is determined by dividing the sample into two aliquots. The first aliquot is analyzed as usual. The second aliquot is spiked with a known concentration of the analyte of interest. The spike should be approximately 10 times the method's standard deviation (at the level of interest). A spiked environmental sample is analyzed when appropriate at a frequency of 1 spiked sample for every 20 samples or 1 spiked sample per month if fewer than 20 samples per month are analyzed. Samples are related to the spiked recovery date by means of a date or batch identifier.

Data generated by the analysis of spiked samples are used to calculate the percent recovery. The percent recovery data is used to construct a control chart and tabulation and limits established. Instructions for constructing a chart or tabulation and computing limits are to be found later in this section.

A new control chart of tabulation, the analysis is regarded as out of control and immediate action is taken to determine the cause of the outlying result. Data generated on the same day as the outlying result are regarded as unreliable and the analysis repeated after corrective action has been taken and the procedure is back in control. A new control chart or tabulation with freshly computed limits is generated annually. The last 20 data points for the previous year are used to compute the new limits.

7. Duplicate Analysis

A duplicate analysis is required only when a sample yields a positive result. A minimum of 10 percent of all positive samples for a given analyte is analyzed in duplicate. The range between the duplicates is tabulated and acceptance limits established. Instructions for the tabulation and the computation of limits are to be found later in this section.

A new tabulation with a freshly computed acceptance limit is generated annually. The last 20 data points for the previous year are used to compute the acceptable control limits.

8. External QA/QC

In as much as the OCDWEP laboratory is a NYSDOH-ELAP certified laboratory, it is also National Environmental Laboratory Accreditation Conference (NELAC) certified, and is obligated to follow all of the criteria for maintaining this certification under the auspices of the ELAP program. Part of this program consists of a biannual inspection by a NYS Laboratory Inspector, who spends one or more days at each facility checking all aspects of the operation. In addition, performance evaluations are conducted twice per year. This consists of unknown samples sent to the laboratory to be analyzed and the results reported back to ELAP. The laboratory is required to submit results for each parameter that we are certified for, including bacteriology, metals, nutrients, etc.

The USEPA also uses the results from this program to satisfy the requirements of the SPDES permit program that regulates the various wastewater treatment plants in the OCDWEP system.

9. Internal QA/QC

In addition to the above, the OCDWEP laboratory conducts an internal QA/QC program consisting of unknowns that are generated periodically by the OCDWEP staff and given to technicians as “typical” samples, occurring without the analysts' knowledge. The object of this is to ensure that “typical” samples are analyzed using the same care as the “official” samples.

C. LABORATORY QUALITY CONTROL REQUIRED - BY PARAMETER

Inorganic Analytes		
Sub-Category or Analytical Group	**QC Measure Record Acquired**	**Frequency**
Demand/Residue		
BOD	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
COD and TOC	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation Of all positive samples	On positive samples only, a minimum of 10% of all samples.
Mineral		
Alkalinity and Hardness	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
All other analyses except pH	Reference Sample Chart	Every 10^{th} sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20^{th} sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.

Sub-Category or Analytical Group	QC Measure Record Acquired	Frequency
Nutrient		
All nutrient analyses	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
Wastewater Metals		
ICP (same as Flame)	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
Flame or Colorimetric Method	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
Furnace Method	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Post only if Dupes are ±15%.
	Duplicates Tabulation	Double matrix spiked every 10th sample.
Mercury (FIMS)	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Post only if Dupes are ±15%.
	Duplicates Tabulation	Double matrix spiked every 10th sample.

Sub-Category or Analytical Group	QC Measure Record Acquired	Frequency
Miscellaneous Analytes		
Oil & Grease	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
Cyanide, Phenols, and Silica	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
Organic Analytes		
Organic Purgeables		
Priority Pollutants by GC	Laboratory Blank Tabulation	Daily or with each batch run.
	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Surrogate Standard Tabulation	All samples.
Organic Extractables		
Priority Pollutants and Pesticides by GC	Laboratory Blank Tabulation	Daily or with each batch run.
	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.

Sub-Category or Analytical Group	QC Measure Record Acquired	Frequency
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Surrogate Standard Tabulation	All samples.
Solid Waste Metals		
All Methods	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
All Other Analytes		
Inorganic	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.

Sub-Category or Analytical Group	QC Measure Record Acquired	Frequency
All Other Analytes		
Organic	Laboratory Blank Tabulation	Daily or with each batch run.
	Duplicates Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Matrix Check	Daily or with each batch run.

XI. PROGRAM ASSESSMENTS

OCDWEP has designed several means of assessing whether the goals of the data acquisition program are being met. Both the field and laboratory components of the Ambient Monitoring Program will be assessed on an ongoing basis, with formal checkpoints each month.

The program team reviews the workplan with key field and laboratory personnel. An annual calendar is put together, noting field sampling days. Weekly coordination meetings are held with field and laboratory personnel in attendance. Any significant activities or problems identified in either the field or laboratory component of the program are discussed. A formal list of action items is kept from these weekly meetings.

Data are received from the laboratory on a monthly basis and are reviewed. Charge balances (summing the milliequivalent of the major anions and cations) of the inorganic data are performed to screen for data quality. Relative percent difference between field replicates is calculated.

A field audit will be conducted during the Year 2009 monitoring season. Members of the project team will accompany the field sampling team and observe sample collection and field data acquisition. A formal report of the field assessment will be maintained in the OCDWEP lake files. A laboratory audit will also be scheduled. The procedures for sample handling and analysis will be evaluated whether the criteria defined in the workplan are being consistently implemented.

XII. DATA QUALITY ASSESSMENT

Choices made in design of the sampling program (spatial and temporal), field sampling procedures, laboratory procedures, and data evaluation and interpretation can greatly influence the ability to draw conclusions. In this section, we describe the quantitative and qualitative decisions made to ensure that the data quality is adequate to meet the needs of this program. Data quality will be assessed using EPA's 40 CFR 30.503 standard criteria; precision, accuracy, representativeness, completeness, and comparability. In addition, a field audit will be performed to assess field procedures and sample handling. QA/QC methods for field and analytical procedures are those mandated by the New York State Department of Health Environmental Laboratory Approval Program (ELAP).

A. PRECISION

The plan to monitor and control the precision and accuracy of analytical measurements is described in the section on analytical procedures. Precision of field samples will be assessed through a program of field replicate analyses: one replicate per sample delivery group, or twenty samples. For routine lake and tributary monitoring, one sampling depth (lake) and station (tributary) will be sampled in duplicate for the complete suite of parameters.

B. ACCURACY

Accuracy, or how close the reported concentrations of concern are to “true” values, can be difficult to assess. The laboratory analytical program describes how this data quality indicator is monitored through a program of audit samples. A second approach Onondaga County has implemented is a validation program, using an outside expert in limnology and statistics to audit the results. The data validation program cannot be a final arbiter of what values in a data set are true, but it can help test for outliers and systematic differences between researchers that warrant further investigation. In addition, ELAP Laboratories require proficiency samples.

C. REPRESENTATIVENESS

Representativeness refers to the degree to which the samples acquired reflect the nature of the underlying population. Any monitoring program relies on the results of a limited number of samples drawn from a much larger underlying population to provide information regarding the nature of that larger population. The sampling program described in this document has been designed to accommodate the known temporal and spatial variability of the lake and its tributaries. Onondaga Lakes undergoes thermal stratification.

This requires both temporal and spatial adjustments to the annual monitoring program. Water quality analyses and data manipulation reflects the nature of the lake's stratification. Samples are taken at 3m intervals that span the thermal regime. Upper Mixed Layer (UML) results are separated from the Lower Water Layer (LWL) results in the calculations of annual and growing season (5/15 - 9/15) means and medians. Trends in concentrations during both the mixed and stratified periods are calculated. The primary sampling station in the Year 2009 Monitoring Program is a point in the southern lake basin (South deep). This station has been sampled throughout the 36 years of lake monitoring. Four times each year, Onondaga County monitors a second station (designated North Deep) to determine whether water quality results differ. Tributary monitoring is on a bi-weekly basis. Judgment will be used to select the number and location of transects to collect water samples in the

tributaries. Samples of the Lake Outlet are obtained at 2-feet and 12-feet depths to accommodate the density stratification that has been documented to occur in the Seneca River under low-flow conditions.

D. COMPARABILITY

Documentation of procedures and results of the monitoring program have been maintained by OCDWEP since 1968. Our goal is for data generated during the Year 2009 program to be comparable to the historical data. To meet this goal, we are committed to fully documenting the sampling and analytical procedures used, including any special modifications necessary to maximize precision, accuracy, or sensitivity in the lake water matrix.

E. COMPLETENESS

We are fortunate to have an extensive database of Onondaga Lake water quality to provide guidance regarding optimal sampling design with respect to variability of the measured parameters. An analysis of the reduction on the coefficient of variation achieved by different sampling strategies for the lake indicates that a monthly sampling program is adequate for most parameters (Walker 1992). Other parameters associated with short-term fluctuations in algal populations such as Chlorophyll-*a* require more frequent (weekly) monitoring from May through September.

Non-parametric statistics has been selected to indicate trends in water quality over time. The seasonal Kendall test allows us to differentiate seasonal variations within years from changes between years. The non-parametric statistics will maintain their power even with occasional missing values. Our goal for Year 2009 is to complete and validate 100% of the planned samples.

F. FIELD AUDIT

A technical advisor, to assess the field procedures and sample handling will perform an annual field audit. The audit findings and recommendations will be forwarded to the NYSDEC and also included in the annual monitoring report.

G. EQUIPMENT RINSATE BLANKS

Wildco Beta Dunker, Churn, and Pump QA/QC equipment rinsate blanks will be collected for each of the AMP sampling events, as appropriate.

XIII. DATA REVIEW AND VALIDATION

Data will be screened for both technical defensibility (were procedures followed, were the laboratory control limits for precision and accuracy observed and usability, are the sample results sufficient to allow inferences regarding the nature of the underlying population?). Both of these criteria are important to meet the objectives of the lake-monitoring program.

Technical defensibility includes evaluation of the following:

a. Internal laboratory quality control: blanks, spikes, replicates, and standard curves;

b. Chain-of-custody complete; and

c. Holding times for all parameters met in accordance with analytical method.

Data usability includes evaluation of the following:

a. Charge balance of major anions and cations;

b. Results of field replicates; and

c. Statistical evaluation of outliers.

XIV. DOCUMENTATION

A. FIELD AND LABORATORY DATA

Field and laboratory data are stored both on the Laboratory Information Management System (LIMS) and on paper copy to be filed at OCDWEP. Data may be retrieved at any time from either of these sources.

B. LABORATORY REPORTS

Samples are delivered to the laboratory along with chain of custody forms on the date of sampling. YSI sondes' field data are delivered to the laboratory by the next day. Laboratory reports are finalized and delivered to the program manager and field supervisor within 30 days of the sample date.

C. PRELIMINARY DATA VALIDATION

Preliminary data validation is performed within 30 days of receipt of final laboratory data.

D. TREND ANALYSIS

Statistical trend analysis of the data will be performed. The non-parametric seasonal Kendall test will be performed on the lake and tributary data to test for long-term trends and changes in lake water quality in response to the major reductions in external loading.

E. ANNUAL TRIBUTARY LOADS

The flow-weighted concentrations of the constituents will be summarized. Dr. Walker's refined program used to estimate loading to Onondaga Lake will be used. The improved estimation technique, called "Method 5", was developed in conjunction with the compilation of the OCDWEP long-term integrated water quality data base and supporting software. The new technique was developed to support estimation of daily loads, to support development of monthly and seasonal lake mass balances, and to improve the accuracy and precision of the annual load estimates. Method 5 differs from AUTOFLUX Method 2 in several ways. Data are stratified by flow regime (similar to AUTOFLUX Method 2) and are also stratified by season using a multiple regression technique. Conditions during the unmonitored period are projected using a residual interpolation method that includes a flow derivative term.

F. ANNUAL REPORT

At the end of the monitoring year, data are compiled and manipulated into a report of analyses computation and evaluation of the ambient monitoring program.

XV. QAPP – SUMMARY OF REVISIONS

1. Page 9 & 10: Update of Appendix A (Year April 2009-March 2010 Non-Event Based Water Quality Sampling Schedule).
2. Page 14: Table 1 – Sample Collection and Preservation: Deleted analyte Selenium.
3. Page 17: Conventional Parameters: Deleted the parameters VSS and TVS.
4. Page 76: Attachment C (Analytical Methodologies List) - Updated to reflect 2008 Minimum Reporting Limit (MRL), accuracy, and precision values. Also added the 2009 Analytical Methods.
5. Page 86: ORP Calibration. Record the temperature of the unit and enter the correct value for Zobel's solution which corresponds to the temperature value **at 5ºC**.
6. Page 87: Deleted the parameter Chlorophyll (Total) Calibration (for 6600 Sondes Only). This probe will no longer be used for the Lake South Deep buoy.
7. Attachment A: Tributary Sampling Procedures by Site:
   - Added sampling Procedures for Bloody Brook at Old Liverpool Road.
   - For the Onondaga Creek Salt Spring (Spence-Patrick Spring Well Point) Sampling Procedure, added note to make sure to allow enough time for the conductivity readings to stabilize prior to pumping the sample water into the carboy.

Attachments

Attachment A: Tributary Field Sampling Procedures – by sampling site

Attachment B: Chain-Of-Custody Form (Example)

Attachment C: Analytical Methodologies

Attachment D: YSI 600/6600 Calibration Procedures

Attachment E: YSI 600/6600 Maintenance Procedures

Attachment F: YSI 600/6600 Operation Procedures

ATTACHMENT A:

Tributary Field Sampling Procedures

1. Ninemile Creek Rt. 48 Bridge Sampling Procedures

Equipment Requirements:	Bridge Crane and Bomb Sampler
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI Standard Operating Procedure (SOP).
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Divide the stream into 5 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 5 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage reading on the Chain-of-Custody and record all field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

2. Onondaga Creek at Dorwin Avenue Sampling Procedures

Equipment Requirements:	Bridge Crane and Bomb Sampler
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Divide the stream into 5 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 5 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage readings on the Chain-of-Custody and record field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

3. Onondaga Creek at Spencer Street Sampling Procedures

Equipment Requirements:	Bridge Crane and Bomb Sampler
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)

Step 1: Divide the stream into 5 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 5 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

4. Onondaga Creek at Kirkpatrick Street Sampling Procedures

Equipment Requirements:	Bridge Crane and Bomb Sampler
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Divide the stream into 5 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 5 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage readings on the Chain-of-Custody and record field observations on the field sheets.

5. Harbor Brook at Velasko Road Sampling Procedures

Equipment Requirements:	Hand Held Depth Integrated Sampler
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Divide the stream into 3 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and orient the nozzle to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 3 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets.

6. Harbor Brook at Hiawatha Boulevard Sampling Procedure

Equipment Requirements:	Vertical Kemmerer Bottle Sampler
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Divide the stream into 3 equal transects.

Step 2: Set the sampler and lower the sampler into the water until fully submerged.

Step 3: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with water samples.

Step 4: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 5: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 6: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 7: Place samples on ice.

Step 8: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 9: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

7. Ley Creek at Park Street Sampling Procedure

Equipment Requirements:	Vertical Kemmerer Bottle Sampler
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Divide the stream into 3 equal transects.

Step 2: Set the sampler and lower the sampler into the water until fully submerged.

Step 3: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with water samples.

Step 4: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 5: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 6: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 7: Place samples on ice.

Step 8: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 9: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

8. Tributary 5A Sampling Procedures

Equipment Requirements:	Hand Held Depth Integrated Sampler
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Divide the stream into 3 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 3 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information on the Chain-of-Custody and record field observations on the field sheets.

9. East Flume Sampling Procedure

Equipment Requirements:	1-Quart glass jar
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Use a 1-Qt. glass jar at the V-notch weir, collect samples off the downside of the weir.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12 (1-qt) grab samples.

Step 3: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI. Place sonde just behind v-notch weir.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheets.

10. Metro Effluent Sampling Procedure

Equipment Requirements:	1-Quart glass grab jar
	Sample Compositing Churn
	Coli Sampler
	Bucket (for sonde use)
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Use a 1-Qt. glass jar in a grab polyethylene sampling apparatus on a rope. Collect sample from the Final Effluent (IC#789) Grab location.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12 (1-qt.) grab samples.

Step 3: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI. Place sonde in a sample bucket/sample compositing churn.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheets.

11. Lake Outlet Sampling Procedure

Equipment Requirements: Vertical Kemmerer Bottle Sampler (Dunker)
Coli Sampler
Sample Compositing Churn
In-situ parameters - See - YSI SOP

Bottle Requirements:

Lake Outlet 2-ft.	**Lake Outlet 12-ft.**
(1) 1-L plastic pre-cleaned (metals)	(1) 1-L plastic pre-cleaned (metals)
(1) 500-ml boston round plastic (t-alk)	(1) 500-ml boston rnd. plastic (t-alk)
(1) 125-ml plastic (coli)	(1) ½-gallon plastic (t-Cn)
(2) 250-ml round plastic (srp/tdp)	(2) 250-ml round plastic (srp/tdp)
(1) ½-gallon plastic (t-Cn)	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)	
(1) 2 liter amber bottle (Chlorophyll-*a*)	(1) 2 liter amber bottle (Chlorophyll-*a*)

Step 1: Locate the sampling location at mid-channel.

Step 2: Collect one sample from the required sampling depth to rinse the churn.

Step 3: Collect three samples at a depth of 2 feet and deposit the samples in the Churn.

Step 4: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn.

Step 5: Repeat steps 2, 3 and 4 for the 12-foot sample. If a field duplicate is required at either location, collect that sample using the same protocol. Rinse the Churn with water from the corresponding depth prior to sampling.

Step 6: Preserve the samples as per Section IV (Table 1-Sample Collection and Preservation).

Step 7: Place the samples on ice.

Step 8: Collect field data with the YSI. The sonde should be placed at mid-channel. In-situ data will be recorded at .5 meter increments and at .6 m and 3.7 m.

Step 9: Record sample information on Section IV (Table 1-Sample Collection and Preservation) and record all field observations on the field sheets.

NOTE: The sampling site has been moved to the downstream site of the one-lane pedestrian bridge.

12. Metro Bypass Sampling Procedure

Equipment Requirements:
- 1-Quart glass grab jar
- Sample Compositing Churn
- Coli Sampler

Bottle Requirements:
- (1) 1-L plastic pre-cleaned (metals)
- (1) ½-gallon plastic (t-Cn)
- (1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
- (1) ½-gallon plastic (conv)
- (1) 500-ml boston round plastic (t-alk)
- (2) 125-ml sterile plastic (coli)
- (2) 250-ml round plastic (srp/tdp)

Step 1: Use a 1-Qt. glass jar in a grab can on a rope. Collect samples from the Metro Bypass sampling location and pour into a dedicated carboy.

Step 2: Ensure sample is completely mixed prior to pouring sample from the carboy into the sample containers.

Step 3: The Field Sheet will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI. Place sonde in a sample bucket.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheets.

13. Bloody Brook at Onondaga Lake Parkway Sampling Procedure

Equipment Requirements:	1-Quart glass jar
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Use a 1 Qt. glass jar in a grab can on a rope. Collect sample from the Blood Brook Creek bridge grab location.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12-15 (1qt.) grab samples.

Step 3: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the churn. The Chain-of-Custody form will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Chain-of-Custody and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheet. Record the USGS Staff Gage Reading.

14. Bloody Brook at Old Liverpool Road Sampling Procedure

Equipment Requirements:	1-Quart glass jar
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Use a 1 Qt. glass jar in a grab can on a rope. Collect sample from the Old Liverpool Road Creek bridge grab location.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12-15 (1qt.) grab samples.

Step 3: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the churn. The Chain-of-Custody form will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Chain-of-Custody and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheet. Record the USGS Staff Gage Reading.

15. Sawmill Creek at Onondaga Lake Recreational Path Sampling Procedure

Equipment Requirements:	1-Quart glass jar
	Sample Compositing Churn
	Coli Sampler
	In-situ parameters - See YSI SOP
Bottle Requirements:	(1) 1-L plastic pre-cleaned (metals)
	(1) ½-gallon plastic (t-Cn)
	(1) 1-L white plastic pre-cleaned (TKN, NH_3-N, TP)
	(1) ½-gallon plastic (conv)
	(1) 500-ml boston round plastic (t-alk)
	(2) 125-ml sterile plastic (coli)
	(2) 250-ml round plastic (srp/tdp)

Step 1: Use a 1-Qt. glass jar at the downstream side of the Path, dip jar into stream flow as near to center of stream as possible, to collect samples.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12 (1-qt) grab samples.

Step 3: When churning, the disk should touch the bottom on every stroke, and the stroke should be as long as possible without breaking the water surface. The churning rate should be about 9 inches per second (faster rates could introduce air into the sample). Churn for about 10 strokes before subsampling. The first subsample should be the one that requires the largest volume. Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 8: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets.

16. Onondaga Creek Salt Spring (Spence-Patrick Spring Well Point) Sampling Procedure

Location: East Side of Onondaga Creek between Spencer and Kirkpatrick Streets

Equipment Requirements:
Gallon jug deionized water
Sample Compositing Carboy
Portable Pump with NiCd Battery
In-situ parameters - See YSI 600 SOP

Bottle Requirements:
(1) 1 L plastic pre-cleaned (metals)
(1) gallon plastic (conv)
(1) 500ml boston round plastic (t-alk)

Step 1: Unhook the sampling tube attached to the tree located at the sampling site. The sampling site is along the bank between Spencer St. and Kirkpatrick St. (that is, the right bank of Onondaga Creek if facing in the direction of Onondaga Lake). Place the sampling tube in the one gallon jug of deionized water.

Step 2: Turn the pump to reverse. Pump the deionized water into the sampling line and discard the rinse water.

Step 3: Turn the dial to pump "forward". Pump the sample water into a carboy to composite. **Note: Make sure to allow enough time to allow the conductivity readings to stabilize prior to pumping the sample water into the carboy.**

Step 4: Be sure to pump up enough volume to fill the sample containers and to get an in-situ YSI reading. The YSI probes need to be covered completely to get an accurate reading.

Step 5: Swirl the carboy and pour off the sample containers.

Step 6: Preserve samples as per Section IV (Table 2 – Sample Collection and Preservation and check the samples for the appropriate pH.

Step 7: Place samples on ice.

Step 8: Collect field data with the YSI 600. The YSI can be placed in the sampling carboy provided all the sample containers have been filled.

Step 9: Record sample information on the Chain of Custody and record field observations on the field sheet.

ATTACHMENT B:

Chain-Of-Custody Form (Example)

CHAIN OF CUSTODY RECORD

SAMPLE#

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

Engineering and Laboratory Services Division

(Revision: JUNE 2006– COC_62006Dbaseportraitmod.DOC)

Project Name	
IC/FC #	
Sewer#/WCode	
Invoice #	
DEC Permit	
Req by:	

Origin of Sample (i.e., Name of Industry, Treatment Plant, Hauler, etc.)

CATEGORY: AMP IND TP WHC SPECIAL QA/QC

CONTRACT LABORATORY List Name:

Start Date	End Date	P'UP Date	Start Time	End Time	SAMP TYPE	BOTTLE #	Container TYPE	Initial	Preserved? Yes	Preserved? No	SAMPLE NOTES (Lab) Receipt Temp

			Field pH		Meter #		Chlorine Residual	
Bottles/Comp		Aliquot/Bottle		Sample Interval		Refrigerated/ Iced	Yes / No

Preservation Checklist	Oxidizer Present? Yes	Oxidizer Present? No	Oxidizer Removed? Yes	Oxidizer Removed? No	PreKit# / Initials
NH3-N					
TKN					
Color Interfer?			If yes, added [ ] Na Thio		

FLOW (Date/time) > 1. 2.

2nd Reading	
1st Reading	
TOTAL	
UNITS	

MATRIX: Solid WasWater SurWater PotWater

Remarks (sample/collection details)

SPLIT WITH (Name/Title/Date):

PARAMETERS AS LISTED IN ANNUAL SCHEDULE? YES NO → If NO, List Sample Parameters below:

CHAIN OF CUSTODY (Print Name, Signature, Title, Date of Possession)

1.

2.

3.

4.

5.

6.

Attachments included? YES / NO If yes, list pages: Page

ATTACHMENT C:

Analytical Methodologies

ANALYTICAL PROCEDURES FOR WATER QUALITY ANALYSES
2008 AMBIENT MONITORING PROGRAM

Parameter	Code	Methods *	Minimum Reportable Limit (mg/L)	Accuracy (%)	Precision (%)
Bio Oxy Demand 5-day	BOD5	2:(5210)	2.0	101.5	4.6
Carbon. Bio Oxy Demand 5-day	CBOD5	2:(5210 B)	2.0	94.4	10.0
Total Alk as CaCO3	ALK-T	1:(310.1)	1.0	99.0	1.4
Total Organic Carbon	TOC	1:(415.1)	0.5	99.9	1.1
Total Organic Carbon - Filtered	TOC-F	1:(415.1)	0.5		
Total Inorganic Carbon	TIC	1:(415.1)	0.5	98.1	0.5
Total Kjeldahl Nitrogen as N	TKN	3:(10-107-06-2-D)	0.15	93.9	5.9
Low Ammonia Nitrogen as N	NH3-N	2:(4500-NH3-H)	0.01	97.7	6.3
Organic Nitrogen as N	ORG-N	3:(10-107-06-2-D)	0.01		
Nitrate as N	NO3	3:(10-107-04-1-C)	0.01	98.7	3.2
Nitrite as N	NO2	3:(10-107-04-1-C)	0.01	99.3	1.3
Total Phosphorus (Manual)**	TP	1:(365.2)	0.003	100.6	3.8
Total Dissolved Phosphorus	TDP	1:(365.2)	0.003	100.6	3.8
Soluble Reactive Phosphorus	SRP (OP)	2:(4500-P E)	0.001	99.7	2.5
Silica	SiO2	1:(370.1)	0.2	101	8.5
Sulfates	SO4	1:(375.4)	10.0	102.8	5.7
Total Sulfides	S=	1:(376.1)	0.2		
Total Solids	TS	1:(160.3)	1.0		
Total Volatile Solids	TVS	1:(160.4)	1.0		
Total Suspended Solids	TSS	1:(160.2)	1.0		
Total Volatile Suspended Solids	VSS	1:(160.4)	1.0		
Total Dissolved Solids	TDS	1:(160.1)	1.0	100.3	12.0
Arsenic - furnace	As - GFA	4:(200.9)	0.002	100.9	4.3
Total Cadmium	Cd - GFA	4:(200.9)	0.0008	103.9	2.8
Total Calcium	Ca	1:(215.1)	1.0	99.6	1.2
Total Chromium	Cr	4:(200.7)	0.010(0.0025)*	102.0	2.7
Chloride	Cl	3:(10-117-07-1-B)	1.0	101.9	2.1
Residual Chlorine	Cl2 RES	1:(330.4)	0.1		
Total Copper	Cu	4:(200.7)	0.0125(0.0031)*	101.6	2.8

ANALYTICAL PROCEDURES FOR WATER QUALITY ANALYSES
2008 AMBIENT MONITORING PROGRAM
(CONTINUED)

Parameter	Code	Methods *	Minimum Reportable Limit (mg/L)	Accuracy (%)	Precision (%)
Total Cyanide	CN-T	3:(10-204-00-1-A)	0.003	95.3	5.3
Total Iron	Fe	4:(200.7)	0.05	101.2	3.6
Total Lead - furnace	Pb - GFA	4:(200.9)	0.002	99.8	3.7
Total Magnesium	Mg	1:(242.1)	0.1	99.3	1.2
Total Manganese	Mn	4:(200.7)	0.025	102	3.1
Total Mercury (Cold Vapor)	Hg	1:(245.2)	0.00002	99.1	4.6
Selenium - furnace	Se - GFA	4:(200.9)	0.002	103.7	3.4
Total Sodium	Na	1:(273.1)	3.0	100.8	1.5
Total Nickel	Ni	4:(200.7)	0.015(0.00375)*	101.3	2.9
Potassium	K	1:(258.1)	0.020	99	1.4
Total Silver	Ag	4:(200.7)	0.0125	100.5	3.3
Total Zinc	Zn	4:(200.7)	0.025(0.00625)*	102.0	2.8
Turbidity			0.1	94.1	7.9
Conductivity	COND	2:(2510B)	-		
Dissolved Oxygen - Field	DO - Field	1:(360.1)	0.1		
Dissolved Oxygen - Lab	DO - Lab	1:(360.1)	-		
Dissolved Oxygen - Winkler	DO - Winkler	1:(360.2)	-		
pH	pH	1:(150.1)	-		
Temperature	TEMP	1:(170.1)	-		
Phaeophytin *a*	PHEO-A	2:(10200 H.2)	0.0002		
Chlorophyll *a*	CHLOR-A	2:(10200 H.2)	0.0002		
Enterococci	ECOCCI-Enterolert	6:(1040)	1.0 (cells/100mls) MPN		
E. Coliform	ECOLI-Colilert	2:(9223 B)	1.0 (cells/100mls) MPN		
Fecal Coliform	FCOLI-MF	2:(9222 D)	1.0 (cells/100 ml)		

Methods listed are applicable for all matrices of water, wastewater, and surface waters.

* Indicates method has a lower level of detection due to sample concentration

**Started in August 2000 for all AMP samples.

1: Indicates USEPA Methods for Chemical Analysis of Water and Waste 1979

2: Indicates Standard Methods (18th Edition)

3: Indicates Lachat Instruments QuickChem Methods: Approved for use by USEPA - NYSDOH - ELAP

4: Indicates USEPA "Methods for the Determination of Metals in Environmental Samples" Supplement 1, May 1994

5: USEPA Microbiological Methods Manual 1996

6: Approved for use by ELAP

ANALYTICAL PROCEDURES FOR WATER QUALITY ANALYSES
2009 AMBIENT MONITORING PROGRAM

Parameter	Code	Methods *	Minimum Reportable Limit (mg/L)	Accuracy (%)	Precision (%)
Bio Oxy Demand 5-day	BOD5	2:(5210 B)	2.0		
Carbon. Bio Oxy Demand 5-day	CBOD5	2:(5210 B)	2.0		
Total Alk as CaCO3	ALK-T	2:(2320 B)	1.0		
Total Organic Carbon	TOC	2:(5310B)	0.5		
Total Organic Carbon - Filtered	TOC-F	2:(5301B)	0.5		
Total Inorganic Carbon	TIC	2:(5301B)	0.5		
Total Kjeldahl Nitrogen as N	TKN	3:(10-107-06-2-D)	0.15		
Low Ammonia Nitrogen as N	NH3-N	2:(4500-NH3-H)	0.01		
Organic Nitrogen as N	ORG-N	3:(10-107-06-2-D)	0.01		
Nitrate as N	NO3	3:(10-107-04-1-C)	0.01		
Nitrite as N	NO2	3:(10-107-04-1-C)	0.01		
Total Phosphorus (Manual)**	TP	2:(4500-P E))	0.003		
Total Dissolved Phosphorus	TDP	2:(4500-P E)	0.003		
Soluble Reactive Phosphorus	SRP (OP)	2:(4500-P E)	0.001		
Silica	SiO2	2:(4500-Si-D)	0.2		
Sulfates	SO4	7:(426 C)	10.0		
Total Sulfides	S=	1:(376.1)	0.2		
Total Solids	TS	2:(2540 B)	1.0		
Total Volatile Solids	TVS	2:(2540 E)	1.0		
Total Suspended Solids	TSS	2:(2540 D)	1.0		
Total Volatile Suspended Solids	VSS	2:(2540 E)	1.0		
Total Dissolved Solids	TDS	2(2540 C)	1.0		
Arsenic - furnace	As - GFA	4:(200.9)	0.002		
Total Cadmium	Cd - GFA	4:(200.9)	0.0008		
Total Calcium	Ca	2:(3111B)	1.0		
Total Chromium	Cr	4:(200.7)	0.008(0.002)*		
Chloride- Lachat	Cl	3:(10-117-07-1-B)	1.0		
Residual Chlorine	CL2 RES	1:(330.4)	0.1		
Total Copper	Cu	4:(200.7)	0.01(0.0025)*		
Total Cyanide	CN-T	3:(10-204-00-1-A)	0.003		
Total Iron	Fe	4:(200.7)	0.04		
Total Lead - furnace	Pb - GFA	4:(200.9)	0.002		
Total Magnesium	Mg	2:(3111B)	0.1		
Total Manganese	Mn	4:(200.7)	0.02		

ANALYTICAL PROCEDURES FOR WATER QUALITY ANALYSES
2009 AMBIENT MONITORING PROGRAM
(CONTINUED)

Parameter	Code	Methods *	Minimum Reportable Limit (mg/L)	Accuracy (%)	Precision (%)
Total Mercury (Cold Vapor)	Hg	1:(245.2)	0.00002		
Selenium - furnace	Se - GFA	4:(200.9)	0.002		
Total Sodium	Na	2:(3111B)	3.0		
Total Nickel	Ni	4:(200.7)	0.015(0.00375)*		
Potassium	K	2:(3111B)	0.020		
Total Silver	Ag	4:(200.7)	0.01		
Total Zinc	Zn	4:(200.7)	0.02(0.005)*		
Turbidity		2:(2130B)	0.1		
Conductivity	COND	2:(2510B)	-		
Dissolved Oxygen - Field	DO - Field	1:(360.1)	0.1		
Dissolved Oxygen - Lab	DO - Lab	1:(360.1)	-		
Dissolved Oxygen - Winkler	DO - Winkler	1:(360.2)	-		
pH	pH	1:(150.1)	-		
Temperature	TEMP	1:(170.1)	-		
Phaeophytin *a*	PHEO-A	2:(10200 H.2)	0.0002		
Chlorophyll *a*	CHLOR-A	2:(10200 H.2)	0.0002		
Enterococci	ECOCCI-Enterolert	6:(1040)	1.0 (cells/100mls) MPN		
E. Coliform	ECOLI-Colilert	2:(9223 B)	1.0 (cells/100mls) MPN		
Fecal Coliform	FCOLI-MF	2:(9222 D)	1.0 (cells/100 ml)		

Methods listed are applicable for all matrices of water, wastewater, and surface waters.

* Indicates method has a lower level of detection due to sample concentration

**Started in August 2000 for all AMP samples.

1: Indicates USEPA Methods for Chemical Analysis of Water and Waste 1979

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3: Indicates Lachat Instruments QuickChem Methods: Approved for use by USEPA - NYSDOH - ELAP

4: Indicates USEPA "Methods for the Determination of Metals in Environmental Samples" Supplement 1, May 1994

5: USEPA Microbiological Methods Manual 1996

6: Approved for use by ELAP

7: Indicates Standard Methods (15th Edition)

ATTACHMENT D:

YSI 600/6600 Calibration Procedures

YSI 600 & 6600 Calibration

The YSI 600 & 6600 sonde units are calibrated in the OCDWEP Laboratory located at the Henry Clay Boulevard Facility (HCBF). All calibration solutions e.g. (20^0C DI water; pH buffers 7,10; Conductivity KCl buffers 0.01N & 0.02N) are purchased and supplied with a certificate of analysis and stored in the laboratory. The YSI 600 & 6600 are calibrated no more than 24 hours prior to use on the day that it is used in the field. Post-calibration checks are conducted after use, on the same day (to the extent possible or the following day), on all calibrated parameters. All calibration records are maintained in a bound book.

Dissolved Oxygen (DO) Calibration

1. Bring the DI water bucket, which can be found in the 20^0C walk-in incubator room, to the ELS Field Staging Room. Place the sonde unit (with attached weighted probe guard) into the 20° C DI water bucket. Allow the unit to stabilize in the bucket for 10 minutes.

2. Record the current barometric pressure (from the MDS 650). Record the mm of Hg value in the bound calibration notebook.

3. The DI water in the bucket should be well stirred, and the YSI 600 or 6600 should be temperature stabilized before proceeding with DO calibration.

4. Once stable, record in the calibration log book the DO and temperature value on the display unit. Collect two Winkler bottle DO samples from the DI water bucket, and turn these samples over to the laboratory technician responsible for DO analysis.

5. The DO concentration is determined in each of the two bottles using the Winkler method. Record each result and the average value of the two DO concentrations in the calibration logbook.

6. If the concentration results of the two bottles, using the Winkler method, are greater than 0.2 ppm different, the DO concentrations should be determined again.

7. If the "average Winkler DO" value is not within five-hundredths (0.05) of the value on the display unit, then it is necessary to calibrate the YSI 600 or 6600, using the "average Winkler DO" value.

8. Select **"Sonde Menu,"** then **"Calibrate,"** then **"DO %"** on the display unit. Enter the calculated barometric pressure **"mm/Hg."** The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed DO value as the initial reading. Then select "enter"; the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". For calibration to a DO Winkler value, select **"DO mg/L"**, enter the average Winkler DO value. The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed DO value as the initial reading. Then select "enter"; the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The DO is now calibrated.

9. After use in the field, conduct the post-calibration procedure repeating steps 1 through 5 as listed above. The difference between the displayed DO value recorded in the log book and the "average Winkler DO" is the drift, which should be recorded in the log book.

pH Calibration

1. Remove the weighted probe guard from the sonde unit and screw on the calibration cup. Rinse the cup with DI water. Thoroughly mix the container of pH 6 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 6 buffer, then fill the cup with the buffer until all probes are submerged. Allow the readings to stabilize for approximately 90 seconds.

2. Select **"Sonde Menu,"** then **"Calibrate,"** then **"pH,"** then **"2 point cal"** on the display unit. Enter the first pH buffer for calibration (pH 6.00). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed pH value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter".

3. Rinse the cup with DI water. Thoroughly mix the container of pH 10 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 10 buffer, then fill the cup with the buffer until all probes are submerged. Allow the readings to stabilize for approximately 90 seconds.

4. Next, enter the second pH buffer for calibration (pH 10.00). The display will then return to the data display screen, with the option "**calibrate**" highlighted. Record the displayed pH value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value as the calibrated pH in the logbook. The display will show "**continue**" highlighted, select "enter" to continue with options.

5. Next, put the display unit in run mode. Rinse the cup with DI water. Thoroughly mix the container of pH 7.00 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 7.00 buffer, then fill the cup with the buffer. All probes should be submerged. Allow the readings to stabilize for approximately 90 seconds. Record the value on the display unit. This value should be recorded in the logbook as the check value. (Target value +/- 0.05 Standard Units)

6. <u>After use in the field</u>, conduct the post-calibration procedure by repeating steps 1 and 3. The displayed value should be recorded as the "after use" value. The difference between the "after use" value and the "calibrated" value is the drift. Record this value in the logbook.

Conductivity Calibration

1. Rinse the calibration cup twice with DI water, then once with the 0.02N KCl solution. Fill the calibration cup with the 0.02N KCl solution such that the conductivity block is fully submerged. Tap the sonde unit to dislodge any possible air bubbles.

2. Select **"Sonde Menu,"** then **"Calibrate,"** then **"conductivity,"** then **"sp. cond."** Enter the value 2.76 mS/cm for calibration of (0.02N KCl). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed sp.cond. value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run."**

3. Rinse the calibration cup twice with DI water, then once with the 0.01N KCl solution. Fill the calibration cup with the 0.01N KCl solution such that the entire conductivity block is fully submerged. Tap the sonde unit to dislodge any possible air bubbles.

4. Record the displayed conductivity value in the logbook as the "initial reading".

5. After use in the field, conduct the post-calibration procedure by repeating steps 1 and 3. The displayed value for each solution should be recorded as the "after use" value. The difference between the "after use" value and the "calibrated value" (for 0.02N KCl) and "initial value" (for 0.01N KCl) should be recorded as the drift.

Depth Calibration

1. Calibration of depth should occur in the field, immediately prior to use. Suspend the sonde unit by holding the cable, such that the probes are just above the water surface. Select **"Sonde Menu,"** then **"Calibrate"**, then **"Pressure-ABS"** on the display unit. Enter the calibrated value (0.0 meters). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Select "enter", the calibration will stabilize and be completed. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run."**

Battery Voltage Evaluation

1. Internal battery voltage is shown on the display unit. Batteries are replaced when the battery voltage indicator is down to 1/4 charge. Replace with four C cell batteries.

Temperature Calibration

1. The temperature sensor is factory calibrated.

2. Quarterly calibration checks are performed by the OCDWEP Lab.

ORP Calibration

The ORP sensor is factory calibrated. However, it is possible to calibrate or check the sensor using a standard Zobel's solution. This calibration will be done quarterly.

2. Rinse the calibration cup twice with DI water, then once with the Zobel's solution. Fill the calibration cup with the Zobel's solution such that the ORP probe is fully submerged.

3. Select **"Sonde Menu,"** then **"Calibrate,"** then **"ORP"**. Record the temperature of the unit and enter the correct value for Zobel's solution which corresponds to the temperature value at 5ºC (See instrument manual for table). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed ORP value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run."**

Turbidity Calibration (6600 Sondes Only)

1. The Turbidity sensor is calibrated as needed for each use. A three- point calibration is performed at the office or in the field.

2. Rinse the calibration cup twice with DI water. (Note: Presence of air can cause erroneous readings. DI water should be allowed to stand prior to calibration.)

3. Carefully fill the calibration cup with DI water by pouring the DI water gently onto the side of the

calibration chamber to reduce air bubbles. Place the calibration cup/chamber with a black cover on the countertop. Approximately two to three inches of water will be sufficient.

4. Carefully place the sonde on top of the calibration cup. Loosely screw the cap on. Be sure that the sonde is stable and not going to fall over.

5. Select **"Sonde Menu"**, then **"Calibrate".** Scroll down to select **"Optic T-Turbidity".** Press Enter. Scroll to" **3- point calibration**". Press the "enter" key.

6. At this point, press the ESC and Enter key simultaneously. The screen will then ask if you want to **Uncal**. Select yes. The display will return to the calibration value screen.

7. The display will then ask for a calibration value, enter 0.0. Press the "enter" key. The unit will stabilize and display "Calibrate" and "Clean Optics". Scroll to "**clean optics**". When complete, scroll to "**calibrate**". When the display is stable, press the enter key. Unit will display "**Continue**" and press the enter key.

8. Rinse the calibration cup with 10 NTU standard. Check the expiration date on the standard prior to use. (**NOTE:** If you are limited on standard volume, the probes must be clean and dry prior to immersing in the standard.) Fill calibration cup with 10 NTU standard. Pour the standard gently onto the side of the calibration cup to prevent air bubbles. Be sure to use the black chamber cover. The standard should not be shaken or agitated. Again the sonde is placed on top of the chamber loosely. Follow the keypad instructions. The black turbidity probes are 6136 probes. The 10 NTU standard is adjusted to a value of 11.2 NTU. If the turbidity probe is gray in color the NTU standard value would be 10.0. Enter the second point **11.2** value. Press the "enter "key.

9. Rinse the calibration cup with 100 NTU standard. Check the expiration date on the standard prior to use.

10. Fill calibration cup with 100 NTU standard. Follow the keypad instructions. Again if the turbidity probe is black, it is a 6136 probe and the 100 NTU standard value is adjusted to 123 NTU. Enter third point **123** value. Press the "Enter" key.

10. Calibration is complete. Press **ESC** to go back to main screen.

ATTACHMENT E:

YSI 600/6600 Maintenance Procedures

YSI 600 & 6600 Maintenance

General Maintenance

1. After use, the YSI 600 / YSI 6600 units are stored clean and dry in the Field Support Staging room at the HCBF. Batteries are replaced on the 650 MDS when the battery voltage indicator is down to 1/4 charge. Replace with four C cell batteries.

2. The cable is cleaned and recoiled, clean and lubricate the rubber connectors. Store the sonde unit with ~ 1 inch of tap water in storage cup.

3. Check the Dissolved Oxygen (DO) membrane after each use and replace as needed. Avoid over stretching the membrane, invert sonde unit several times, check for trapped air bubbles under the membrane.

4. Rinse pH bulb with tap water to remove any film or debris. If good readings are not established, soak the probe in a dishwashing liquid solution for 10-15 minutes. A cotton swab can be used gently to clean the bulb, if needed.

Quarterly Maintenance

1. If the sonde does not have a good response time, soak the pH electrode in a 1:1 HCl solution for 30 - 60 minutes. Remove and rinse the electrode with water. If biological contamination is present soak the probe in a 1 to 1 dilution of chlorine bleach. Then rinse the probe in clean tap water for one hour, swirl occasionally.

2. Clean the Conductivity block and electrodes with a dishwashing liquid solution.

3. Maintain the ORP sensor in the same manner as the pH probe.

4. The depth sensor port should be inspected for blockages or build-ups of mineral or biological matter. A syringe can be used to flush out the ports with tap water.

5. The temperature sensor is factory set and requires no calibration, however, it should be checked against a certified laboratory thermometer quarterly. Wipe down the temperature sensor with a clean cloth.

6. The function of the Redox (ORP) sensor can be checked quarterly against a standard Zobel's solution.

Special Maintenance on the 6600 Sonde Units

1. The Turbidity optical sensor should be cleaned, as needed, using the attached wiper mechanism. The wiper should be changed as needed.

ATTACHMENT F:

YSI 600/6600 Operation Procedures

YSI 600 & 6600 Operation

Tributary Field Sampling

1. Transport the YSI 600 or 6600 sonde unit along with the 650 MDS in the carry case, with the storage cap secured. Be sure to keep the cable coiled neatly and secure the unit such that it does not slide in the cab of the vehicle. When using the unit in the field, set the case on a plastic crate, keeping it off the ground and clean.

2. Before lowering the sonde unit, attach the weighted probe guard. Throughout the day, and in between sampling sites, the probe guard may be removed and the storage cup is replaced.

3. Lower the sonde unit into the stream at mid-stream & mid-depth. This method should be used at all sampling locations except for the following sites. At the **Lake Outlet** sampling site collect a mid-channel profile along the bridge, obtain readings at half-meter increments and at 0.6 meters and 3.7 meters (corresponding to the sample depths of 2' and 12'). At **East Flume** sampling site, lay the sonde unit in front of the v-notch weir.

4. When securing the sonde unit cable to a railing be sure not to overly bend it, as that could damage the coaxial **cable**.

5. Log the data after approximately 2 minutes or when the readings appear stable. Record data by: selecting **"sonde run"** from the 650 Main Menu, then **select "log one sample"** from the 650 column, selecting **"enter"**. Choose a file name and select **"ok."** The display will tell you that the sample is logged. Note that the sonde unit will take longer to stabilize in cold weather.

Lake Sampling

1. Transport the YSI 600 or 6600 sonde unit along with the 650 MDS in the carry case, with the storage cap secured to the sonde unit. Be sure to keep the cable coiled neatly and secure the unit such that it does not slide in the cab of the vehicle.

2. Before lowering the sonde unit, attach the weighted probe guard. Throughout the day, and in between sampling sites, the probe guard may be removed and the storage cup is replaced.

3. Record data at every 0.5 meter increment, starting at the surface to the bottom. Log the data after approximately 2 minutes or when **the** readings appear stable. To record data for the event select **"sonde run"** from the 650 Main Menu, then **select "log one sample"** from the 650 column, selecting **"enter"**. Choose a file name and select **"ok."** The display will tell you that the sample is logged. Note that the sonde unit will take longer to stabilize in cold weather.

River Sampling

1. Transport the YSI 600/6600 sonde unit along with the 650 MDS in the carry case, with the storage cap secured to the sonde unit. Be sure to keep the cable coiled neatly and secure the unit such that it does not slide in the cab of the vehicle. When using the unit in the field, set the case on a plastic crate if possible, keeping it off the deck of the boat.

2. Before lowering the sonde unit, attach the weighted probe guard. Throughout the day it is advisable to keep the sonde unit in a tub of river water. This allows for quicker usage and reduces the need for frequent removal of the probe guard.

3. Record data at every 0.5 meter increment, starting at the surface to the bottom. Be sure to log a data reading at 1 meter below the surface and 1 meter above the bottom, to correspond to water sample collection depths. Record the data after approximately 2 minutes or when the readings appear stable. Record data as described above.

Data Download

1. Connect the YSI 650 display unit to the interface cable on the designated computer. Turn the YSI 650-display unit on.

2. On the computer; access **EcoWatch** from the Windows menu, by selecting the icon.

3. On the YSI 650 select **"file"** from the main menu, then select **"upload to PC,"** then choose the file you wish to transfer.

4. On the computer select the **"sonde icon on the tool bar,"** the file transfer status will be displayed on the computer. After the file has been transferred select **"file"**, then **"open"** from the main tool bar and choose the file you wish to open. The new file will be opened in the EcoWatch software and can now be exported as a text file. In the file menu system on the computer, select **"export"**, then **"CDF/WMF."** Now give the file to be exported a text file name, such as: 05-22-02, in the Q:\AMP\2009\Tribs\Biweekly\ directory. Select **"export"** on the computer. The transfer will be completed.

5. Open *Excel* from the Windows menu, open Q:\AMP\2009\Tribs\Biweekly\ then choose the file type as **"All Files,"** then selected text file e.g. 05-22-02. In order to import this file into *Excel* two options must be **selected**. The first drop down box selection should be **"delimited"**, then choose **"Next"**, the second drop down box selection should be **"comma"**, be sure to click off **"tab"**, then choose **"finish"**.

6. Save the file in *Excel*. Select **"Save as"**. For a lake file save as: Q:\AMP\2009\Lake\Biweekly\05-22-02SD. Be sure to select the **"File Type"** as **"Microsoft Excel Workbook."** Open *Excel* from the Windows menu and open the desired file. Manipulate the data to fit the data format.

ATTACHMENT 2

QUALITY ASSURANCE PROGRAM PLAN

ONONDAGA LAKE FISH SAMPLING PROGRAM (2009)

AMBIENT MONITORING PROGRAM

Prepared for the NYSDEC

Prepared by:

Onondaga County
Department Of Water Environment Protection

February 2009 (Draft)

TABLE OF CONTENTS

1.0 INTRODUCTION/PURPOSE

As part of the Onondaga Lake Ambient Monitoring Program the Onondaga County Department of Water Environment Protection has prepared a Quality Assurance Program Plan (QAPP) for the Onondaga Lake Fish Sampling Program for 2009. This document provides written documentation of the QAPP associated with a baseline fisheries investigation that was initiated in 2000, and subsequent revision or modifications to the program.

The County's long-term monitoring program includes assessment of physical, chemical, and biological attributes of the aquatic resource. The baseline Onondaga Lake Fisheries Monitoring Program and on going studies are expected to address the goal of the *Ambient Monitoring Program* to assess progress towards "swimmable and fishable" conditions in Onondaga Lake by monitoring fish reproductive success and changes in the structure of the fish community.

Background

The Onondaga Lake Fish Program was developed in consultation with expert technical advisors in limnology, engineering, statistics, and fisheries. In addition, Ichthyological Associates, Inc assisted with the development of the original document, and Ecologic, LLC assisted with the development of the original document and subsequent revisions. The 2009 lake fisheries program is summarized in Table 1.

Development of the QAPP

OCDWEP (formerly OCDDS), Ichthyological Associates, Inc. (IA), and EcoLogic, LLC (EcoLogic) staff met on August 15, 2000 to review the schedule and services to be provided for the AMP. Following those discussions, IA/EcoLogic began a series of meetings with OCDWEP technical staff to document procedures used for the Onondaga Lake 2000 Fisheries AMP. The meetings included interviews of OCDWEP staff involved in each aspect of the program. Following initial interviews IA/EcoLogic staff observed field collections of ongoing program and reviewed data entry requirements for each program. Following the initial interviews and review of the *Onondaga County Ambient Monitoring Program: Year 2000 Onondaga Lake Fish Sampling Program* (EcoLogic 2000), IA/EcoLogic prepared the initial draft of the QAPP for review and comment by the OCDWEP. The February 2009 revision of the QAPP was completed by OCDWEP.

The purpose of the QAPP is to mesh field collection procedures and data requirements into a comprehensive document that provides a template for field, laboratory, and data management methods. The QAPP is meant to supplement in-house training of OCDWEP technicians and provide a framework from which trained staff can conduct consistent field surveys. The QAPP is considered to be a living document. That is, as changes are made in the Onondaga Lake Fisheries AMP, revisions will be made to the QAPP to reflect those changes.

Changes or revisions to the QAPP may include:

- intensity of the sampling program;
- incorporation of new elements to the program, or deletion of specific;
- revisions and improvements to methodologies; and
- incorporation of new methodologies into the program.

Thus the QAPP will serve multiple purposes. It will provide annual documentation of Standard Operating Procedures (SOPs), although more formal and detailed SOPs have developed for in-house training and documentation purposes. It will provide a framework of data forms designed to ensure collection and entry of data, and provide a framework for training of OCDWEP's staff via consistent mentoring by more senior, experienced staff through the structure of the QAPP.

The QAPP has been divided into chapters, with each chapter represents a major field component of the AMP. Each chapter provides a purpose and description of the component, the procedures for sampling that component, appropriate data sheets, maps, and descriptions of stations and station codes. Only minor clarifications were made to the QAPP, and no major program modifications were incorporated in to the 2009 monitoring season.

Table 1. Summary of Year 2009 Onondaga Lake Fish Community AMP Sampling Plan.

Component	Methodology and Gear	Sampling Objectives	Location and Number of Samples	Timing	Changes
Pelagic Larvae	Modified double oblique Miller high-speed trawl, with flow meter attached, collected during the day in the pelagic zone.	Determine species richness.	- 4 double oblique tows in each basin (North and South) per event. -Tows will sample water depths from the surface to 5.5 meters. -Total No. of events =8 -Total No. of samples =64	-Daytime -Bi-weekly. -April (when water temps. are 7-8 ºC) through end of July.	-No Change from previous year.
Juvenile Fish	50' x 4' x 1/4" bag seine swept into shore in the littoral zone.	Determine community structure and species richness.	-5 strata with 3 sites in each strata and 1 sweep at each site. -No. of Sites = 15 -Total No. of events = 6 -Total No. of samples = 90	-Daytime -Every 3 weeks. -July - October.	-No Change from previous year.
Nesting Fish	Lake wide nest survey.	Document spatial distribution and species composition	-Entire perimeter of lake divided into 24 equal length sections. -Total No. of events = 1 -Total No. of samples = 24	-Once in June when water temperature is between 15° and 20 °C.	-No Change from previous year.
Adult Fish-Littoral Zone	Boat mounted electrofisher in the littoral zone at night.	Determine community structure, species richness, CPUE, and relative abundance.	-Entire perimeter of lake shocked in 24 contiguous transects. -Alternating all-fish/gamefish transects. -Total No. of events = 2 -Total No. of samples = 48	-Night-time. -Twice per year; Spring and Fall. -Spring and Fall. -Water temp. between 15º and 21 ºC.	-No Change from previous year.
Adult Fish-Profundal Zone	Experimental gill nets of standard NYSDEC dimensions.	Determine community structure, and species richness.	-One net per strata. -Nets set on bottom, parallel to shore at a water depth of 4-5m for two hours. -Total No. of events = 2 -Total No. of samples = 10	-During the day. -Twice per year, within one week of littoral electrofishing.	-No Change from previous year.
Angler Census	Angler diary program.	Determine catch rates, species composition. Attitudes and opinions over the AMP.	-Recruit diary participants at fish & game clubs and fishing organizations.	-Issued annually and collected at end of fishing season (fall).	- Dropped tagging at fish tournament weigh-in.

2.0 STAFF TRAINING

The OCDWEP has approached the AMP under the self-monitoring element that is central to the Federal Clean Water Act. OCDWEP has acquired a staff with a wide range of academic education supplemented by experience gained by working for state fisheries agencies, universities, and environmental consulting and research firms. This staff of scientists and technicians are supported by maintenance and operation personnel that provide the skills to build, construct, maintain, and modify gear needed to conduct the fisheries surveys. This expertise allows the OCDWEP to successfully train and mentor qualified individuals to provide a high level of quality to the data of the fisheries program. As with any long-term monitoring program, individuals will advance in their careers, retire, or move to new locations. This matriculation will require periodic in-house training of new individuals. The QAPP is integral to this training. Its use and understanding will provide each individual with an easy to understand document to ensure day-to-day and year-to-year consistency of the Onondaga Lake Fish Sampling Program.

In addition to the QAPP and SOPs, the County's Consultant, Ecologic LLC, conducts annual audits for each biological monitoring component. The audits are intended to ensure that the field technicians conducted their work in a professional manner and comply with the procedures outlined in the QAPP and SOPs. In addition, the audits determine if any observation would jeopardize the quality of the data (technique, field logs, training, etc.). The biological monitoring component to be audited annually includes the pelagic larvae, juvenile seining, adult electrofishing, and adult gill nets.

Thus the use of the QAPP in conjunction with the formal Standard Operating Procedures (SOPs) and external audits for the biological monitoring program activities, the *Onondaga County Ambient Monitoring Program: Onondaga Lake Fish Sampling Program (2009)*, and subsequent programs will provide OCDWEP with a successful fisheries assessment program.

3.0 PELAGIC LARVAE – Miller High Speed/Modified Double Oblique Tow

3.1 Procedures

Pelagic larvae will be collected using the Miller High Speed/Modified Double Oblique Tow during eight (8) sampling events occurring biweekly from April (water temperature between 7 and 8°C) through the end of July. One (1) sample will be collected from each of eight (8) transects (four (4) in the north basin and four (4) in the south basin) in Onondaga Lake during each sampling event.

3.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet, and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Print labels and pre-label sample jars.

Step 5. Check calibration of water quality (WQ) meter.

Step 6. Review weather reports for sampling feasibility.

3.1.2 Field:

Step 1. Proceed to (north basin or south basin) predetermined locations using the Global Positioning System (GPS). These locations were determined and set at the beginning of the 2002 sampling season. Collect water quality data from 0 to 6 meters, in 0.5 meter intervals, using a pre-calibrated water quality meter. Log the depth and water quality data on the meter (all data will be downloaded at the end of the day). Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

Step 2. Proceed to the first transect (refer to Appendix A1) and record transect number, date, time, and actual GPS coordinates on the field data sheets.

Step 3. Attach one (1) sampling rig to the crane and record starting flow meter reading. Thoroughly inspect the net, collection chamber mesh, cable, connections and all hardware prior to deployment at each location. Any repairs or replacements must be completed prior to deployment.

Step 4. Place the boat in forward gear and accelerate to 3 miles per hour. Pay out sufficient cable to achieve the correct depth of 5.5 meters (this is the last meter mark on cable). The direction of the travel shall be in a straight line heading in a northwest to southeasterly direction (or southeast to northeasterly direction depending on the transect or influence of the sun glare on visual contact with the cable marks).

Step 5. When the correct depth is achieved, accelerate the boat to approximately 5 or 6 miles per hour. Pay out additional cable to maintain a proper depth of approximately 5-5.5 meters. Confirm the actual depth via the following method:

Measure the angle of the cable from vertical (the optimal angle range should be between 55°- 60°) using the WildCo clinometer, and record the angle measurement on the field data sheet. Using the "Angle of Cable Measured" (between 55°- 60°) and the "Length of Cable" let out (typically 10 meters as measured from the water surface), verify on the following chart that the "Proper Vertical Depth" of the sampler has been achieved (optimum depth of approximately 5.0 to 5.5 meters):

Angle of Cable Measured from the Vertical (Degree)		**Proper Vertical Depth (Meters)**		
		5.0	**5.5**	
	53	8.3	9.1	Length of cable measured from the water surface to the sampler (meters)
	54	8.5	9.4	
Optimal Range	**55**	**8.7**	**9.6**	
	56	**8.9**	**9.8**	
	57	**9.1**	**10.1**	
	58	**9.4**	**10.4**	
	59	**9.7**	**10.7**	
	60	**10.0**	**11**	
	61	10.3	11.3	
	62	10.7	11.7	

Step 6. Once a depth of 5-5.5 meters is obtained tow the sampler at a consistent speed (approximately 5 or 6 miles per hour) for 25 seconds heading northeast to southwest or vice versa.

Step 7. After 25 seconds has elapsed, begin retrieving the sampler until the next meter mark is visible and continue towing at that depth for 25 seconds. Repeat this procedure at each individual meter depth on the cable until the 1 meter mark is visible, at which time reduce boat speed to idle and retrieve the sampler. After retrieval, thoroughly inspect the net and collection chamber mesh for any tears that may have compromised the sample. If the sample has been compromised, the location will need to be resampled/repeated.

Step 8. Record ending flow meter reading on the field data sheet, and rinse the inside of the sampler and the net into the sampling bucket with the wash down pump or pump sprayer. Decant as much water as possible. Remove the sampling bucket and pour the contents into the pre-labeled sample jar. Rinse the remaining sample into the jar using tap water from a squirt bottle. Preserve the sample with 10% buffered formalin, filling the jar below the shoulder (wear Nitrile gloves and goggles during this operation).

Step 9. Fill out chain of custody form, and place the sample and Chain of Custody in a clip board box (or equivalent) for safekeeping.

Step 10. Repeat the above process four (4) times in each basin.

3.1.3 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

Step 4. Download water quality data.

3.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

3.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet.
- Facility code/station description.
- List of fish species codes/names (identification will be completed in the HCBF Biology laboratory location).
- Sample labels.
- Chain-of-custody forms (as appropriate).

Appendix A1 contains examples of the station data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in pelagic larvae sampling.

4.0 LITTORAL YOUNG-OF-YEAR (YOY)/JUVENILE FISH – BAG SEINE

4.1 Procedures

Littoral YOY/juvenile fish will be collected using a bag seine (seine dimension - 50' x 4' x 1/4") approximately every three (3) weeks from July to October, resulting in a total of six (6) sampling events. Three (3) randomly selected sites within each of five (5) strata encompassing the littoral zone of the lake were selected in 2000 and are revisited for each sampling event. These sites are physically marked on the shoreline and their coordinates documented with a GPS unit. One (1) sample will be collected at each sampling site for a total of fifteen (15) samples collected from Onondaga Lake during each sampling event.

4.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Check calibration of water quality (WQ) meter.

Step 5. Review weather reports for sampling feasibility.

4.1.2 Field:

Step 1. Proceed to appropriate station and record WQ meter number, facility code/location, date, time, and WQ data at the near surface. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

Step 2. Stretch the seine out on shore and remove any material lodged in the mesh. Check for holes and repair if necessary.

Step 3. Bring net to the marked site location. (Note: Sites have been previously selected and marked by OCDWEP staff).

Step 4. Walk one end of the seine off shore until full length of net is deployed perpendicular to the shoreline.

Step 5. Check the bag section of the seine to make sure it is fully deployed and not tangled.

Step 6. With one person holding the in-shore brail stationary, a second person sweeps the offshore brail to shore. A third person walks behind the bag end of the seine to dislodge the seine if it becomes stuck. A sample will be rejected if the leadline of the seine must be lifted or the seine must be fully stopped in order to dislodge the snag.

In this case, the site will be returned to later during the sampling event to collect the sample.

Step 7. As the offshore brail approaches shore, the two brails will be worked together, and the seine will be beached while being careful to maintain the integrity of the bag section of the seine and keeping the leadline on bottom.

Step 8. Immediately upon retrieval of the seine all fish will be picked and placed in holding tanks. Care shall be taken to sort through captured debris (algae mats and macrophytes) in order to retrieve all fish. In the event adult fish are captured, they should be identified to species, counted, released back into the lake, and noted as such on the data forms. Representative adult bass and other selected game fish should be tagged with a numbered floy tag, measured and sampled for scales (scales are only collected in the fall) prior to release. The tag number, scale envelope number, and other related information should be recorded on the appropriate data form.

Step 9. Stretch the seine out on shore and remove any material lodged in the mesh. Check for holes and repair if necessary.

Step 10. Stretch out seine to dry while processing samples.

Step 11. A minimum of 30 random individuals in each life stage (YOY and juvenile) and species should be measured (total length in mm). Remaining fish should be mass-counted based on life stage (YOY, juvenile, adult). YOY sunfish should be grouped as "*Lepomis* sp." All other individuals should be identified to species. All fish should be returned to the lake after completing measurements.

Unknown species should be noted as such on the data forms by number (for example *Unknown Species No.1* and *Unknown Species No. 2*) and placed in a formalin-filled, labeled jar and identified later in the laboratory.

Step 12. Review data sheets for completeness before proceeding to next station.

4.1.3 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

4.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

4.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet.
- Bulk fish data sheet.
- Individual fish data sheet.
- Map showing location of sampling stations.
- Facility code/station description.
- List of fish species codes/names.
- Sample labels.
- Scale envelopes.

Appendix A2 contains examples of the station data sheet, individual fish data sheet, bulk fish data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in sampling littoral YOY and juvenile fish.

5.0 NESTING SURVEY

5.1 Procedures

Nesting survey transects were determined in 2000 by dividing the lake's littoral zone into twenty-four (24) approximately equal length transects that encompass the entire perimeter of the lake. These transects are utilized for each annual event, and these are the same transects used for the adult fish boat electrofishing events. The beginning and ends of each transect are designated by GPS coordinates. Fish nests will be identified when possible and counted along these transects that are parallel to the shoreline. Date of the survey will be determined based on the time of year (June), water temperature (between 15 and 20ºC), water clarity (ability to see bottom in 2 m of water), weather conditions (sunny and calm), and observations of peak spawning activities of select gamefish.

5.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of program.

Step 2. Determine if bluegill, pumpkinseed and largemouth bass appear to be near peak spawn (typically observed during other lake sampling events).

Step 3. Determine if water visibility is at least 2 m (based on secchi disc readings).

Step 4. Assemble: field data sheet packet and equipment.

Step 5. Examine equipment for needed repairs.

Step 6. Check calibration of water quality (WQ) meter.

Step 7. Review weather reports for sampling feasibility.

5.1.2 Field:

Step 1. Proceed to appropriate transect and position boat at its start in 1 m of water. Record WQ meter number, facility code/location, date, time, and WQ data at the near surface. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

Step 2. Post one technician on the bow of the boat with polarized glasses. This technician will serve as nest spotter. Position a second technician in the center of the boat. This technician will serve as the data recorder. A third technician serves as the boat driver.

Step 3. Start boat and proceed parallel to shore keeping the boat in 1 m of water at all times. Speed of travel will be dependent on the nest spotters and nest density.

Step 4. The technician on the bow will count and report to the data recorder all nests observed, and when possible identify species on the nest. The observer shall report nest counts to the recorder every five (5) to ten (10) fish nest observed. An alternative method is to utilize a mechanical handheld counter.

Step 5. The driver will stop the boat at the end of the transect.

Step 6. Review data sheets for completeness before proceeding to next transect.

Step 7. Bring the boat to the beginning of the next transect and repeat steps 1 through 6.

5.1.3 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

5.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

5.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet.
- Map showing location of sampling stations.
- Facility code/station description.
- List of fish species codes/names.

Appendix A3 contains examples of the station data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names (located on station data sheet) appropriate for use in conducting a nest survey.

6.0 ADULT FISH – BOAT ELECTROFISHING

6.1 Procedures

Boat electrofishing stations were determined in 2000 by dividing the lake's littoral zone into twenty-four (24) approximately equal length transects that encompass the entire perimeter of the lake. These transects are utilized for each sampling event. The beginning and ends of each transect are designated by GPS coordinates. Transects are divided into alternating all-fish/gamefish samples (odd number transects are always all fish and even numbered transects are always game fish only). In "all-fish" transects all species are netted, while in "gamefish only" transects only those species designated as gamefish by the County are netted (see attached list). Time spent electrofishing at each transect will be recorded during each sampling event to allow for standardization of catch per unit effort.

Boat electrofishing is conducted for two (2) sampling events, in the Spring and in the Fall based on surface water temperatures between 15 and 21° C. During each sampling event, fish will be collected during the night along the twenty-four (24) transects distributed around the perimeter of the lake, resulting in collection of a total of forty-eight (48) boat electrofishing samples/transects for the year (24 all-fish and 24 gamefish).

6.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Check calibration of water quality (WQ) meter.

Step 5. Review weather reports for sampling feasibility.

Step 6. Notify Onondaga County Sheriff's Office and the OCDWEP Metro Board operator of proposed night sampling event.

6.1.2 Field:

Step 1. Proceed to predetermined transect location and record facility code/location, date, time, and WQ data taken at near surface depth. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

This event will require four technicians, two (2) will collect fish with nets at the front of the electrofishing boat, one (1) will be the data recorder, and one (1) will drive and operate the generator/pulsator.

Step 2. Determine if transect is for all fish or game fish (odd number transects are all fish and even numbered transects are game fish).

Step 3. Record start of sample data: time of day, starting seconds on pulsator, and actual GPS coordinates.

Step 4. Place boat into forward gear at idle speed. Start the generator, activate electrofisher and begin collection of fish. The two netting technicians will maintain the foot pedal, that activates the electrofisher, in the "on" position for the entire transect. For gamefish transects any fish that resembles one of the gamefish species should be boated. If the fish is identified as being a non-gamefish species while still in the net it may be immediately released.

For all-fish transects, an attempt should be made to collect all fish encountered, with the exception of common carp, or gizzard shad and alewives occurring in large schools or quantities incapable of boarding. The quantity of common carp within netting distance shall be counted (or estimated if in large numbers) and noted as a count (or estimate) in the bulk fish section of the field sheet.

Gizzard shad and alewives occurring in large schools or un-boardable quantities may be estimated without actually collecting each fish (this will minimize catch mortality and will prevent under estimating significant quantities of "missed/non-boarded" fish. However, these "missed/non-boarded" fish shall be noted in the bulk fish section of the field sheet as an "estimate". Gizzard shad and alewives that are boarded, but are in excess of the 30 individuals initially counted and measured, shall be individually counted (not measured) and noted in the bulk fish section of the field sheets as a "count". Because of the difficulty in differentiating small shad and alewives from one another, if a school of small clupeids (shad/alewives) is encountered, a sample of the school should be netted, brought on board and identified. After positive identification the number of fish in the school can be estimated.

For all other species, missed fish shall be estimated, and recorded in the bulk fish section of the field sheets as an "estimate". Since the two netting technicians will be maintaining a mental tally of "missed/non-boarded" fish, this data should be recorded immediate following the completion of each transect to minimize loss of semi-quantifiable data.

Step 5. Record electrofisher data: voltage, amps, and pulse width. Monitor settings and displays throughout the transect.

Step 6. Maintain the boat electrofisher on course approximately parallel with the shore in one meter of water at approximately idle speed (the motor tilt will need to be adjusted to maintain appropriate speed). The boat may be slowed down in order to try and capture a rare fish that is initially missed by the netters. However, all attempts should be made to keep the boat moving slowly forward in approximately one meter of water for the majority of the transect.

Note: All attempts are made to maintain the monitoring depth of one (1) meter. However, the natural variation of the depth contours or abrupt drop offs (natural or man-made) may result in short periods of shallower or deeper monitoring.

Step 7. When the end of the transect is reached, turn off electrofisher unit, and return boat to neutral.

Step 8. Record time, GPS coordinates, and miscellaneous collection notes (missed/non-boarded fish, estimates, counts, etc.)

Step 9. Proceed to approximately the mid-transect location to work up collected fish.

Step 10. Fish whose numbers were estimated should be entered in the bulk fish section of the field form first to prevent omissions.

Then, collected fish should be identified to species, measured for length (nearest mm), and, for the fall samples only, measured for weight (nearest gram).

Note: Individual fish weighing less than 100 grams will be weighed on the small scale.

If the small scale will not stabilize, multiple fish of the same species and size range may be bulk weighed and divided by the total number of fish to establish a relative weight (e.g. weigh all alewife between 140 mm and 160 mm – divide total weight of all alewife weighed by total number of alewife to establish a relative weight for each of the individual alewife). These weights shall be noted in the comment section of the individual fish data sheet as a "bulk weight".

For samples in which small to moderate numbers of fish are collected (less than 30), all fish should be measured. In samples in which high numbers (greater than 30) of one or more species are collected, random sub-samples of the abundant species will be measured, and the remaining individuals of those species need only be counted and listed in the bulk fish data sheet. This will result in some samples having both individual fish data and bulk fish data. Fish not measured individually should be mass-counted based on life stage (YOY, juvenile, adult). Unknown species should be noted as such on the data forms by number (for example unknown species 1 and unknown species 2) and placed in a formalin-filled, labeled jar and identified later.

Step 11. Representative adult bass and other selected game fish should be tagged with a numbered floy tag and sampled for scales (fall only) prior to release. In addition, during the fall, select species (bluegill, pumkinseed, white perch, yellow perch, and gizzard shad) shall also be randomly sampled for scales prior to release.

On spiny-rayed species, including but not limited to largemouth bass, smallmouth bass, bluegill, pumpkinseed, white perch, walleye, yellow perch and black crappie,

scales will be removed from left side of the body below the lateral line, near the tip of the depressed left pectoral fin. On soft-rayed species, including trout and salmon, scales will be removed from the middle region of the body above the lateral line, beneath the posterior end of the dorsal fin on the left side.

Fish that are tagged should appear to be in good health and not overly stressed from the capture experience. The tag number, scale envelope number, and other related information should be recorded on the appropriate data form. Any recaptured fish shall be recorded on the individual field sheet data form, and evaluated to determine the need for a replacement tag.

Step 12. Review data sheets for completeness before proceeding to next station.

6.1.3 End of Sample Day

Step 1. Notify Metro Board of safe return from field.

Step 2. Review field notes for completeness and QAPP sign offs.

Step 3. Submit original data sheets and field notes for duplication.

Step 4. Write down needed equipment repairs and report to supervisor.

6.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

6.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet.
- Bulk fish data sheet.
- Individual fish data sheet.
- Map showing location of sampling stations.
- Facility code/station description.
- List of fish species codes/names.
- Sample labels.
- Scale envelopes.

Appendix A4 contains examples of the station data sheet, individual fish data sheet, bulk fish data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in sampling littoral adult fish.

7.0 ADULT FISH – Littoral-Profundal (Fixed Deep Water) Gill Net Sampling

7.1 Procedures

Gill net sampling will be conducted during two (2) sampling events, in Spring and Fall within one (1) week of the electrofishing events. During day-time hours, one (1) net will be randomly set in each of the five (5) strata (refer to Appendix A5). The nets will be set for two (2) hours on the lake bottom in 4 to 5 meters of water, resulting in collection of a total of ten (10) samples/sets during the year.

7.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Check calibration of water quality (WQ) meter.

Step 5. Review weather reports for sampling feasibility.

7.1.2 Field (Gill Net Setting):

Step 1. Proceed to a random monitoring location within one (1) of the five (5) stratums.

Step 2. Upon arrival locate 5 meters depth of water with depth finder and collect water quality data from 0 to 5 meters in 0.5 meter intervals. Log the depth and water quality data on the meter (all data will be downloaded at the end of the day). Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP. Record the GPS coordinates on the field data sheet.

Step 3. Rig gill net with appropriate anchors and buoys.

Step 4. Bring the boat parallel to shore in 5 meters of water (turn the boat into the prevailing wind if possible).

Step 5. With one technician on the bow of the boat lower the leading anchor to the bottom and pay out the net as the boat is slowly reversed. Pay out the net by handling the float-line and shaking out or spreading the mesh as the boat reverses to assure net deploys.

Step 6. After the full length if the gill net is set out, stretch the net as taut as possible, and drop the trailing anchor.

Step 7. Allow for two hours to elapse before retrieval.

7.1.3 Field (Gill Net Retrieval):

Step 1. Pull in the downwind buoy and anchor, and remove them from the net. Grasping the lead and floatlines together, slowly bring in the net.

Step 2. As fish are encountered remove them as fast as possible and place in a live well. Under ideal conditions and a light catch, the fish may be removed from the net as it is being retrieved. When large catches are encountered, remove only gamefish, all other fish can be removed after net is retrieved at a location secluded from public viewing.

Step 3. Record data on catch using the appropriate field forms, recording the following information:

- Species identification.
- Length (mm) total length.
- Weight (gram - fall sample only).
- Scale samples (only in fall samples on all bass).
- Condition of fish (dead or alive).
- Tag all game fish if healthy and record tag number.

Step 4. Repeat all steps (7.1.2 and 7.1.3) for the other four (4) locations.

7.1.4 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2 Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

Step 4. Download water quality data.

7.1.5 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

7.1.6 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet
- Bulk fish
- Individual fish
- Map showing location of sampling stations
- Facility code/station description
- List of fish species codes/names
- Sample labels
- Scale envelopes

Appendix A5 contains examples of the station data sheet, individual fish data sheet, bulk fish data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in sampling pelagic adult fish.

8.0 DEFORMITIES, EROSIONS, LESIONS, TUMORS, FUNGAL INFECTIONS, AND MALIGNANCIES (DELTFM) MONITORING

Tracking of DELTFM parameters will be conducted in conjunction with all fisheries sampling activities with the exception of larval fish sampling and the adult fish nesting survey. DELTFM parameters will be recorded for only individual juvenile fish (not the bulk counts). All captured fish will be screened for any visible abnormalities. The abnormalities will be recorded on the corresponding data sheet. The technicians will be required to record the following abnormalities on the data sheets:

Deformities – Any distorted form of the fish's anatomy.
Erosions – Wear marks, scares, or scrapes.
Lesions – Visible sores, or wounds.
Tumors – A localized swelling of tissue on or in the body that has no physical function.
Fungal Infections – Any visible fungal growth on the fish.
Malignancies – A growth that could be cancerous. (use field judgment).

9.0 RECREATIONAL FISHERY – ANGLER DIARY

Angler diaries will continue to be used to assess the recreational fishery of Onondaga Lake. Angler catch rate and species composition of the catch, as well as angler attitude and opinions will be assessed. Potential anglers for participation in the angler diary program will be solicited at various fishing tournaments and through local sportsman organizations. The OCDWEP angler diary program uses record keeping forms similar to those used by the New York State Department of Environmental Conservation in their angler diary program.

10.0 CHRONOLOGY OF QAPP

The QAPP for the Onondaga Lake Fish Sampling Program is a living document in that it will be periodically updated to reflect changes in the monitoring program that are instituted to improve the efficiency of data collection, focus on a particular aspect of the fish community, or narrow or expand the scope of investigation. The periodic updating of the QAPP will provide a written record of sampling procedures over the entire life of the Onondaga Lake Fish Sampling Program. This February 2009 version of the QAPP is the eighth version/issue of the document.

The first version (Initial Draft) was submitted to OCDWEP on October 18, 2000 for review and comment by OCDWEP staff. Following review of the Initial Draft by OCDWEP, a meeting was held between IA and OCDWEP in which comments on the Initial Draft were provided. These comments, along with information gathered during data analysis and report preparation for the 2000 fish sampling program were incorporated into a second version of the document submitted to OCDWEP in July 2001. Annual revisions to the QAPP have incorporated various changes made to the fisheries assessment program.

The original QAPP, and subsequent revisions, have been reviewed by the NYSDEC, revised by OCDWEP as requested, and approved by the NYSDEC prior to implementation.

11.0 LITERATURE CITED

EcoLogic, LLC. *Onondaga County Ambient Monitoring Program: Year 2000 Onondaga Lake Fish Sampling Program. Prepared for Onondaga County Department of Drainage and Sanitation, Syracuse, NY. EcoLogic, LLC., Cazenovia, NY.*

OCDWEP *SOP For Fish Scale Age and Growth Determination (DOC No. BIO-001)*

OCDWEP *SOP For Larval Fish Identification (DOC No. BIO-002)*

OCDWEP *SOP For Fish Tagging (DOC No. BIO-003)*

OCDWEP *SOP For Littoral-Profundal Zone Fixed Deep Water Gill Net Sampling (DOC No. BIO-006)*

OCDWEP *SOP For Littoral Zone Electrofishing (DOC No. BIO-007)*

OCDWEP *SOP For Littoral Zone Young-Of-Year and Juvenile Fish Bag Seine (DOC No. BIO-008)*

OCDWEP *SOP For Fish Nesting Survey (DOC No. BIO-009)*

OCDWEP *SOP For Pelagic Larvae Sampling – Miller High Speed/Modified Double Oblique Tow (DOC No. BIO-010)*

APPENDIX A1:

Field Data Packet For Pelagic Larvae Sampling

Facility Code and Station Description

Facility Code	Site Abbreviation	Site Description
2700	NBMHT1	North Basin Miller High Speed Trawl 1
2701	NBMHT2	North Basin Miller High Speed Trawl 2
2702	NBMHT3	North Basin Miller High Speed Trawl 3
2703	NBMHT4	North Basin Miller High Speed Trawl 4
2704	SBMHT1	South Basin Miller High Speed Trawl 1
2705	SBMHT2	South Basin Miller High Speed Trawl 2
2706	SBMHT3	South Basin Miller High Speed Trawl 3
2707	SBMHT4	South Basin Miller High Speed Trawl 4

Onondaga County Department of Water Environment Protection
Onondaga Lake Fish Monitoring Program

PELAGIC LARVAE -- MILLER TRAWL
Modified Double Oblique Tow

Date: _____ **Basin:** _____

Crew: _____ **Site Abbreviation:** _____

Time Start: _____ *(trawl)* **End:** _____ *(trawl)* **Bottle No:** _____

GPS: North: 43° _____ *(Start)* West: 76° _____ **Fac. Code:** _____ **Preserv.Y/N** _____

North: 43° _____ *(End)* West: 76° _____ **# of Bottles:** _____ **Compass Brg:** _____

Flow Meter Start: _____ **Flow End:** _____ **Cable Angle:** _____ **At** _____ **Meters**

Total Trawl Time: _____ *(min:sec)* **Avg Speed:** _____ *(mph)*

Field Observations - Only Enter One (1) Option

Weather: _____
OVercast PartlyCloudy HaZy CLear RAining SNowing

Waves: *Calm / Swells / Whitecaps*

Water Clarity: *Poor / Moderate / Good*

Wind: _____ **from:** _____
0-5mph 5-10 10-15 >15 *N,SE,SSE, etc.*

Significant Rainfall in the Last 48 Hours? *Yes / No*

Water Quality Profile Taken? *Yes / No*

Comments: *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

Meters	Cable Angle	Meters	Cable Angle
10		5	
9		4	
8		3	
7		2	
6		1	

Measure/Check at 1 or 2 locations.

Data Validity Classification: *Good / Conditional / Invalid*

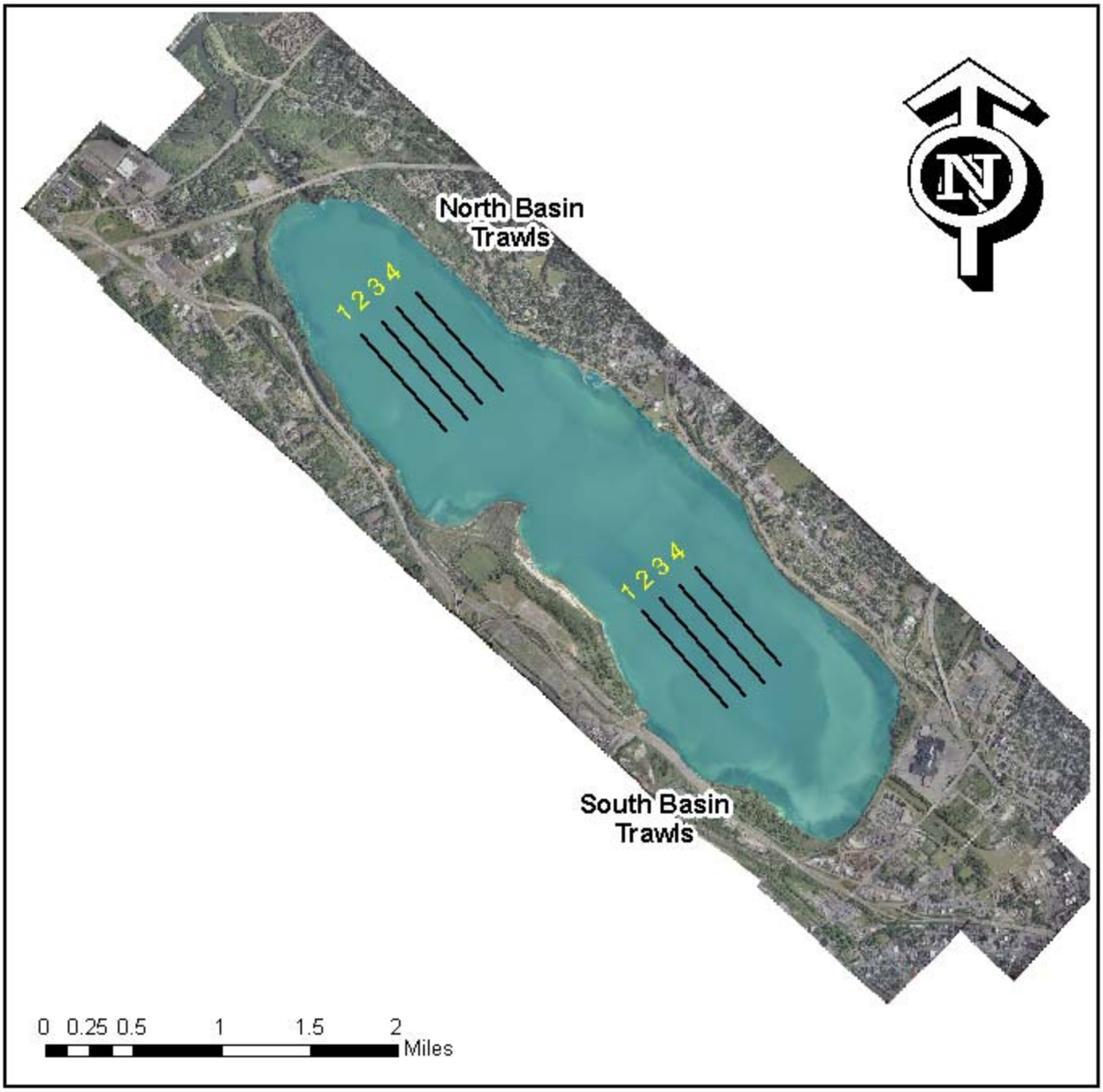
# of Attached Data Sheets: Bulk Fish _____ Larval Fish _____ (During Biology Lab ID)
C of C _____

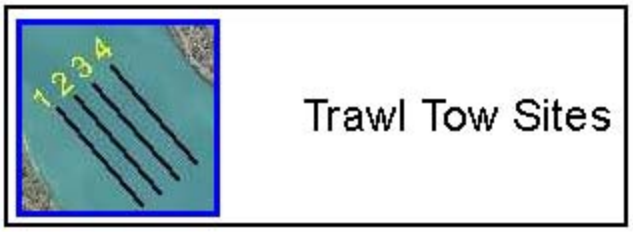
Date Sorted: _____ **QA/QC Date:** _____
Initials: _____ **Initials:** _____

QAPP Signoffs (Initital and Date):
Field: _____ Office: _____ Data Entry: _____

Species Codes and Common Names

Species Code	Common Name	Species Code	Common Name	Species Code	Common Name
0	No Catch	390	Spottail shiner	576	White bass
207	Sea lamprey	394	Spotfin Shiner	576.1	Temperate Basses
268	Longnose gar	396	Redfin shiner	591	Rock bass
271	Bowfin	397.1	Notropis sp.	595	Green sunfish
276	American eel	400	Bluntnose minnow	596	Pumpkinseed
285	Blueback Herring	401	Fathead minnow	598	Bluegill
289	Alewife	401.1	Pimephalus sp.	599.1	Lepomis sp.
290.1	Blueback and/or Alewife	403	Longnose dace	600	Smallmouth bass
294	Gizzard shad	406	Creek chub	601	Largemouth bass
297.1	Herring Family (Cluepeidae)	407	Fallfish	601.1	Black Bass (SM or LM)
326	Rainbow trout	408.1	Semotilus sp.	602	White crappie
327	Atlantic salmon	409.1	Minnow Family (Cyprinadae)	603	Black crappie
328	Brown trout	419	White sucker	603.1	Crappie (White or Black)
329	Brook trout	423	Northern hog sucker	603.2	Sunfish Family (Centrarchidae)
329.1	Tiger Trout (hybrid)	432	Shorthead redhorse	613	Johnny darter
332	Splake	433.1	Suckers (Catostomidae)	614	Tesselated darter
332.1	Trout Family (Salmonidae)	443	Yellow bullhead	616.1	Ethostoma sp.
335	Rainbow smelt	444	Brown bullhead	617	Yellow perch
340	Central mudminnow	444.1	Bullhead (species unknown)	618	Logperch
347	Northern pike	445	Channel catfish	624.1	Darter (not YPerch)
349	Chain pickerel	450.1	Freshwater Catfish	626	Walleye
350	Tiger muskellunge	461	Trout perch	628.1	Perch Family (Percidae)
350.1	Pike Family (Esocidae)	493	Burbot	700	Freshwater drum
365	Carp	531	Banded killifish	970	NS (Bullhead sunfish, etc)
377	Golden shiner	545	Brook Silverside	999	SPECIES UNKNOWN
381	Emerald shiner	561	Brook stickleback		
385	Common shiner	575	White perch		





LOCATION OF PELAGIC LARVAL TRAWL SITES ON ONONDAGA LAKE

APPENDIX A2:

Field Data Packet For Littoral YOY/Juvenile Fish Sampling

Facility Code and Station Description

Facility Code	Site Abbreviation	Site Description
2581	ST1JS1R1	Stratum 1 Juvenile Seine Site 1
2584	ST1JS2R1	Stratum 1 Juvenile Seine Site 2
2587	ST1JS3R1	Stratum 1 Juvenile Seine Site 3
2590	ST2JS1R1	Stratum 2 Juvenile Seine Site 1
2593	ST2JS2R1	Stratum 2 Juvenile Seine Site 2
2596	ST2JS3R1	Stratum 2 Juvenile Seine Site 3
2599	ST3JS1R1	Stratum 3 Juvenile Seine Site 1
2602	ST3JS2R1	Stratum 3 Juvenile Seine Site 2
2605	ST3JS3R1	Stratum 3 Juvenile Seine Site 3
2608	ST4JS1R1	Stratum 4 Juvenile Seine Site 1
2611	ST4JS2R1	Stratum 4 Juvenile Seine Site 2
2614	ST4JS3R1	Stratum 4 Juvenile Seine Site 3
2617	ST5JS1R1	Stratum 5 Juvenile Seine Site 1
2620	ST5JS2R1	Stratum 5 Juvenile Seine Site 2
2623	ST5JS3R1	Stratum 5 Juvenile Seine Site 3

Onondaga County Department of Water Envrironment Protection
Onondaga Lake Fish Monitoring Program

LITTORAL JUVENILES -- BAG SEINE

Date: _____ **Stratum:** _____

Crew: _____ **Site:** _____

Time Start: _____ (Start Seining) **Time End:** _____ (Processing Fish) **Facility Code:** _____

GPS North: 43° _____ West: 76° _____ *(decimal minutes)*

Field Observations - Only Enter One (1) Option

Weather: _____
OVercast PartlyCloudy HaZy CLear RAining SNowing

Waves: *Calm / Swells / Whitecaps*

Water Clarity: *Poor / Moderate / Good*

Wind: _____ **from:** _____
0-5mph 5-10 10-15 >15 *N,SE,SSE, etc.*

Significant Rainfall in the Last 48 Hours?
Yes / No

Habitat and Substrate Observations - Include Only The Actual Physical Area Seined.

Habitat: Vegetation _____ Pct cover _____ Structure _____ Pct _____
Emergent Submerged Algae Debris None *overhead Veg. Rocks Logs Dropoff Manmade*
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Substrate: *VeGetated Plant Debris MuD Sllt SAnd* Type _____ Pct _____
GRavel CObble BOulder BedRock CLay Type _____ Pct _____
ONcolites WasteBed ConcreTe MarL UNknown Type _____ Pct _____
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Water Quality:	*Depth(m)*	*Temp('C)*	*DO(mg/l)*	*DO(%Sat)*	*Cond*	*pH*	*Redox*

Average Depth (m): _____ **Shoreline Length (m)** _____

Comments: *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

_____

_____

_____

_____

_____

Data Validity Classification: *Good / Conditional / Invalid*

# of Attached Data Sheets: Bulk Fish _____ Indiv. Fish _____

QAPP Signoffs (Initital and Date):

Field: _____ Office: _____ Data Entry: _____

_____ _____

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _____ **of** _____

INDIVIDUAL FISH DATA SHEET

Date: _____ **Program/GearType:** _____
Facility Code: _____ **Location/Site:** _____
(Include Facility Codes for all samples on data sheet)

Facility Code	Species Code	Common Name	Stage *(A,J,Y)*	Length *(mm)*	Weight *(grams)*	Scale #	Tag #	*Is fish Dead?*	DELTFM *Codes*	Comments

QAPP Signoffs (Initital and Date):
Field: _____ Office: _____ Data Entry: _____
_____ _____

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _______ **of** _______

BULK CATCH DATA SHEET

(Record Individual Fish > Initial 30 Count, and Non-Boarded Estimates and/or Counts)

Date: ______________ **Program/GearType:** ____________________

Facility Code: ______________________________ **Location/Site:** ____________________

(Include Facility Codes for all samples on data sheet)

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

QAPP Signoffs (Initital and Date):

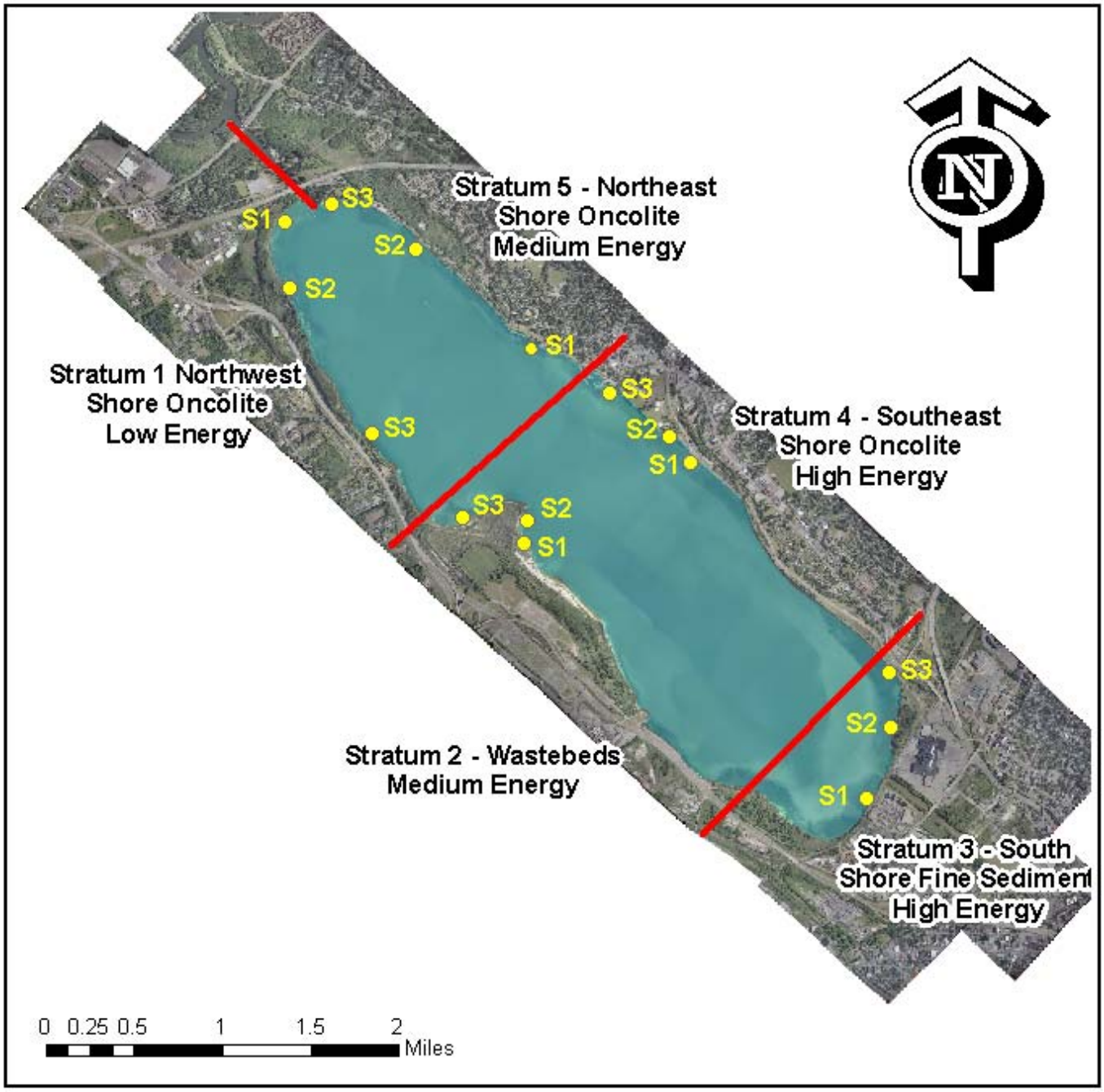
Field: ______________ Office: ____________________ Data Entry: ____________________

*** All fish with obvious DELTFM parameters must be listed on the individual fish data form.**

Revised by OCDWEP 2/2006

Species Codes and Common Names

Species Code	Common Name	Species Code	Common Name	Species Code	Common Name
0	No Catch	390	Spottail shiner	576	White bass
207	Sea lamprey	394	Spotfin Shiner	576.1	Temperate Basses
268	Longnose gar	396	Redfin shiner	591	Rock bass
271	Bowfin	397.1	Notropis sp.	595	Green sunfish
276	American eel	400	Bluntnose minnow	596	Pumpkinseed
285	Blueback Herring	401	Fathead minnow	598	Bluegill
289	Alewife	401.1	Pimephalus sp.	599.1	Lepomis sp.
290.1	Blueback and/or Alewife	403	Longnose dace	600	Smallmouth bass
294	Gizzard shad	406	Creek chub	601	Largemouth bass
297.1	Herring Family (Cluepeidae)	407	Fallfish	601.1	Black Bass (SM or LM)
326	Rainbow trout	408.1	Semotilus sp.	602	White crappie
327	Atlantic salmon	409.1	Minnow Family (Cyprinadae)	603	Black crappie
328	Brown trout	419	White sucker	603.1	Crappie (White or Black)
329	Brook trout	423	Northern hog sucker	603.2	Sunfish Family (Centrarchidae)
329.1	Tiger Trout (hybrid)	432	Shorthead redhorse	613	Johnny darter
332	Splake	433.1	Suckers (Catostomidae)	614	Tesselated darter
332.1	Trout Family (Salmonidae)	443	Yellow bullhead	616.1	Ethostoma sp.
335	Rainbow smelt	444	Brown bullhead	617	Yellow perch
340	Central mudminnow	444.1	Bullhead (species unknown)	618	Logperch
347	Northern pike	445	Channel catfish	624.1	Darter (not YPerch)
349	Chain pickerel	450.1	Freshwater Catfish	626	Walleye
350	Tiger muskellunge	461	Trout perch	628.1	Perch Family (Percidae)
350.1	Pike Family (Esocidae)	493	Burbot	700	Freshwater drum
365	Carp	531	Banded killifish	970	NS (Bullhead sunfish, etc)
377	Golden shiner	545	Brook Silverside	999	SPECIES UNKNOWN
381	Emerald shiner	561	Brook stickleback		
385	Common shiner	575	White perch		



Seine Sites

Stratum Border

LOCATION OF YOY-JUVENILE SEINE SITES ON ONONDAGA LAKE

APPENDIX A3:

Field Data Packet For Nesting Surveys

Facility Code and Station Description

Facility Code	Site Abbreviation	Site Description
2626	NS1	Nesting Survey Transect 1
2627	NS2	Nesting Survey Transect 2
2628	NS3	Nesting Survey Transect 3
2629	NS4	Nesting Survey Transect 4
2630	NS5	Nesting Survey Transect 5
2631	NS6	Nesting Survey Transect 6
2632	NS7	Nesting Survey Transect 7
2633	NS8	Nesting Survey Transect 8
2634	NS9	Nesting Survey Transect 9
2635	NS10	Nesting Survey Transect 10
2636	NS11	Nesting Survey Transect 11
2637	NS12	Nesting Survey Transect 12
2638	NS13	Nesting Survey Transect 13
2639	NS14	Nesting Survey Transect 14
2640	NS15	Nesting Survey Transect 15
2641	NS16	Nesting Survey Transect 16
2642	NS17	Nesting Survey Transect 17
2643	NS18	Nesting Survey Transect 18
2644	NS19	Nesting Survey Transect 19
2645	NS20	Nesting Survey Transect 20
2646	NS21	Nesting Survey Transect 21
2647	NS22	Nesting Survey Transect 22
2648	NS23	Nesting Survey Transect 23
2649	NS24	Nesting Survey Transect 24

Onondaga County Department of Water Environment Protection
Onondaga Lake Fish Monitoring Program

NEST SURVEY COVER SHEET

Date: _____ **Transect:** _____
Crew: _____ **Facility Code:** _____
Time Start: _____ **End:** _____ **Observer:** _____

Field Observations - Only Enter One (1) Option

GPS: *Starting Coordinates* North: 43° _____ West: 76° _____ *(decimal minutes)*
Ending Coordinates North: 43° _____ West: 76° _____ *(decimal minutes)*

Weather: _____ **Waves:** *Calm / Swells / Whitecaps*
OVercast PartlyCloudy HaZy CLear RAining **Water Clarity:** *Poor / Moderate / Good*

Wind: _____ **from:** _____ **Significant Rainfall in the Last 48 Hours?**
0-5mph 5-10 10-15 >15 *N,SE,SSE, etc.* *Yes / No*

Habitat: Vegetation _____ Pct cover _____ Structure _____ Pct _____
Emergent Submerged Algae Debris *overhead Veg. Rocks Logs Dropoff Manmade*
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Substrate: *VeGetated Plant Debris MuD SIlt SAnd* Type _____ Pct _____
GRavel CObble BOulder BedRock CLay Type _____ Pct _____
ONcolites WasteBed ConcreTe MarL UNknown Type _____ Pct _____
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Water Quality:	*Depth(m)*	*Temp('C)*	*DO(mg/l)*	*DO(%Sat)*	*Cond*	*pH*	*Redox*

Comments: *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

_____

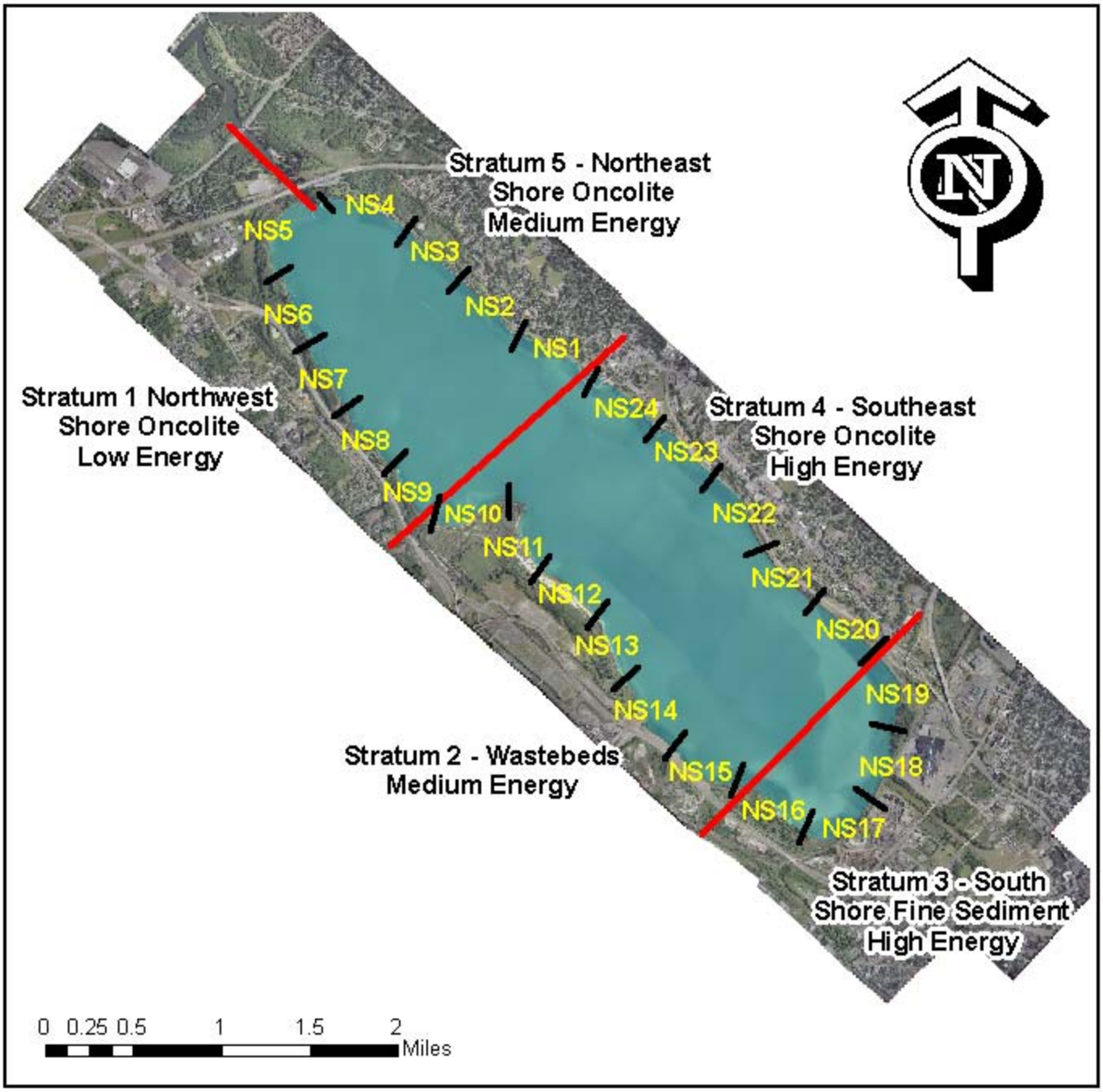
_____

NUMBER OF NESTS OBSERVED

SppCode	Common Name	Field Marks	#Nests
999	UNKNOWN		
596	Pumpkinseed		
598	Bluegill		
599.1	Lepomis. sp.		
600	Smallmouth Bass		
601	Largemouth Bass		
601.1	Black Bass		
444.1	Bullhead		
		Total No. of Nests Observed:	

Average Water Depth (Meters) _____ **Data Validity Class:** *Good / Conditional / Invalid*

QAPP Signoffs (Initital and Date):
Field: _____ Office: _____ Data Entry: _____
_____ _____



Transect Border

Stratum Border

LOCATION OF NESTING SURVEY TRANSECTS IN ONONDAGA LAKE

APPENDIX A4:

Field Data Packet For Littoral Adult Fish Sampling (Electrofishing)

Facility Code and Station Description

Facility Code	Site Abbreviation	Site Description
2676	EF1	Electrofishing Transect 1
2677	EF2	Electrofishing Transect 2
2678	EF3	Electrofishing Transect 3
2679	EF4	Electrofishing Transect 4
2680	EF5	Electrofishing Transect 5
2681	EF6	Electrofishing Transect 6
2682	EF7	Electrofishing Transect 7
2683	EF8	Electrofishing Transect 8
2684	EF9	Electrofishing Transect 9
2685	EF10	Electrofishing Transect 10
2686	EF11	Electrofishing Transect 11
2687	EF12	Electrofishing Transect 12
2688	EF13	Electrofishing Transect 13
2689	EF14	Electrofishing Transect 14
2690	EF15	Electrofishing Transect 15
2691	EF16	Electrofishing Transect 16
2692	EF17	Electrofishing Transect 17
2693	EF18	Electrofishing Transect 18
2694	EF19	Electrofishing Transect 19
2695	EF20	Electrofishing Transect 20
2696	EF21	Electrofishing Transect 21
2697	EF22	Electrofishing Transect 22
2698	EF23	Electrofishing Transect 23
2699	EF24	Electrofishing Transect 24

Onondaga County Department of Water Environment Protection
Onondaga Lake Fish Monitoring Program

LITTORAL ADULTS -- BOAT ELECTROFISHER

Date: _____ **Transect:** _____
Crew: _____ **Facility Code:** _____
Start Time : _____ **End Time:** _____
GPS: North: 43° _____ West: 76° _____ **GPS:** North: 43° _____ West: 76° _____

Field Observations - Only Enter One (1) Option

Weather: _____
OVercast PartlyCloudy HaZy CLear RAining SNowing

Waves: *Calm / Swells / Whitecaps*

Water Clarity: *Poor / Moderate / Good*

Wind: _____ **from:** _____
0-5mph 5-10 10-15 >15 *N,S,E,W,SE,SW,NE,NW.*

Significant Rainfall in the Last 48 Hours? *Yes / No*

Water Quality:	*Depth(m)*	*Temp('C)*	*DO(mg/l)*	*DO(%Sat)*	*Cond*	*pH*	*Redox*

Comments: *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

_____
_____

BULK CATCH DATA

-- Include Individual fish > initial 30 count, & non-boarded estimates and/or counts)

Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
		Total Catch:				

EF Settings:

Sec. Start:		**Sec End:**		**Total # Seconds:**	**(UnitEffort)**
Pct Range:		**Amps:**		**Avg. Speed:**	
Frequency:		**Volts:**		**Avg. Depth:**	

Data Validity Classification: *Good / Conditional / Invalid*

# of Attached Data Sheets: Bulk Fish _____ Indiv. Fish _____

QAPP Signoffs (Initital and Date):
Field: _____ Office: _____ Data Entry: _____
_____ _____

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _____ **of** _____

INDIVIDUAL FISH DATA SHEET

Date: _____ **Program/GearType:** _____
Facility Code: _____ **Location/Site:** _____
(Include Facility Codes for all samples on data sheet)

Facility Code	Species Code	Common Name	Stage *(A,J,Y)*	Length *(mm)*	Weight *(grams)*	Scale #	Tag #	*Is fish Dead?*	DELTFM *Codes*	Comments

QAPP Signoffs (Initital and Date):
Field: _____ Office: _____ Data Entry: _____
_____ _____

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _______ of _______

BULK CATCH DATA SHEET

(Record Individual Fish > Initial 30 Count, and Non-Boarded Estimates and/or Counts)

Date: ______________ **Program/GearType:** ______________________

Facility Code: ______________________________ **Location/Site:** ______________________

(Include Facility Codes for all samples on data sheet) ______________________

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

QAPP Signoffs (Initital and Date):

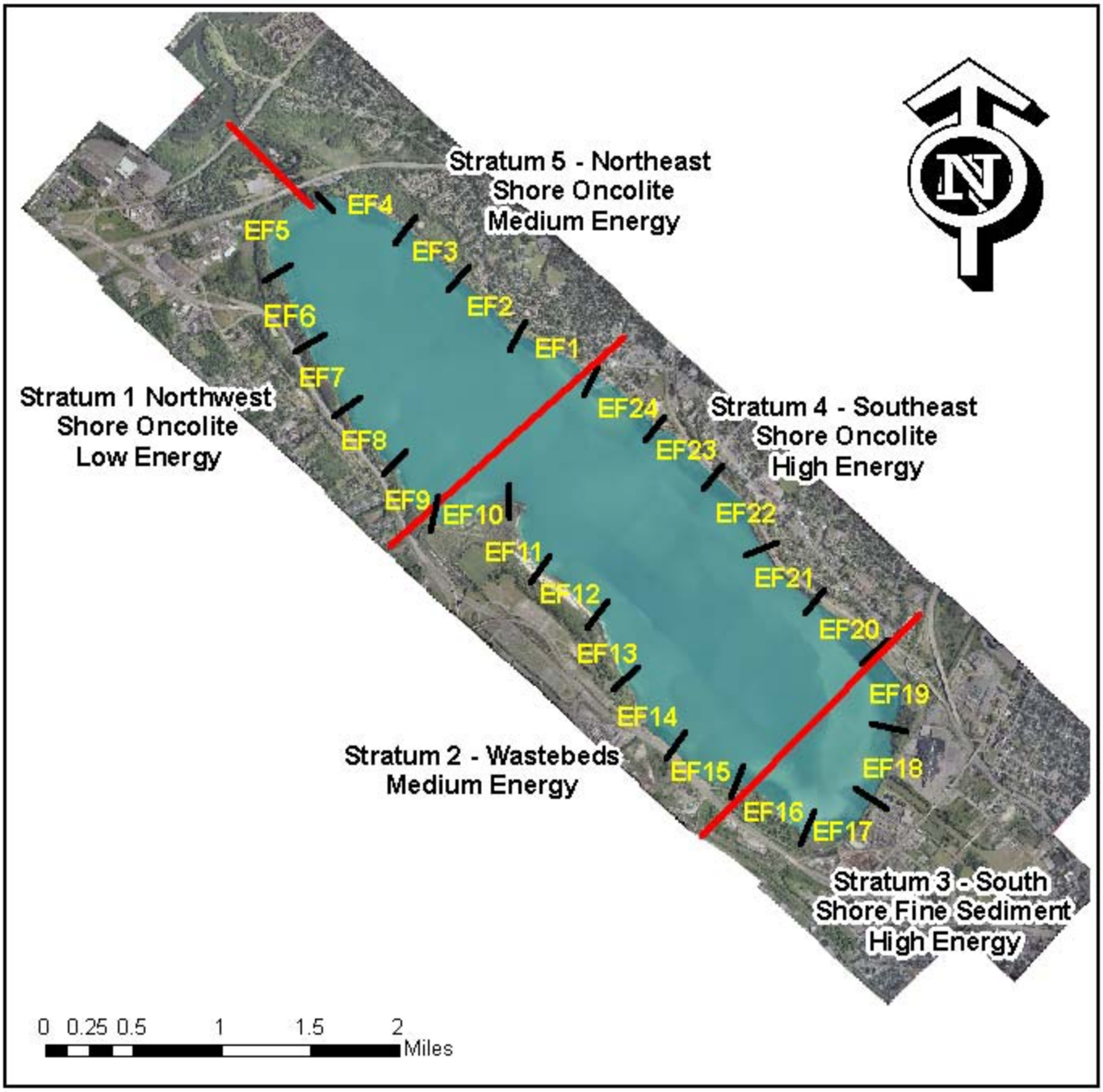
Field: ______________ Office: ______________________ Data Entry: ______________________

*** All fish with obvious DELTFM parameters must be listed on the individual fish data form.**

Revised by OCDWEP 2/2006

Species Codes and Common Names

Species Code	Common Name	Species Code	Common Name	Species Code	Common Name
0	No Catch	390	Spottail shiner	576	White bass
207	Sea lamprey	394	Spotfin Shiner	576.1	Temperate Basses
268	Longnose gar	396	Redfin shiner	591	Rock bass
271	Bowfin	397.1	Notropis sp.	595	Green sunfish
276	American eel	400	Bluntnose minnow	596	Pumpkinseed
285	Blueback Herring	401	Fathead minnow	598	Bluegill
289	Alewife	401.1	Pimephalus sp.	599.1	Lepomis sp.
290.1	Blueback and/or Alewife	403	Longnose dace	600	Smallmouth bass
294	Gizzard shad	406	Creek chub	601	Largemouth bass
297.1	Herring Family (Cluepeidae)	407	Fallfish	601.1	Black Bass (SM or LM)
326	Rainbow trout	408.1	Semotilus sp.	602	White crappie
327	Atlantic salmon	409.1	Minnow Family (Cyprinadae)	603	Black crappie
328	Brown trout	419	White sucker	603.1	Crappie (White or Black)
329	Brook trout	423	Northern hog sucker	603.2	Sunfish Family (Centrarchidae)
329.1	Tiger Trout (hybrid)	432	Shorthead redhorse	613	Johnny darter
332	Splake	433.1	Suckers (Catostomidae)	614	Tesselated darter
332.1	Trout Family (Salmonidae)	443	Yellow bullhead	616.1	Ethostoma sp.
335	Rainbow smelt	444	Brown bullhead	617	Yellow perch
340	Central mudminnow	444.1	Bullhead (species unknown)	618	Logperch
347	Northern pike	445	Channel catfish	624.1	Darter (not YPerch)
349	Chain pickerel	450.1	Freshwater Catfish	626	Walleye
350	Tiger muskellunge	461	Trout perch	628.1	Perch Family (Percidae)
350.1	Pike Family (Esocidae)	493	Burbot	700	Freshwater drum
365	Carp	531	Banded killifish	970	NS (Bullhead sunfish, etc)
377	Golden shiner	545	Brook Silverside	999	SPECIES UNKNOWN
381	Emerald shiner	561	Brook stickleback		
385	Common shiner	575	White perch		



Transect Border

Stratum Border

LOCATION OF ADULT ELECTROFISHING TRANSECTS IN ONONDAGA LAKE

APPENDIX A5:

Field Data Packet For Pelagic Adult Fish Sampling (Gill Nets)

Facility Code and Station Description

Facility Code	Site Description
2750	Stratum 1 – Northwest Shore
2756	Stratum 2 – Wastebeds
2762	Stratum 3 – South Shore
2768	Stratum 4 – Southeast Shore
2774	Stratum 5 – Northeast Shore

Onondaga County Department of Water Environment Protection
Onondaga Lake Fish Monitoring Program

PELAGIC ADULTS -- GILL NET

Haul Date: _____ **Basin:** _____ **Facility Code:** _____

Net Set	**Net Hauled**
Date: _____	**Date:** _____
Crew: _____	**Crew:** _____
Time: _____	**Time:** _____
GPS North: 43° _____ *(decimal minutes)*	**GPS** North: 43° _____ *(decimal minutes)*
Position: West: 76° _____	**Position:** West: 76° _____
Water Depth _____ *(meters)*	
Weather: _____	**Weather:** _____
OVercast PartlyCloudy HaZy CLear RAining SNowing	*OVercast PartlyCloudy HaZy CLear RAining SNowing*
Wind: _____ **from:** _____	**Wind:** _____ **from:** _____
0-5mph 5-10 10-15 >15 N,SE,SSE, etc.	*0-5mph 5-10 10-15 >15 N,SE,SSE, etc.*
For the Following Data, Circle the Appropriate Response	*For the Following Data, Circle the Appropriate Response*
Waves: *Calm / Swells / Whitecaps*	**Waves:** *Calm / Swells / Whitecaps*
Water Clarity: *Poor / Moderate / Good*	**Water Clarity:** *Poor / Moderate / Good*
Significant Rainfall in the Last 48 Hours? *Yes / No*	**Significant Rainfall in the Last 48 Hours?** *Yes / No*
Water Quality Profile Taken? *Yes / No*	**Water Quality Profile Taken?** *Yes / No*

Comments: *(Gear Condition, Unusual Weather, Predator Damage, Equipment or Sampling Problems, etc.)*

_____

_____

_____

_____

_____

Is Net Intact Upon Recovery? *Yes / No*

Total # of Hours Fished (Unit Effort): _____

Data Validity Classification: *Good / Conditional / Invalid*

# of Attached Data Sheets: BulkFish _____ Indiv. Fish _____

QAPP Signoffs (Initital and Date):

Field: _____ Office: _____ Data _____

_____ _____ Entry: _____

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _____ **of** _____

INDIVIDUAL FISH DATA SHEET

Date: _____ **Program/GearType:** _____
Facility Code: _____ **Location/Site:** _____
(Include Facility Codes for all samples on data sheet)

Facility Code	Species Code	Common Name	Stage *(A,J,Y)*	Length *(mm)*	Weight *(grams)*	Scale #	Tag #	*Is fish Dead?*	DELTFM *Codes*	Comments

QAPP Signoffs (Initital and Date):
Field: _____ Office: _____ Data Entry: _____
_____ _____

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _______ of _______

BULK CATCH DATA SHEET

(Record Individual Fish > Initial 30 Count, and Non-Boarded Estimates and/or Counts)

Date: ______________ **Program/GearType:** ____________________

Facility Code: ______________________________ **Location/Site:** ____________________

(Include Facility Codes for all samples on data sheet)

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

QAPP Signoffs (Initital and Date):

Field: ______________ Office: ____________________ Data Entry: ____________________

*** All fish with obvious DELTFM parameters must be listed on the individual fish data form.**

Revised by OCDWEP 2/2006

Species Codes and Common Names

Species Code	Common Name	Species Code	Common Name	Species Code	Common Name
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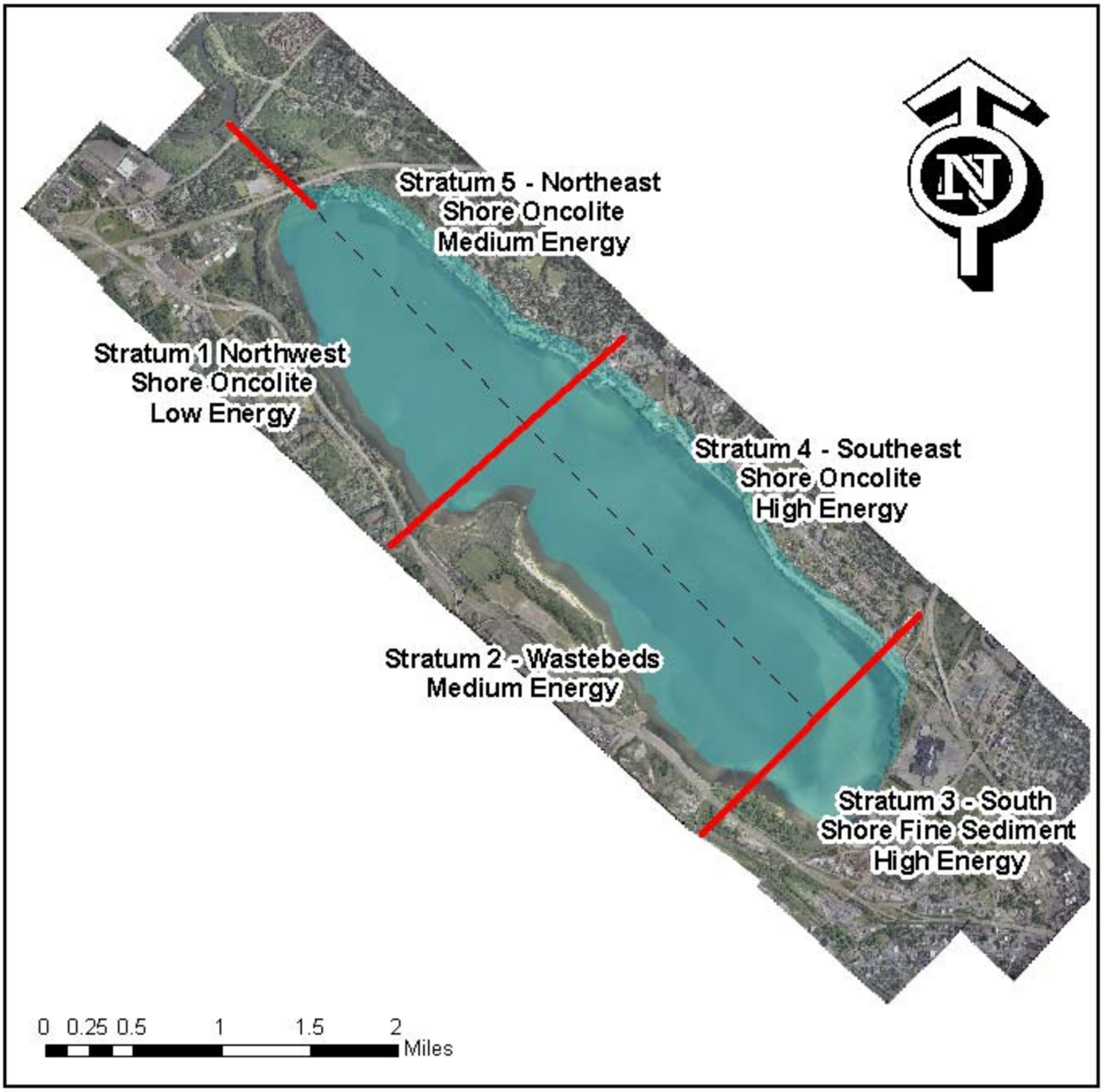
268	Longnose gar	396	Redfin shiner	591	Rock bass
271	Bowfin	397.1	Notropis sp.	595	Green sunfish
276	American eel	400	Bluntnose minnow	596	Pumpkinseed
285	Blueback Herring	401	Fathead minnow	598	Bluegill
289	Alewife	401.1	Pimephalus sp.	599.1	Lepomis sp.
290.1	Blueback and/or Alewife	403	Longnose dace	600	Smallmouth bass
294	Gizzard shad	406	Creek chub	601	Largemouth bass
297.1	Herring Family (Cluepeidae)	407	Fallfish	601.1	Black Bass (SM or LM)
326	Rainbow trout	408.1	Semotilus sp.	602	White crappie
327	Atlantic salmon	409.1	Minnow Family (Cyprinadae)	603	Black crappie
328	Brown trout	419	White sucker	603.1	Crappie (White or Black)
329	Brook trout	423	Northern hog sucker	603.2	Sunfish Family (Centrarchidae)
329.1	Tiger Trout (hybrid)	432	Shorthead redhorse	613	Johnny darter
332	Splake	433.1	Suckers (Catostomidae)	614	Tesselated darter
332.1	Trout Family (Salmonidae)	443	Yellow bullhead	616.1	Ethostoma sp.
335	Rainbow smelt	444	Brown bullhead	617	Yellow perch
340	Central mudminnow	444.1	Bullhead (species unknown)	618	Logperch
347	Northern pike	445	Channel catfish	624.1	Darter (not YPerch)
349	Chain pickerel	450.1	Freshwater Catfish	626	Walleye
350	Tiger muskellunge	461	Trout perch	628.1	Perch Family (Percidae)
350.1	Pike Family (Esocidae)	493	Burbot	700	Freshwater drum
365	Carp	531	Banded killifish	970	NS (Bullhead sunfish, etc)
377	Golden shiner	545	Brook Silverside	999	SPECIES UNKNOWN
381	Emerald shiner	561	Brook stickleback		
385	Common shiner	575	White perch		



Stratum Border

Note: One gill net is randomly placed in each of the five (5) strata at a depth of 4 to 5 Meters.

LOCATION OF LITTORAL-PROFUNDAL GILL NET SETS IN ONONDAGA LAKE

APPENDIX A6:

Game Fish List

Onondaga Lake Fisheries Assessment
Game Fish List

Largemouth bass
Walleye
White Crappie
Yellow Bullhead
Bluegill
Pumpkinseed
Yellow Perch
Smallmouth bass
Black Crappie
Brown Bullhead
Channel catfish
All esocids (pike family)
All salmonids (trout)
Rock bass

ATTACHMENT 3

QUALITY ASSURANCE PROGRAM PLAN

ONONDAGA LAKE MACROPHYTE ASSESSMENT PROGRAM
(2009)

AMBIENT MONITORING PROGRAM

Prepared for the NYSDEC

Prepared by:

Onondaga County
Department Of Water Environment Protection

February 2009 (Draft)

TABLE OF CONTENTS

1.0 INTRODUCTION/PURPOSE

As part of the Onondaga Lake Ambient Monitoring Program the Onondaga County Department of Water Environment Protection has prepared a Quality Assurance Program Plan (QAPP) for the Onondaga Lake Macrophyte Assessment Program, 2009.

The County's long-term monitoring program includes assessment of physical, chemical, and biological attributes of the aquatic resource. The baseline Onondaga Lake Macrophyte Assessment Program and on going studies are expected to address the goal of the *Ambient Monitoring Program*.

Background

The Macrophyte Assessment Program was developed in consultation with expert technical advisors in limnology. The 2009 lake macrophyte program is summarized in Table 1.

Development of the QAPP

The purpose of the QAPP is to mesh field collection procedures and data requirements into a comprehensive document that provides a template for field, laboratory, and data management methods. The QAPP is meant to supplement in-house training of OCDWEP technicians and provide a framework from which trained staff can conduct consistent field surveys. The QAPP is considered to be a living document. That is, as changes are made in the Onondaga Lake Macrophyte Assessment Program, revisions will be made to the QAPP to reflect those changes. These may include changes to the:

- intensity of the sampling program;
- incorporation of new elements to the program, or deletion of specific;
- revisions and improvements to methodologies; and
- incorporation of new methodologies into the program.

Thus the QAPP will serve multiple purposes. It will provide documentation of standardized operations and procedures (SOPs), although more formal SOPs have been developed for in-house training and documentation purposes. It will provide a framework of data forms designed to ensure collection and entry of data, and provide a framework for training of OCDWEP's staff via consistent mentoring by more senior, experienced staff through the structure of the QAPP.

The QAPP has been divided into chapters. Each chapter represents a major field component of the AMP. Each chapter provides a purpose and description of the component, the procedures for sampling that component, appropriate data sheets, maps, and descriptions of stations and station codes. Only minor clarifications were made to the QAPP, and no major program modifications were incorporated in to the 2009 monitoring season.

Table 1. Summary of year 2009 Onondaga Lake Macrophyte Assessment Program.

Component	Methodology/Gear	Sampling Objectives	Location and Number of Samples	Timing	Change
Onondaga Lake Aerial Photography	Program utilizes plane with belly mounted 9x9 camera. 60% forward overlap, 30% side overlap.	Determine annual percent of littoral zone with macrophytes.	-Three (3) flight lines full lake coverage.	-June or July when water clarity is approximately 3-meters on the secchi disk. -Early morning or early evening with low sun angle.	-No change from previous year.
Field Species Verification of Aerial Photography	Visual identification.	Determine species.	-Two (2) sites in each of the five (5) strata for a total of ten (10) sites.	-Within 1 week of the aerial photos.	-No change from previous year.
Macroalgae	At nine (9) near shore locations using a laser range finder to estimate distance from shore and visual percent cover estimate.	Document percent cover and annual proliferation of littoral zone macroalgae.	-Survey once per week at nine (9) near shore buoy locations.	-May through September.	- No change from previous year.

2.0 STAFF TRAINING

The OCDWEP has approached the AMP under the self-monitoring element that is central to the federal Clean Water Act. OCDWEP has acquired a staff with a wide range of academic education supplemented by experience gained by working for state agencies, universities, and environmental consulting and research firms. This staff of scientists and technicians are supported by maintenance and operation personnel that provide the skills to build, construct, maintain, and modify gear needed to conduct the surveys. This expertise allows the OCDWEP to successfully train and mentor qualified individuals to provide a high level of quality to the data of the macrophyte assessment program. As with any long-term monitoring program, individuals will advance in their careers, retire, or move to new locations. This matriculation will require periodic in-house training of new individuals. The QAPP is integral to this training. Its use and understanding will provide each individual with an easy to understand document to ensure day-to-day and year-to-year consistency of the Onondaga Lake Macrophyte Assessment Program.

In addition to the QAPP and SOPs, the County's Consultant, Ecologic LLC, conducts annual audits for macrophyte field verification component. The audit is intended to ensure that the field technicians conducted their work in a professional manner and comply with the procedures outlined in the QAPP and SOPs. In addition, the audits determine if any observation would jeopardize the quality of the data (technique, field logs, training, etc.).

Thus the use of the QAPP in conjunction with the formal Standard Operating Procedures (SOPs) and external audits for the biological monitoring program activities, the *Onondaga County Ambient Monitoring Program: Onondaga Lake Macrophyte Assessment Program (2009)* and subsequent programs will provide OCDWEP with a successful monitoring program.

3.0 AERIAL PHOTOGRAPHY

3.1 Procedures

Aerial photographs will be taken of Onondaga Lake on an annual basis utilizing a qualified contracted aerial photography firm. The aerial photographs must meet the following specifications:

- 1"=445' +/- scale.
- 3 flight lines (Must duplicate previous flight lines).
- 63 total exposures.
- 60% forward lap.
- 30% side lap.
- Formal titling of 63 exposure (*Onondaga Lake Macrophyte Survey – Date, Time, Scale, Flight Line and Exposure).*
- 2 sets of color contact prints.
- 1 set of black and white prints.

3.1.1 Lake Macrophyte Growth Conditions

Step 1. Visually survey the macrophyte growth in the littoral zone from a boat during other lake sampling events (optimal time is usually Early July). Timing is critical; the aerial flight needs to be scheduled when macrophytes are approaching their peak, but before the lake macroalgae peaks (Usually late June to mid July).

Note: Prior to the aerial flight, large buoys (nearly 3ft diameter) will be positioned at the field verification locations for visual identification in the photos.

Step 2. Contact flight contractor to determine flight feasibility.

Note: These indicators are not always achieved due to turbidity, wind and other environmental factors. These are guidelines to determine the best possible conditions for aerial photographs.

3.1.2 Pre-flight Planning and Coordination

Step 1. Review weekly secchi disc readings.

Step 2. Review weather report for the past week. No significant rainfall should be recorded for at least 48 hours prior to the flight.

Step 3. Review detailed weather report for the next few days. A clear day with low humidity and no haze needs to be targeted for the flight.

Step 4. Contact flight contractor as early as possible in the morning to confirm the flight. Usually this is done at 700 hours to allow the contractor travel time to shoot the photos during the period of low sun angle which is the period of 600 –1030 hours and 1630 – 2000 hours during this time of year.

3.2 Macrophyte Digitizing from Aerial Photos

Step 1. Geo referenced color Tiff images of the littoral zone are imported into an ArcView job file.

Step 2. The Tiff images are overlaid at a scale of 1:1,856 on a bathymetric map of Onondaga Lake. Digitizing should be carried out on the computer screen and areas perceived as macrophyte growth, based on color and texture, should be delineated.

Step 3. The perimeter of each macrophyte bed in the lake is outlined using the polygon feature of ArcView.

Step 4. In addition to macrophyte beds, nearshore areas that appear to have been dredged, piers, and other structures should be delineated and categorized separately from the macrophyte beds.

Step 5. ArcView will calculate the area of polygons in the file; this will be comparable to the area of the lake where macrophytes are present.

4.0 FIELD SPECIES VERIFICATION OF AERIAL PHOTOGRAPHY

4.1 Procedures

Field verification of macrophyte species present in Onondaga Lake will be conducted within one (1) week of the aerial flight. Two (2) samples will be collected from each of the five (5) strata for a total of ten (10) samples.

4.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: map and field sheets, equipment, and species key.

Step 3. Review weather reports for sampling feasibility.

4.1.2 Field:

Step 1. Proceed to the first monitoring site. The following table summarizes the site description and coordinates for each sampling location.

Site Description	Coordinates/Position
Onondaga Lake Site 1	43° 06.653' N, 76° 13.746' W
Onondaga Lake Site 2	43° 05.966' N, 76° 12.525' W
Onondaga Lake Site 3	43° 05.468' N, 76° 11.773' W
Onondaga Lake Site 4	43° 04.489' N, 76° 10.667' W
Onondaga Lake Site 5	43° 03.853' N, 76° 11.057' W
Onondaga Lake Site 6	43° 04.324' N, 76° 12.202' W
Onondaga Lake Site 7	43° 05.388' N, 76° 12.565' W
Onondaga Lake Site 8	43° 06.813' N, 76° 14.702' W
Onondaga Lake Site 9	43° 05.589' N, 76° 13.937' W
Onondaga Lake Site 10	43° 06.909' N, 76° 14.390' W

Step 2. Upon arrival at site position the boat in approximately 1 to 1.5 meters of water, Then anchor the boat to secure the position.

Step 3. Confirm and record GPS location (the actual final position) and site number, then begin filling out the macrophyte field verification sheet (Figure 2).

Step 4. With rope or pole attached, position the meter-squared frame in the water and lower to bottom If dense beds of macrophytes are present use the rake to firmly ground the frame.

Step 5. Using the metal rake remove all macrophytes from the square meter area. If there are emergent or floating leafed macrophytes in the sample area, it may be necessary to

pull them by hand in order to get them loose from the bottom. If large amounts of macroalgae are present the algae should be carefully pushed aside prior to collecting the sample, note presence of macroalgae and relative abundance on the datasheet in the comment section.

Step 6. As macrophytes are removed from the sample area place them in a tub filled with water.

Step 7. After removing all the macrophytes in the sample area, visually separate them into similar groups, placing each group into a separate 5-gallon bucket.

Step 8. Once all macrophytes are separated into groups, remove individual specimens from the 5-gallon buckets for identification. Spread the specimen out on a flat surface (top of a cooler) and identify it using a key. Record the identified species on the macrophyte field verification sheet. Continue to identify all remaining species of plants in this manner.

Step 9. Estimate percent cover of macrophytes from the area around the sample site in approximately a 5-meter radius around the boat. In addition, estimate the relative abundance for each species within the 5-meter radius.

Note: Determine and record if the species in the 5-meter radius represent the species around the boat (growth may be patchy). For example, the 1-square meter area may be primarily curly pondweed, but may have an elodea nearby within the 5-meter radius. These types of comments should be noted on the field data sheet.

Note: If a successful identification cannot be completed in the field, place the specimen in a plastic quart jar and fill with 10% buffered formalin for preservation. Use a separate generic name on the data sheet (such as Species a, b and so on) for each unidentified species, and estimate relative abundance for that species as you would for species identified in the field. The jar should be clearly marked with the following information:

- Date and time.
- Generic species name.
- Location.
- Field crew.
- Comments.

Step 10. Once all of the plants have been identified or preserved for further identification, and the field data sheet entries are complete, remove group of buoys. Then proceed to next station, and repeat Step 1 through 9.

4.1.3 End of Sample Day

Step 1. Review field notes for completeness.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs.

Step 4. Log any samples into the biological laboratory

4.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

4.1.5 Field Data Sheet Packet

Appendix B1 contains examples of the field verification data sheet and map of sampling stations.

5.0 MACROALGAE

5.1 Procedures

Annual macroalgae proliferation will be estimated on Onondaga Lake to determine the season percent cover within the littoral zone. This task will be coupled with the weekly lake near shore sampling. A total of nine (9) measurements will be collected weekly. Stakes with reflective discs will be placed on shore at the beginning of the field season. These stakes will be the bench mark to estimate the distance that the algae extends from shore.

5.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble field data sheets, laser range finder, and digital camera.

Step 3. Check batteries in laser range finder.

5.1.2 Field:

Step 1. Proceed to site number, and position boat at its start at the outer edge of the algae mat, or in approximately 1 m of water if the algae mat does not extended beyond the 1 meter depth. The following table summarizes the coordinates of transects used in the macroalgae monitoring program in Onondaga Lake.

Site #	Location	Buoy Coordinates	Shore Benchmark
Site 1	Lake Nearshore (Nine Mile Creek)	43° 05.477'N 76° 13.650'W	Point adjacent to Trib Mouth.
Site 2	Lake Nearshore (Harbor Brook)	43° 03.877'N 76° 11.043'W	43° 03.77'N 76° 11.06'W
Site 3	Lake Nearshore (Metro/Outfall)	43° 03.923'N 76° 10.805'W	43° 03.90'N 76° 10.85'W
Site 4	Lake Nearshore (Ley Creek)	43° 04.516'N 76° 10.592'W	43° 04.52'N 76° 10.61'W
Site 5	Lake Nearshore (Eastside)	43° 06.529'N 76° 13.598'W	43° 06.55'N 76° 13.58'W
Site 6	Lake Nearshore (Willow Bay)	43° 06.907'N 76° 14.167'W	43° 06.90'N 76° 14.17'W
Site 7	Lake Nearshore (Maple Bay)	43° 06.732'N 76° 14.713'W	43° 06.70'N 76° 14.83'W
Site 8	Lake Nearshore (Bloody Brook)	43° 05.720'N 76° 12.225'W	43° 05.76'N 76° 12.11'W
Site 9	Lake Nearshore (Wastebeds)	43° 04.880'N 76° 12.620'W	NA

Step 2. Using the laser range finder, aim at the shoreline stake with the reflective disc and record the distance on the field sheet. Record the approximate depth of water (in meters), and document each location with a digital picture.

Step 3. Estimate the percentage of the algae mat surface coverage along a straight visual line, approximately 2 meters wide, from the boat to the shoreline. If the algae mat is not large, or to distinguish between algae mats and emergent macrophytes, the boat may be moved towards shore to establish an accurate estimate. The laser range finder may be used to measure the inner and outer edge of any large algae mats to develop the estimate.

Step 4. The field data sheet should include a sketch of the algae mat formation from the boat to the shoreline, and include a description of the algae mats (e.g. some formation on emergent macrophytes, no mats present, primarily *Cladophora,* some blue-green algae present, etc.).

Step 5. Proceed to next station, and repeat steps 1 through 4.

5.1.3 End of Sample Day

Step 1. Review field notes for completeness.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

Step 4. Download digital pictures.

5.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

5.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet
- Map showing location of sampling stations
- Facility code/station description and coordinates

Appendix B2 contains examples of the station data sheet and map of sampling stations.

6.0 CHRONOLOGY OF QAPP

The QAPP for the Onondaga Macrophyte Assessment Program is a living document in that it will be periodically updated to reflect changes in the monitoring program that are instituted to improve the efficiency of data collection, focus on a particular aspect of the aquatic macrophytes. The periodic updating of the QAPP will provide a written record of sampling procedures over the entire life of the Onondaga Macrophyte Assessment Program. Annual revisions to the QAPP have incorporated various changes made to the macrophyte assessment program.

The original QAPP, and subsequent revisions, have been reviewed by the NYSDEC, revised by OCDWEP as requested, and approved by the NYSDEC prior to implementation.

7.0 LITERATURE CITED

OCDWEP *SOP For Macroalgae Survey (DOC No. BIO-011)*

OCDWEP *SOP For Macrophyte Field Verification of Aerial Photography (DOC No. BIO-012)*

APPENDIX B1

Field Data Packet for Macrophyte Species Verification of Aerial Photography

Onondaga County Department of WATER ENVIRONMENT PROTECTION

MACROPHYTE FIELD VERIFICATION SHEET

Date: _____

Crew: _____

Site Number: _____

Weather: _____
OVercast PartlyCloudy HaZy CLear RAining SNowing

Wind: _____ **from:** _____
0-5mph 5-10 10-15 >15 *N,S,E,W,SE,SW,NE,NW.*

Date of Aerial Photography: _____

Depth of Water (Meters): _____

Substrate Type: _____
Rock, logs, sand, silt, oncolites,solvay waste, etc.

Do the Species in the 1-meter^2 Represent the Species Found in the 5-meter Radius (Y/N)? ___

Dense Growth ☐ **Sparce Growth** ☐

COMMENTS:

GPS Coordinates: **N: 43°** _____
W: 76° _____

MACROPHYTE SPECIES IDENTIFICATION		
Common Name	**Scientific Name**	**Est. Percent Coverage (5-meter Radius)**

Samples Collected For Laboratory Identification*
* Preserve samples in 10% Buffered Formalin.

Date: _____

Crew: _____

Site Number: _____

Weather: _____
OVercast PartlyCloudy HaZy CLear RAining SNowing

Wind: _____ **from:** _____
0-5mph 5-10 10-15 >15 *N,S,E,W,SE,SW,NE,NW.*

Date of Aerial Photography: _____

Depth of Water (Meters): _____

Substrate Type: _____
Rock, logs, sand, silt, oncolites,solvay waste, etc.

Do the Species in the 1-meter^2 Represent the Species Found in the 5-meter Radius (Y/N)? ___

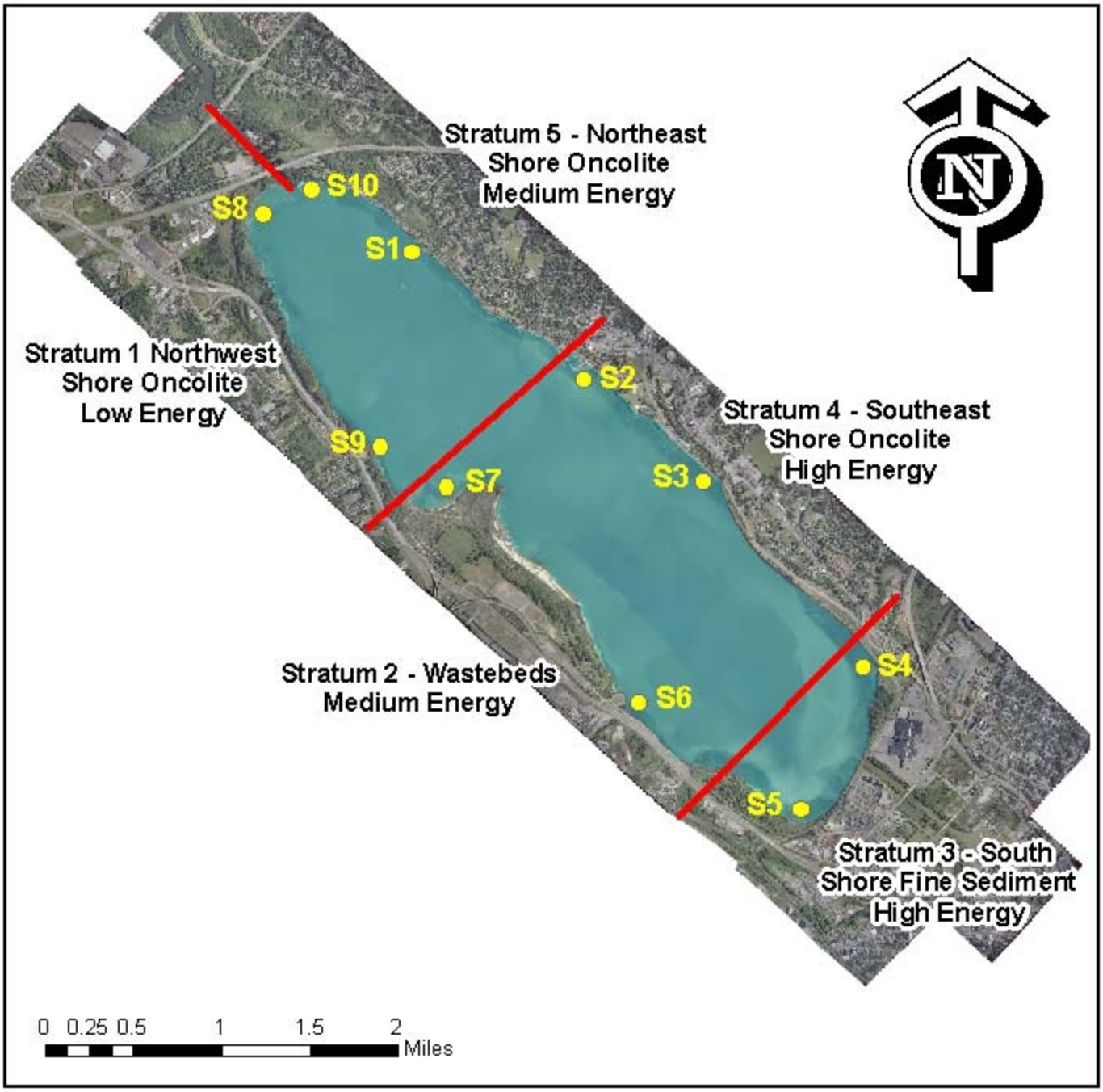
Dense Growth ☐ **Sparce Growth** ☐

COMMENTS:

GPS Coordinates: **N: 43°** _____
W: 76° _____

MACROPHYTE SPECIES IDENTIFICATION		
Common Name	**Scientific Name**	**Est. Percent Coverage (5-meter Radius)**

Samples Collected For Laboratory Identification*
* Preserve samples in 10% Buffered Formalin.



Verification Sites

Stratum Border

SITES FOR FIELD SPECIES VERIFICATION OF AERIAL PHOTOGRAPHY ON ONONDAGA LAKE

APPENDIX B2

Field Data Packet for Macroalgae

Onondaga County Department of WATER ENVIRONMENT PROTECTION

MACROALGAE FIELD SHEET

Date: _____

Crew: _____

Near Shore Location: _____

Weather: _____
OVercast PartlyCloudy HaZy CLear RAining SNowing

Wind: _____ **from:** _____
0-5mph 5-10 10-15 >15 *N,S,E,W,SE,SW,NE,NW.*

Are Shoreline Bench Marks Intact (Y/N)? ____

Check if Any Algae Samples Were Collected: ____

Depth of Water at Edge of Algal Mat (or Formation) in (Meters):

(Left side)	(Middle)	(Right Side)

Distance From Edge of Algal Mat (or Formation) To Shoreline Benchmark/Target (Meters):

(Left side)	(Middle)	(Right Side)

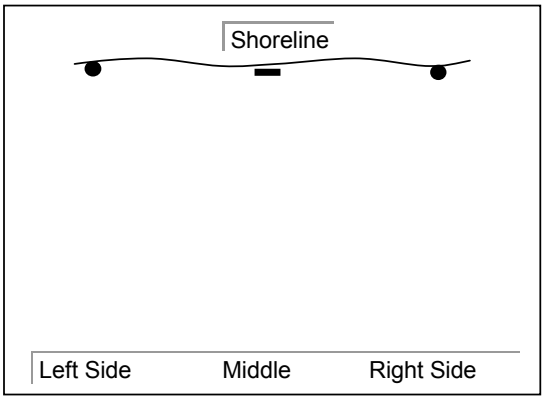
Estimated Percent Cover (Range):

(Left side)	(Middle)	(Right Side)

Percent Cover Ranges:
0%, 1-20%, 21-40%, 41-60%, 61-80%, 81-100%

COMMENTS:

Algal Mat Sketch



Date: _____

Crew: _____

Near Shore Location: _____

Weather: _____
OVercast PartlyCloudy HaZy CLear RAining SNowing

Wind: _____ **from:** _____
0-5mph 5-10 10-15 >15 *N,S,E,W,SE,SW,NE,NW.*

Are Shoreline Bench Marks Intact (Y/N)? ____

Check if Any Algae Samples Were Collected: ____

Depth of Water at Edge of Algal Mat (or Formation) in (Meters):

(Left side)	(Middle)	(Right Side)

Distance From Edge of Algal Mat (or Formation) To Shoreline Benchmark/Target (Meters):

(Left side)	(Middle)	(Right Side)

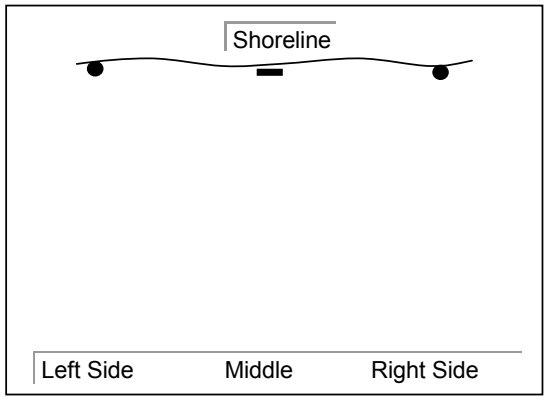
Estimated Percent Cover (Range):

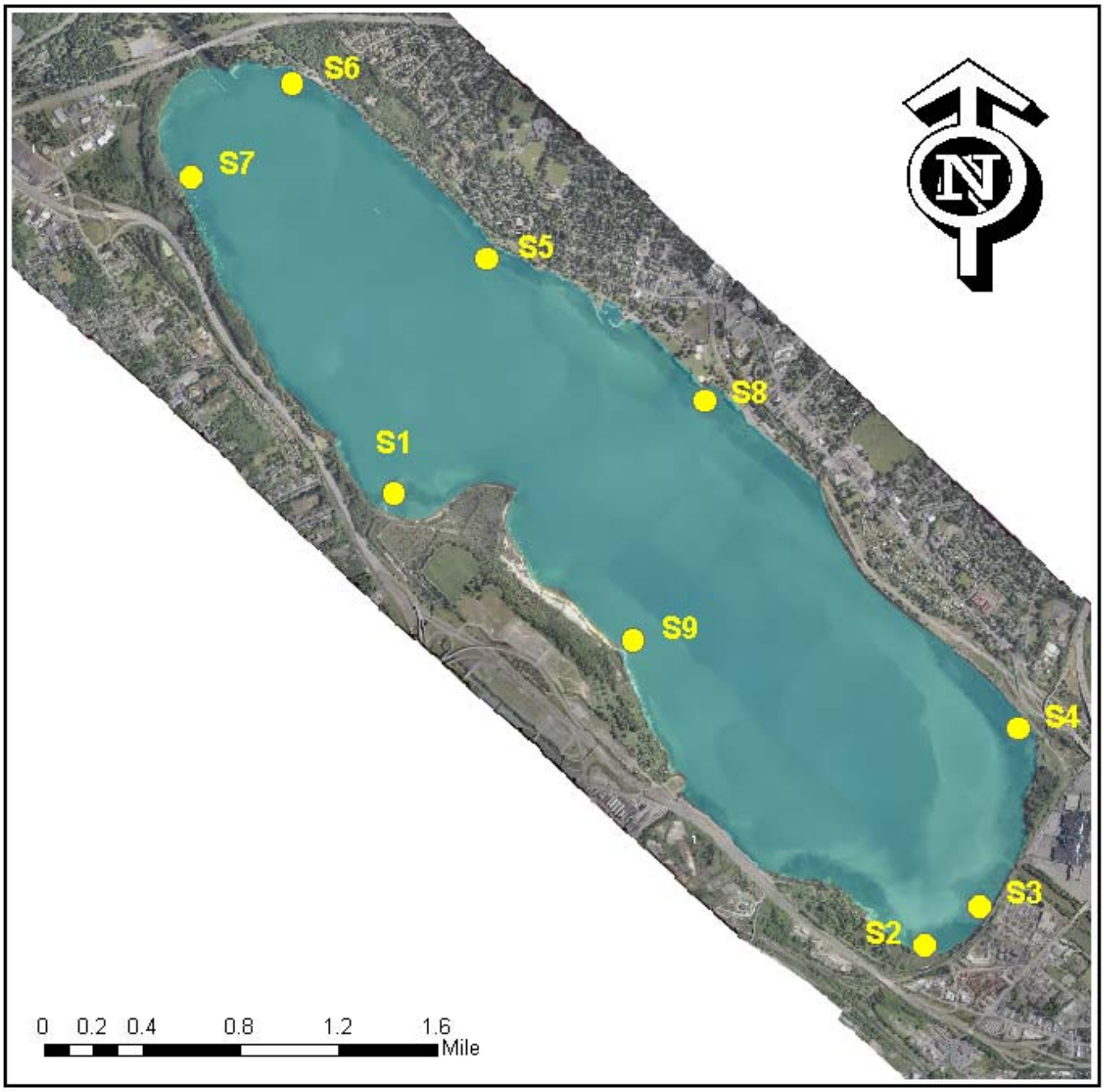
(Left side)	(Middle)	(Right Side)

Percent Cover Ranges:
0%, 1-20%, 21-40%, 41-60%, 61-80%, 81-100%

COMMENTS:

Algal Mat Sketch





Verification Sites

SITES FOR MACROALGAE MONITORING ON ONONDAGA LAKE