



The Monmouth County Department of Health
Environmental Laboratory

QUALITY ASSURANCE PROJECT PLAN

AMBIENT STREAM MONITORING

Microbial and Chemical Sampling Plan

For the Year 2008/2009

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REVISED 03/31/08

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WORK/QUALITY ASSURANCE PROJECT PLAN

MONMOUTH COUNTY AMBIENT STREAM MONITORING

MONMOUTH COUNTY HEALTH DEPARTMENT ENVIRONMENTAL HEALTH WATER POLLUTION CONTROL PROGRAM

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1. Project Name:

UPDATES for the Years 2008 and 2009, Monmouth County Ambient Surface Water Quality Monitoring Program

2. Project History:

Ambient stream monitoring has been performed since 1987 as part of the cooperative agreement between the NJDEP and Monmouth County Department of Health to provide surface water monitoring, as authorized in the County Environmental Health Act.

The purpose of this Quality Assurance Project Plan(QAPP) is to establish the performance criteria for providing ambient water monitoring data. This QAPP describes the frequency, location, type of samples, and method of collection for field and lab data. Data that is generated by this project will be submitted to the NJDEP.

3. Project Officer:

Ann Marie Fournier, Water Pollution Control Coordinator

4. Quality Assurance Officer:

4.1. Overall:

William Simmons, Environmental Health Officer

4.2. Monmouth County Health Department Environmental Laboratory:

Elizabeth B Cosgrove, Laboratory Supervisor

5. Project Description:

5.1. Objective

The objectives of the ambient surface water quality monitoring program are to (1) support NJDEP watershed initiatives; (2) track water quality trends through time; (3) establish background water quality; (4) obtain water quality data which can be correlated with specific land uses and (5) coordinate the collection of chemical and bacterial data with Monmouth County Health Department Biological Assessment Program and Cooperative Coastal Monitoring Program.

5.2. Data Usage

The data submitted for this project will be as per New Jersey Register Notice (May 21, 2001) Data Submittal Information to develop the Water Quality Limited Segments List. (Data is submitted to the NJDEP on diskette in a Microsoft Access format and maps on CD ROM to develop the Water Quality Limited Segments List). Data will be used for watershed assessments and countywide water quality characterizations.

Data is available to the public on the County’s website at www.visitmonmouth.com/health/environmental/water/Ambients/ambients.htm. Data will be submitted to the NJDEP on CD-ROM in a Microsoft Access format. Every other year, a plan will be submitted for NJDEP approval for the next two project years. In addition, an updated plan will be submitted when significant changes are made to the plan.

5.3. Monitoring Program Design

The program was designed by the NJDEP under the County Environmental Health Act (CEHA), NJSA 26:3 AZ-21 et seq. Parties entered into the agreement in 1987. The Monmouth County Health Department determines fecal coliform, enterococcus, E. coli, pH, total phosphorous, total ammonia and calculated un-ionized ammonia, non-filterable residue (TSS), turbidity, specific conductivity, temperature, salinity, Nitrate-Nitrogen, and TKN. Sites were chosen with the assistance of the NJDEP to be representative of all areas of the county.

5.4. Monitoring Parameters and Frequency of Collection

Monitoring will occur during four sampling periods annually. The 8 week periods for sampling are February-March, May-June, August-September and November-December. This schedule allows a greater number of days on which to sample so that inclement weather can be avoided and so that the samplers have more flexibility to spend a greater amount of time at each site if needed.

In 2008 a total of 80 sites will be sampled during each monitoring period(4 times), except 9 lake sites which will be sampled during 3 monitoring periods per year. Ambient sampling sites have been categorized according to their classification in 2007 Surface Water Quality Criteria, 7:9B. See Table 4.

New and existing sites were placed into 3 categories. Streams are (FW2NT, FW2TM, FW2TP) and have a different group of parameters analyzed than other groups. Lakes are a group of 9 sites with an emphasis on nutrients. Saline/Estuary tests are those most appropriate for estuaries. The 2007 re-alignment was in order to perform tests and collect samples that are necessary to determine SWQS compliance and most correctly and adequately characterize the waterway.

Parameters are those in Table 1 at the frequency indicated.

Table 1.

	STREAMS	LAKES	SALINE/EST
# SITES	40	9	31
FREQUENCY	4X/year	3X/year (no 1st Q)	4X/year

SPECIFIC CONDUCTANCE	x		
DISSOLVED OXYGEN		X	x
TEMPERATURE C	x	X	x
SALINITY	x	on 2 SE lakes	x
TURBIDITY	x	X	x
TSS (NON FILTERABLE RESIDUE)	x	X	x
PH	x	X	x
<i>E. coli</i>	x	X	
FECAL COLIFORM	x	X	x
ENTEROCOCCUS		on 2 SE lakes	x
NITRATE NITROGEN		x contract lab	
TKN		x contract lab	
TOTAL-P	x (2nd Q and 3 Q only)	X	
AMMONIA-N		x contract lab	
PHYTOPLANKTON		OPTIONAL	OPTIONAL
CHLOROPHYLL		as possible lab test	as possible lab test

Visual observations and information on current precipitation, precipitation in the last 48 hours, wind speed, wind direction, last high and low tides, and ambient temperature is also collected.

Sampling location data are gathered using Global Positioning System (GPS) instrumentation.

6. Laboratory Services Coordination:

Elizabeth B Cosgrove, Monmouth County Health Department. Laboratory Supervisor.

7. Field Sampling Procedures:

7.1. Sample Collection:

All sampling and measurement of field parameters are by trained staff of the MCHD. Training records for use of meters and recording of measurements are kept by the laboratory.

All microbiological samples are “grab samples” collected in accordance with NJDEP Field Sampling Procedures Manual (1992) Chapter 7, and are collected upstream of any obstructions. There is to be no intermediate sampling device for bacteria sampling. Samples for ammonia, total-phosphorus, non-filterable residue (TSS) are collected in discrete samples from a churn splitter (Bel-Art 4-Liter). Turbidity measurements are taken as discrete samples from the churn splitter when the water volume in the compositor is near maximum. Measurements of pH and temperature are

made in stream rather than from the sample churn. If the water flow is very fast or site not easily accessed, the sample is withdrawn from the sample churn into a field rinsed collection vessel for the pH measurement. All sites are sampled using the churn splitter method unless the exceptions are described and the alternate sampling technique is detailed in the QAPP. Field measurements have the time recorded for each discrete measurement(not just one time to cover for all tests at that site).

7.2. Sample Handling and Custody Requirements:

Samples are labeled with inspector's name, sample location, date, time, and analysis requested, and placed into coolers in the field with ice to keep the temperature near to 4 degrees C. A chain of custody form is initiated by the sampler and completed by the laboratory. Samples are transported directly to the Monmouth County Health Department Environmental Laboratory for analysis. A temperature control container is placed in each cooler and accompanies the samples. The temperature of this container is measured immediately upon return to the laboratory. Laboratory will verify that the sample was properly preserved upon sample receipt.

Ammonia-N after distillation, Nitrate-Nitrogen and TKN will be subcontracted to QC Inc in 2008. The contract laboratory is subject to change in 2009 as the contract is bid annually.

7.3. Field Measurements:

7.3.1. Salinity(parts per thousand) is measured using YSI Model 85 only on sites that are indicated to be tidally influenced.

7.3.2. Specific Conductance: EPA 120.1 Wheatstone Bridge. Use YSI Model 85 probe with 25 ft cable or 50 ft cable. Specific Conductance is measured using instruments that are calibration checked daily, before deployment, in the laboratory using Conductivity Standard in the appropriate range. Sample measurements are recorded on field sampling sheets, with time measured, and submitted to the laboratory for data entry.

7.3.3. Temperature is measured using YSI 85 digital probes that are checked quarterly against NIST traceable thermometer.(SOP0060A Dissolved Oxygen, Salinity, Temperature, and Conductance) Meters have 25 and 50 foot cables so that in some cases, the probe is lowered from a bridge or can be used with a sampling pole so that the probe is dangled into the stream. Temperature measurements that are representative of the entire waterway are difficult to collect. At some sampling locations the temperature can be stratified and it will not be possible to reach the deeper center regions of some waterbodies. The temperature measurements will represent the general area of the sampling location. Also, temperature is never measured in an intermediate sampling device. Any special instructions for measurement of

temperature at larger rivers and in lakes will be described as they are developed in the first year of sampling.

- 7.3.4. Special techniques will be used in the field measurement of turbidity. Measurement for turbidity is performed in the field using Hach Model 2100P Portable Turbidimeter. Sampling staff are trained at the MCHD laboratory in the principles of operation, procedure for verifying the calibration, checking blank and taking the measurement at the site. Quality Control performed in the field is as stated in LABSOP 0100 Procedure for using Hach Model 2100P Portable Turbidimeter. This involves checking blanks and known “Gelex standards” at frequency described in LABSOP 0100 which is 1/20 samples.

Measurements for pH are made in the field using Oakton pHTestr 3 units, which are calibrated in the Monmouth County Health Department Environmental Laboratory on the morning of use. Units are individually numbered and unit number is recorded on field data sheets. At least two calibration checks of pH buffer 7.0 are performed in the field. Duplicate samples are performed in field at rate of 2 per 20 or fewer samples.

7.4. Sample bottles

Bottles are prepared and provided by the Monmouth County Health Department’s Environmental Laboratory. Laboratory SOPs address the preparation of bottles and the quality control on these bottles. Microbiological sample containers are 100 ml plastic Corning. Each Lot is checked for sterility. Containers for contract lab parameters are ordered from the contract lab. These containers and preserved at MCHD Lab when samples are received and prompt arrangement is made for courier pick-up.

8. Field Sampling Table:

Field Sample Matrix: Water

Total number of sample stations: 79

Table 2.

Parameter	Container/volume	Preservation	Holding time
fecal coliform	125 ml P or G	Cool 4C	6 hours
E. coli	125 ml P or G	Cool 4C	6 hours
Enterococcus (cfu/100 ml)	125 ml P or G	Cool 4C	6 hours
Total Ammonia(mg NH ₃ + NH ₄ /L)	250 ml P or G	H ₂ SO ₄ to pH<2	28 days
Un-ionized Ammonia (mg NH ₃ -N/L) after distillation	250 ml P or G	H ₂ SO ₄ to pH<2	28 days
Total	250 ml P or G	H ₂ SO ₄ to pH<2	28 days

Phosphorus(mg/L)			
Residue, non-filterable (TSS), (mg/L)	1 L Plastic	Cool 4C	7 days
pH, standard units	_____	Analyze immediately	Determined in field
Turbidity, NTU	-----		Determined in field
Specific Conductance: Wheatstone Bridge umhos/cm	_____	_____	Determined in field
Nitrate-Nitrogen as N: Colorimetric, Brucine Sulfate (mg/L)	250 ml P or G	H2SO4 to pH<2	28 days
Nitrogen, Kjeldahl, Total (mg/L)	1 L Plastic	H2SO4 to pH<2	28 days
Oxygen (dissolved): Electrode (mg/L)	Determined in field	Analyze immediately	Determined in field
Temperature, C	Determined in field	Analyze immediately	Determined in field
Salinity, parts per thousand	Determined in field	Analyze immediately	Determined in field

9. Data Quality Requirements:

9.1. Field Measurement:

NJDEP Field Sampling Procedures Manual (1992)

Field duplicates will be collected at a rate of 2 per 20 or fewer samples, collected for the parameters of fecal coliform, enterococcus, E. coli, un-ionized ammonia, phosphorus, TSS, Nitrate-Nitrogen, and TKN. Field Duplicates are measured and recorded on field sheets for turbidity, specific conductance, DO and pH in the field at a rate of 2 per 20 or fewer and recorded on data forms which are submitted to the laboratory.

9.2. Laboratory Measurements:

Analysis of fecal coliform, enterococcus, E. coli, phosphorus and TSS will be provided at Monmouth County Department of Health Laboratory. NJ State Certified Lab # 13417 N.J.A.C. 7.18 – Regulations Governing the Certification of Laboratories and Environmental Measurements. July 1, 1996. The MCHD Laboratory is certified by the NJDEP Office of Quality Assurance for all parameters they analyze. All analytical and quality assurance procedures are documented in laboratory in house method and QA/QC manual.

The procedure for the calculation of un-ionized ammonia from the Total ammonia-nitrogen after distillation using pH, temperature, and salinity is attached. See Table 2, Calculation of Unionized ammonia(LABSOP 0200A) .

Ammonia-N after distillation, Nitrate-Nitrogen and TKN will be subcontracted to QC Inc in 2008. The contract laboratory is subject to change in 2009 as the contract is bid annually

10. Data Representativeness:

Streams and saline estuary site samples are collected quarterly, four times a year which will be sufficient to assess ambient water quality; lake sites are collected 3 times per year.

11. Data Comparability:

Results are comparable because the same field techniques, analytical methods, quality control and data reporting techniques are used throughout the project. Any changes to the sampling or analysis are evaluated thoroughly by project supervisors so that the comparability is not affected.

12. Data Completeness:

All samples are required to complete the project; however, occasionally sites may be affected by drought, construction, or other factors beyond our control. In these instances, the reason a sample was not collected will be documented on the field data worksheet.

13. Data Validation:

The Laboratory supervisor will review phosphorus-total and Nitrate-Nitrogen data as per MCHD Environmental Laboratory SOP # 0093, Quality Control Procedures and Data Authorization for Nutrient Analysis. SOPs for the review of bacteria data, TSS and pH are those in the in-house methods for those individual parameters. These SOPs include specific requirements for blanks, lab duplicates, spikes, and independent quality control samples. In addition, specifics are contained in the in-house documents, Requirements for quality assurance/quality control program and Requirements for Environmental Laboratory Equipment, Supplies, Materials, and Instrumentation. The formulas for calculation of results (TSS) are checked against a hand calculated method to ensure that unintended changes are not made in the spreadsheet formulas.

The laboratory supervisor checks results reported on the final report forms against the original data to make sure there are no transcription errors. After the data is reviewed the result is entered into STIS lab database software.

14. Data Reports:

Sample Tracking & Inventory System(STIS) software(ChemSW, Inc), a Windows database program, was installed on the network for the laboratory in the Summer of 2003 and was fully in use by 2004. The software fits our requirements for an automatically generated bar code label that reflects the current date and tracks progress of samples flowing through the laboratory. Laboratory data is accessed only by three persons with password security. Security and an auditing system

prevents data from being inadvertently or maliciously changed or lost. Sample numbers cannot be incorrectly transferred to paperwork. Benchsheets are read with the barcode scanner to verify sample numbers for data entry. OLE links the sample to a “word” document when needed. Files are exported in PARADOX to ACCESS where they are available for department use.

The Ambient Monitoring Report is generated by the laboratory supervisor at the completion of all analyses. Results are to local health agencies only if requested.

15. Corrective Action:

If corrective action is required during this project, the QAPP will be revised and redistributed to the NJDEP Office of Quality Assurance for approval.

16. Data Usage:

Data is evaluated against N.J.A.C. 7:9B, 2002 Surface Water Quality Standards. Exceedances of standards may result in additional investigations of the waterway by conducting “stream walks”, sanitary surveys, or additional sampling.

Data is compiled and submitted to: NJDEP, Division of Science Research and Technology, 401 East State Street, CN 409, Trenton, NJ 08625-0409. Data is submitted every 2 years. A “citable” hard-copy report accompanies the data package.

17. Project Plan Audits:

Field sampling audits have been conducted on an in-house basis, following initial field training technique training by NJDEP at the conception of the CEHA contract.

Laboratory audits are performed by NJDEP Office of Quality Assurance as part of laboratory certification program. The most recent full audit September 2006.

18. Sample Custody and Label Procedures:

A Chain of custody form is used in this project for all samples. Field sheets are used to record the field parameters and the time of each individual test measurement is recorded. The field test meter identification is recorded on the field sheet to link the measurements with calibration records.

19. Analytical method requirements:

All analytical methods and field methods referenced are available from The Monmouth County Department of Health Environmental Laboratory. The Standard Operating Procedure for Quality Control Procedures and Data Authorization for Nutrient Analyses(LABSOP 0093) is also available. Seven(7) analytical methods used for Ambient Monitoring were affected by the MUR Rule(Methods Update Rule) Federal Register: March 12, 2007 (Volume 72, Number 47)]. Withdrawn methods have been replaced with those approved for use by NJDEP OQA.

Table 3.

Analyte/ Parameter	Sample Matrix	Analytical Method Reference	Method Detection Limit	Estimated Accuracy*	Estimated Precision*	Required Action Levels or Standards
Fecal Coliform cfu/100 ml	Surface water	SM 18/19 ED 9222D	10 cfu/100 ml	NA	SD = 5.41 cfu/100 ml	400 cfu/100 ml
Enterococcus (cfu/100 ml)	Surface water	USEPA Method 1600	10 cfu/100 ml	NA	SD = 31.3 cfu/100 ml	61 cfu/100 ml for FW2. 104 cfu/100 ml for SE1 and SC
E. coli, m-tec	Surface water	Modified thermo-tolerant e coli USEPA 1603	10 cfu/100ml	NA	False pos <1% False neg 4%	E. Coli levels shall not exceed a geometric mean of 126/100 ml or a single sample maximum of 235/100 ml. for FW2
pH, (SU)	Surface water	SM 4500 H B		NA	+/- 0.16 SU	6.5 - 8.5 for FW2 and all SE
Temperature	Surface water	SM 2550 B		NA	NA	No thermal alterations which would cause temperatures to exceed 20° C (68° F) Summer seasonal average FW2-TP and FW2-TM
Salinity	Surface water	Standard Method 20th 2520B		NA	NA	NA
Un-ionized Ammonia (mg NH3-N/L)	Surface water	Use temp and pH to calc from total ammonia	0.05 mg/L	NA	NA	0.115(a) mg/L All SE 0.030(c) mg/L All SE FW2-TM and FW2-NT are calculated values.
Total Ammonia(mg NH3 + NH4/L)	Surface water	Standard Method 20 th 4500 NH3 D or E	0.05 mg/L	SD= +/- 6.34%	+/- 0.12 mg/L mean = 2.97	NA
Residue, non-filterable(TSS) (mg/L)	Surface water	SM 2540 D	2 mg/L	NA	+/- 22.6 mg/L	25.0 mg/L FW2-TP and FW2-TM. 40.0 mg/L FW2-NT.
Phosphorus-total (mg/L)	Surface water	SM 4500-P B5 & E	0.02 mg/L	SD= +/- 14.6%	+/- 0.01 mg/L mean = 0.30	0.1 mg/L
Specific Conductance: Wheatstone Bridge umhos/cm	Surface water	SM 2150 B	NA	99% REC (Multi Laboratory)	3.9 RSD (Multi Laboratory)	
Nitrate-Nitrogen as N: Colorimetric, Brucine Sulfate_(mg/L)	Surface water	<u>USEPA 352.1</u>	Applicable range 0.1 - 2 mg/L nitrate-N/L.	102% REC (Multi Laboratory)	14 RSD (Multi Laboratory)	10 mg/L

Nitrogen, Kjeldahl, Total (mg/L)	Surface water	SM 20 th 4500 NH3 C	Applicable range 0.1 to 20 mg/L TKN	102% REC (Multi Laboratory)	16 RSD (Multi Laboratory)	NA
Oxygen (dissolved): Electrode (mg/L)	Surface water	<u>Standard Method 18/19ed 4500-O G Electrode</u>	NA	TO WITHIN 0.2 mg DO/L	TO WITHIN 0.2 mg DO/L	Not less than 7.0 at any time for FW2-TP Not less than 5.0 at any time for FW2-TM not less than 4.0 at any time for FW2-NT and SE1
Turbidity (NTU)	Surface water	EPA Method 180.1 Using HACH 2100 P	0.0 mg/L	SD= +/- 0.03 on 1.26 NTU	Report the median of the last three or more sequential values that fall within ±10 percent.	Max 30 day avg 15 NTU, max 50 NTU at any time FW2, SE3. Max 30 day avg 10 NTU, max 30 NTU at any time SE1, SE2.

* Fecal Coliform and Enterococcus: Values were collected from in-house data Summer 2003.

20. Instrument, Equipment, and Supplies Testing and Maintenance Requirements:

- 20.1. Fecal coliform bacteria(cfu/100 ml): Method SM 9222 D For the differentiation of coliforms found in the feces of warm blooded animals from those of other sources. Densities determined by the Membrane Filtration technique. This method has been used extensively by the MCHD as an indicator of the presence of human or animal waste. This quantitative method with high levels of sensitivity and can both be used to evaluate all types of water including treated and untreated drinking water and recreational waters.
- 20.2. Enterococcus(cfu/100 ml): USEPA Method 1600 July 2006 version. To detect and enumerate enterococci in water using a membrane filter (MF) procedure. The 24 hour procedure provides a direct count of enterococci in the water based on the number of colonies that develop on the surface of the membrane filter. This method is applicable to both marine and fresh waters.
- 20.3. Temperature (Celcius): USEPA Method 170.1 Thermometric. Use YSI Model 85 probe with 25 ft cable or 50 ft cable. Temperature is measured using instruments that are calibrated quarterly against a precision thermometer that is NIST traceable. Sample measurements are recorded on field sampling sheets and submitted to the laboratory for data entry.
- 20.4. Salinity: Standard Method 18/19ed 2520B. Electrical conductivity method Use YSI Model 85 probe with 25 ft cable or 50 ft cable. Salinity is measured using instruments that are calibrated daily in the laboratory, before deployment, using Conductivity Standard. Sample measurements are recorded on field sampling sheets and submitted to the laboratory for data entry.

- 20.5. pH(standard pH units): Method electrometric SM 4500 H B. pH is measured using instruments that are calibrated in the laboratory on the day of use with buffers 4 and 7 and 10. A QC check standard is employed in the field to measure the performance of the meter. Sample measurements and QC checks are recorded on field sampling sheets and submitted to the laboratory for data entry.
- 20.6. Ammonia(mg/L): Standard Method 20th 4500 NH3 D or E Ammonia samples are collected and kept near to 4C until accepted at the laboratory. The samples are preserved with sulfuric acid to pH <2 immediately upon arrival at the laboratory. Ammonia is determined potentiometrically using an ion selective ammonia electrode and meter having an expanded millivolt scale.
- Un-ionized Ammonia: In aqueous solution, unionized ammonia exists in equilibrium with ammonium ion and hydroxide ion. The equilibrium constant for this reaction is a function of temperature and pH. Using the equilibrium constant for a particular temperature and the pH of a solution, the fraction of un-ionized ammonia can be calculated. In addition, the calculated value for the Surface Water Quality Standard(SWQS) will be produced by the laboratory and reported with the results after all data has been reviewed. The SWQS will be calculated differently depending on stream classification, pH, and temperature and season(fish spawning). The criteria for SE classification requires no calculation.
- 20.7. Phosphorus(total): Persulfate digestion + manual SM 4500-P B5 & E Phosphorus(total) samples are collected and kept at 4C until accepted at the laboratory. The samples are preserved with sulfuric acid pH<2 immediately upon arrival at the laboratory. All phosphorus present in the sample, regardless of form, is measured by the direct colorimetric analysis procedure.
- 20.8. Residue-nonfilterable(TSS): Gravimetric, 103-105 Degrees C SM 2540 D A well mixed sample is filtered through a glass fiber filter, and the residue retained on the filter is dried to a constant weight at 103-105 C. Weights are recorded and transferred to spreadsheets with cells formatted for calculation of TSS mg/kg.
- 20.9. Turbidity: USEPA Method 180.1 Nephelometric HACH Model 2100P meter is calibrated once per sampling event(day) as recommended in the instrument manual for this meter. Diluting samples that are >40NTU is performed as necessary as per instructions in LABSOP 0100 Procedure for using Hach Model 2100P Portable Turbidimeter. 3 to 5 turbidity measurements are recorded on Field Data Reporting Sheet. Measurements are made from the first draws of the churn splitter. The median value of the 3 sequential values that fall within 10% of each other is final value. The Blank is measured and recorded after each sample.
- 20.10. Specific Conductance: SM 2150 B Wheatstone Bridge. Use YSI Model 85 probe with 25 ft cable or 50 ft cable. Specific Conductance is measured using

instruments that are calibration checked daily, before deployment, in the laboratory using 0.01M Conductivity Standard. Sample measurements are recorded on field sampling sheets and submitted to the laboratory for data entry.

- 20.11. Nitrate-Nitrogen as N: Colorimetric, Brucine Sulfate USEPA 352.1
 Nitrate-Nitrogen as N samples are collected and kept at 4C until accepted at the laboratory. The samples are preserved with sulfuric acid pH<2 immediately upon arrival at the laboratory. This method is based on the reaction of Nitrate ion with brucine sulfate in a 13 N H2SO4 solution at a temperature of 100C. The color of the resulting complex is measured at 410 nm. Temperature control of the reaction is extremely critical.
- 20.12. Nitrogen, Kjeldahl, Total: SM 20th 4500 NH3 C One liter TKN samples are collected and kept at 4C until accepted at the laboratory. The samples are preserved with sulfuric acid pH<2 immediately upon arrival at the laboratory. Samples will be determined by contract lab.
- 20.13. Oxygen (dissolved): Standard Method 18/19ed 4500-O G Electrode Use YSI Model 85 probe with 25 ft cable or 50 ft cable. The dissolved oxygen probe is calibrated against the Winkler Titration weekly, before deployment, during its use. A saturated air check is performed daily in the field and recorded on field sheet.

Table 4. Ambient Monitoring Program Sampling Sites Update March 2008

BOTTLE	SITE	STREET	TOWN	WATERSHED	AREA	TYPE	classifications
1	DEAL LAKE	OCEAN AVE	ASBURY	DEAL LAKE	12	L	FW2-NT/SE1
2	CROSSWICKS CREEK	WALNFORD RD	UPPER FREEHOLD	CROSSWICKS	20	S	FW2-NT
3	DOCTORS CREEK	ROUTE 539	UPPER FREEHOLD	CROSSWICKS	20	S	FW2-NT
4	ASSUNPINK CREEK	ROUTE 539	UPPER FREEHOLD	ASSUNPINK	11	S	FW2-NT
5	MILLSTONE RIVER	ROUTE 33	MILLSTONE	MILLSTONE	10	S	FW2-NT
6	NORTH BRANCH METEDECONK	JACKSON MILLS RD	FREEHOLD	METEDECONK	13	S	FW2-NT
7	TOMS RIVER	ROUTE 537	MILLSTONE	TOMS RIVER	13	S	FW2-NT
8	MATAWAN CREEK	AMBOY AVE	ABERDEEN	MATAWAN CREEK	12	S S/E	FW2-NT/SE1
9	WEEMACONK CREEK	MAIN ST	MANALAPAN	MATCHAPONIX BRK	9	S	FW2-NT
10	HOLLOW BROOK	ROUTE 35	NEPTUNE TWNSHP	DEAL LAKE	12	S	FW2-NT
11	MUSQUASH BROOK	BRIGHTON AVE	NEPTUNE TWNSHP	SHARK RIVER	12	S	FW2-NT
12	MARINA	CLINTON PL	NEPTUNE TWNSHP	SHARK RIVER	12	S/E	FW2-NT/SE1
13	BRY'S MARINA	SOUTH CONCOURSE	NEPTUNE TWNSHP	SHARK RIVER	12	S/E	FW2-NT/SE1
14	WRECK POND BROOK	ALLENWOOD RD	WALL	WRECK POND	12	S	FW2-NT
15	YELLOW BROOK	ELTON-ADELPHIA RD	HOWELL	MANASQUAN RIVER	12	S	FW2-TM
16	SQUANKUM BROOK	EASY ST	HOWELL	MANASQUAN RIVER	12	S	FW2-NT
17	MUDDY FORD BROOK	LAKEWOOD-ALLENWOOD RD	HOWELL	METEDECONCK R	13	S	FW2-TM
18	HAYSTACK BROOK	MAXIM-SOUTHARD RD	HOWELL	METEDECONCK R	13	S	FW2-NT
19	TITMOUSE CREEK	FRIENDSHIP RD	HOWELL	METEDECONCK R	13	S	FW2-TM

20	GRAVELLY BROOK	LLOYD RD	MARLBORO	MATAWAN CREEK	12	S	FW2-NT/SE1
21	BIG BROOK	MAYWOOD DRIVE	MARLBORO	SWIMMING RIVER	12	S	FW2-NT
22	McGOLLIARD BROOK	MAIN ST	ENGLISHTOWN	MATCHAPONIX BRK	9	S	FW2-NT
23	MINGOMOHONE BROOK	BELMAR BLVD	FARMINGDALE	MANASQUAN RIVER	12	S	FW2-TM
24	MARSH BOG BROOK	PREVENTORIUM RD	HOWELL	MANASQUAN RIVER	12	S	FW2-NT
25	LONG BROOK	HOWELL RD	HOWELL	MANASQUAN RIVER	12	S	FW2-NT
30	SHARK RIVER BROOK	SHARK RIVER STATION RD	TINTON FALLS	SHARK RIVER	12	S	FW2-NT
31	WHALE POND BROOK	ROUTE 35	EATONTOWN	LAKE TAKANASSEE	12	S	FW2-NT
32	LAFETRA'S BROOK	HOPE RD	TINTON FALLS	SHREWSBURY R	12	S	FW2-NT
33	HUSKY BROOK	SOUTH ST	EATONTOWN	SHREWSBURY R	12	S	FW2-NT
34	PINE BROOK	HOCKHOCKSON RD	TINTON FALLS	SWIMMING RIVER	12	S	FW2-TM
35	WAACKCAACK CREEK	HIGHLAND AVE	KEANSBURG	WAACKAACK CREEK	12	S/E	FW2-NT/SE1
36	CHINGORORA CREEK	BROADWAY	UNION BEACH	CHINGARORA CRK	12	S/E	FW2-NT/SE1
37	NAVESINK RIVER	MARINE PARK	RED BANK	NAVESINK RIVER	12	S/E	FW2-NTC1/SE1
38	NAVESINK RIVER	LAFAYETTE ST	RUMSON	NAVESINK RIVER	12	S/E	FW2-NTC1/SE1
39	SHREWSBURY RIVER	ROUTE 520 (BRIDGE)	SEA BRIGHT	SHREWSBURY R	12	S/E	FW2-NTC1/SE1
40	PARKER CREEK	ALWIN TERRACE	LITTLE SILVER	SHREWSBURY R	12	S/E	FW2-NT/SE1
41	NAVESINK RIVER	CHAPIN AVE	RED BANK	NAVESINK RIVER	12	S/E	FW2-NT/SE1
42	NAVESINK RIVER	FAIR HAVEN RD	FAIR HAVEN	NAVESINK RIVER	12	S/E	FW2-NTC1/SE1
43	NAVESINK RIVER	BINGHAM AVE	RUMSON	NAVESINK RIVER	12	S/E	FW2-NTC1/SE1
44	SHREWSBURY RIVER	AVENUE OF TWO RIVERS	RUMSON	SHREWSBURY R		S/E	FW2-NTC1/SE1
45	BRANCHPORT CREEK	BERDAN PL	LONG BRANCH	SHREWSBURY R	12	S/E	FW2-NT/SE1
46	LANE'S CREEK	EDWARDS AVE	LONG BRANCH	SHREWSBURY R	12	S/E	FW2-NT/SE1
47	TROUTMAN'S CREEK	ATLANTIC AVE	LONG BRANCH	SHREWSBURY R	12	S/E	FW2-NT/SE1
48	MANNAHASSET CREEK	MANNAHASSET AVE	LONG BRANCH	SHREWSBURY R	12	S/E	FW2-NT/SE1
50	LAKE TAKANASSEE	OCEAN AVE	ELBERON	SHREWSBURY R	12	S/E L	FW2-NT/SE1
51	LUPATTATONG CREEK	1ST ST - PETERSON'S MARINA	KEYPORT	LUPPATATONG CRE	12	S/E	FW2-NT/SE1
52	WILLOW BROOK	WILLOW BROOK RD	HOLMDEL	SWIMMING RIVER	12	S	FW2-NT
53	RAMANESSIN BROOK	WILLOW RD	HOLMDEL	SWIMMING RIVER	12	S	FW2-TM
54	BORDENS BROOK	ROUTE 520	HOLMDEL	SWIMMING RIVER	12	S	FW2-NT
55	TROUT BROOK	RICHDALE RD	COLTS NECK	SWIMMING RIVER	12	S	FW2-NTC1
56	BARREN NECK BROOK	LONG BRIDGE RD	COLTS NECK	SWIMMING RIVER	12	S	FW2-NT
57	BIG BROOK	LAURELWOOD DR	COLTS NECK	SWIMMING RIVER	12	S	FW2-NT
58	MINE BROOK	MERCER RD	COLTS NECK	SWIMMING RIVER	12	S	FW2-NT
59	POPLAR BROOK	OCEAN AVE	DEAL	POPLAR BROOK	12	S	FW2-NT
60	SHARK RIVER	MYRON AND WILSON AVE	NEPTUNE CITY	SHARK RIVER	12	S/E	FW2-NT/SE1
61	LAKE TOPANEMUS	POND RD	FREEHOLD	MCGELLIARDS BRK	9	L	FW2-NT
62	TROUTMAN'S CREEK	JOLINE AVE	LONG BRANCH	SHREWSBURY R	12	S/E	FW2-NT/SE1
65	LAKE MATAWAN	MAIN ST	MATAWAN	MATAWAN CREEK	12	L	FW2-NT
66	LAKE LEFFERTS	RT 34 - BUTTONWOOD MANOR	MATAWAN	MATAWAN CREEK	12	L	FW2-NT
67	ECHO LAKE	MAXIM-SOUTHARD RD	HOWELL	HAYSTACK BROOK	13	L	FW2-NT
68	WEMROCK BROOK	RT #9 (BEFORE PIPES)	FREEHOLD	WEAMACONK BROOK	9	S	FW2-NT
69	WEMROCK BROOK	RT #9 (AFTER 1ST PIPE)	FREEHOLD	WEAMACONK BROOK	9	S	FW2-NT
70	SHARK RIVER	GULLEY RD	NEPTUNE TWP	SHARK RIVER	12	S	FW2-TM
71	JUMPING BROOK	RT 33 @ DAYS INN	NEPTUNE TWP	SHARK RIVER	12	S	FW2-NT

72	YELLOW BROOK	CREAMERY ROAD	COLTS NECK	SWIMMING RIVER	12	S	FW2-NT
73	MANASQUAN RIVER	CASINO ROAD	HOWELL	MANASQUAN	12	S	FW2-NT
74	SWIMMING RIVER	END OF PARKWAY PLACE	MIDDLETOWN	SWIMMING RIVER	12	S/E	FW2-NT/SE1
75	HOCKHOCKSON BROOK	RIVERDALE AVE	MIDDLETOWN	SWIMMING RIVER	12	S	FW2-NT
76	EAST SIDE LAKE ALBERTA	TAYLOR AVE	NEPTUNE TWP	SHARK RIVER	12	L	FW2-NT
77	WEST SIDE LAKE ALBERTA	NEPTUNE BLVD	NEPTUNE TWP	SHARK RIVER	12	L	FW2-NT
78	MANASQUAN RIVER	ALLENWOOD-LAKEWOOD RD @ BRIDGE (1-1)	WALL	MANASQUAN RIVER	12	S	FW2-TM
79	MANASQUAN RIVER	2385 RIVERSIDE TERRACE (2-6)	WALL	MANASQUAN RIVER	12	S/E	FW2-NT/SE1
80	MANASQUAN RIVER	1612 BASS ROAD (2-3) END OF OLD BRIDGE RD@2 MCCARTHY	WALL	MANASQUAN RIVER	12	S/E	FW2-NT/SE1
81	MANASQUAN RIVER	MARINA (2-1) DOCK BEHIND 400	BRIELLE	MANASQUAN RIVER	12	S/E	FW2-NT/SE1
82	MANASQUAN RIVER	OSPREY POINT DR (3-5) HIGGINS AVE @ BOGANS BASIN (3-1)	BRIELLE	MANASQUAN RIVER	12	S/E	FW2-NT/SE1
83	MANASQUAN RIVER	BRIELLE AVE (4-8)	BRIELLE	MANASQUAN RIVER	12	S/E	FW2-NT/SE1
84	DEBBIE'S CREEK	BRIELLE RD@	BRIELLE	MANASQUAN RIVER	12	S/E	FW2-NT/SE1
85	GLIMMER GLASS HARBOUR	DRAWBRIDGE (4-7)	MANASQUAN	MANASQUAN RIVER	12	S/E	FW2-NT/SE1
86	GLIMMER GLASS HARBOUR	PERRIN RD (4-6)	MANASQUAN	MANASQUAN RIVER	12	S/E	FW2-NT/SE1
87	STOCKTON LAKE		MANASQUAN	MANASQUAN RIVER	12	S/E L	FW2-NT/SE1