Laboratory Method Evaluation Report – GBRA, August 2013

Introduction

The following report outlines information collected under Task 4.1 of Objective 4: *Laboratory Method Evaluation* of Agreement 582-12-20495, *CWA Section 106 Nutrient Monitoring*. The objective of Task 4.1 was to test various methods of nitrogen analysis, particularly nitrate-nitrogen and nitrite-nitrogen, to determine the applicability of the methods in different matrices of water, especially salt water. These methods were examined for their practicability and feasibility in the laboratory using criteria such as: detectable range of concentrations, analyst time, analysis time, equipment and supply costs, and any other important method requirements. Methods selected were tested using standards and samples in salt matrices. Calibration and quality control standards were made using a 14 part per thousand (ppt) Sodium Chloride (NaCl) salt matrix unless otherwise noted. The percentage of the salt matrix was chosen by measuring the salinities of multiple samples from the San Antonio and Guadalupe Bays and choosing a salinity percentage that fell in the median of that range.

Methods

Table 1 lists the analytes and their cited methods, concentration ranges and the associated equipment evaluated in the study. An attempt was made to acquire and test a Lachat instrument (auto analyzer) but supplies and training could not be arranged with the vendor in time to gain enough experience on the instrument to test the nitrogen modules. Only the module for chloride analysis was able to be tested on the Lachat which was not a part of this study. Also, a method for Total Nitrogen is available on the Lachat but according to the company it is an advanced method that the lab was not prepared to run. From what was able to be tested, the Lachat was a quick and responsive instrument which allows for the analysis of a large volume of samples in a relatively small amount of time. The chloride module evaluated allowed for 120 analyses per hour. The throughput varies between modules but the Lachat would still produce results on other modules quicker than manual methods. The lab will continue to analyze samples on different Lachat modules to see if it consistently produces quality results for a number of different analytes.

Table 1. Analytes and methods.

Analyte	Cited Method	Method Used	Concentration Range	Equipment Used
Nitrate-nitrogen	SM 21st Ed. 4500-NO3 D	Ion Selective Electrode	0.1-14000 mg/L NO3-N	HACH probe ISENO3181 HACH HQ40D multi meter
Ammonium	SM 21st Ed. 4500-NH3 D	Ion Selective Electrode	0.018-9000 mg/L NH4	HACH probe ISENH4181 HACH HQ40D multi meter
Nitrite-nitrogen	EPA 353.2	Test-In-Tube	0.015-0.60 mg/L NO2-N	HACH Test-In-Tube 839 HACH Spectrophotometer DR3900

Analyte	Cited Method	Method Used	Concentration Range	Equipment Used
Nitrate-nitrogen	Approved in 40 CFR 141	Test-In-Tube	0.23-13.5 mg/L NO3-N	HACH Test-In-Tube 835 HACH Spectrophotometer DR3900
Ammonia-nitrogen	EPA 350.1 EPA 351.1 EPA 351.2	Test-In-Tube	Ultra Low Range: 0.015-2.0mg/L NH3-N Low Range: 1.0-12.0mg/L NH3-N High Range: 2.0-47.0 mg/L NH3-N	HACH Test-In-Tube 830 HACH Test-In-Tube 831 HACH Test-In-Tube 832 HACH Spectrophotometer DR3900
Total Nitrogen	HACH 10208	Test-In-Tube	1.0-16.0 mg/L N	HACH Test-In-Tube 826 Hach Spectrophotometer DR3900 Environmental Express Hot Block
Conductivity	SM 21st Ed. 2510 B	Conductivity Probe	0.05-20.0 mg/L	HACH CDC401 HACH HQ40D multi meter

Procedures

Samples were collected at different sites in the San Antonio and Guadalupe Bays of the Guadalupe River Basin and tested for various analytes of nitrogen. The processes for testing the different analytes are as follows:

Nitrate-nitrogen ISE probe - The ISENO3181 Nitrate-Nitrogen probe was used on the HACH HQ 440D multi-meter. The probe was calibrated with standards in the range of 0.5 to 10.0 milligrams per liter (mg/L). Twenty-five milliliters (mL) of each standard was dispensed into a beaker with a stir bar and placed on a stir plate. The ISE probe was submersed in the first calibration standard, the contents of 1 Nitrate-Nitrogen Ionic Strength Adjustment (ISA) pillow was added. The standard was read in calibration mode. This step was repeated with each calibration standard. Once all points had been read, the calibration curve was calculated and stored in the meter. Samples and Quality Control (QC) standards were read by pouring 25 mL of sample and/or QC into a beaker with a stir bar, placing the beaker on a stir plate, submersing the probe into the sample, adding 1 ISA pillow, and then reading the samples/standards with the meter.

Ammonium ISE probe - The ISENH4181 ammonium probe was used on the HACH HQ 440D multi-meter. The calibration standards ranged from 1.0 to 45.0 mg/L. Twenty-five mL of each standard to be used was dispensed into a beaker with a stir bar and placed on a stir plate. The ISE probe was submersed in the first calibration standard, and the contents of 1 Ammonium Ionic Strength Adjustment (ISA) pillow were added. The standards were read in calibration mode. This step was repeated with each calibration standard. Once all points had been read, the calibration curve was calculated and stored in the meter. Samples and QC standards were read by pouring 25 mL of sample and/or QC into a beaker with a

stir bar, placing the beaker on a stir plate, submersing the probe into the sample, adding 1 ISA pillow, and reading the samples and/or standards with the meter.

Nitrite-Nitrogen Test-In-Tube - Follow HACH method 10207 for Test-In-Tube 839. Calibration standards ranged from 0.02 to 0.6 mg/L based on the range of the Test-In-Tube vials. Two mL of sample, calibration standard, QC standard and/or blank were pipetted into test vials. The foil from the DosiCap Zip was removed, the cap flipped over and screwed tightly onto the vial for each sample. The capped vials were shaken several times to make sure the reagent in the cap was dissolved into the test vial. After 10 minutes the tubes were read on the HACH DR3900 spectrophotometer, using the single wavelength option set at 515 nm. Each vial was wiped prior to reading to remove any oils or smudges. The spectrophotometer was zeroed using the prepared blank. The absorbance of each vial was measured and the concentration was calculated based on the calibration curve.

Nitrate-Nitrogen Test-In-Tube - Follow HACH method 10206 for Test-In-Tube 835. Calibration standards ranged from 0.2 to 10.0 mg/L based on the range of the Test-In-Tube vials. One mL of sample, calibration standard, QC standard, and/or blank was pipetted into test vials. A volume of 0.2 mL of Solution A was pipetted into each test vial. The tubes were inverted several times until mixed thoroughly.   After 15 minutes the absorbance of each tube was measured on the HACH DR3900 spectrophotometer, using the single wavelength option set at 345 nm. Each vial was wiped to remove any oils or smudges prior to reading in the instrument. The spectrophotometer was zeroed using the prepared blank. The absorbance of each vial was measured and the concentration was calculated based on the calibration curve.

Ammonia-Nitrogen Test-In-Tube – Follow HACH method 10205 for Test-In-Tube 830, 831, or 832. Calibration standards used were based on the range of the Test-In-Tube vials. The Ammonia-Nitrogen Test-In-Tube method was available in three concentrations ranges. Calibration standards ranged from 0.02 to 45.0 mg/L. The sample, calibration standard (5.0mL(ULR), 0.5mL(LR), or 0.2mL(HR)), QC standard and/or blank was pipetted into each test vial. The foil from the DosiCap Zip was removed, the cap flipped over and screwed tightly onto the vial for each sample.   The capped vials were shaken several times to make sure the reagent in the cap was dissolved into the test vial.   After 15 minutes the absorbance of each vial was read on the HACH DR3900 spectrophotometer, selecting the single wavelength option set at 690 nm. Each vial was wiped to remove any oils or smudges. The spectrophotometer was zeroed using the prepared blank vial. The absorbance of each vial was measured and the concentration was calculated based on the calibration curve.

Total Nitrogen Test-In-Tube – Follow HACH method 10208 for Test-In-Tube 826 to analyze samples. Calibration standards used were based on the range of the Test-In-Tube vials. Calibration standards ranged from 1.0 to 16.0 mg/L. A digestion block was used to digest samples at 100˚C. A volume of 1.3 mL of sample, calibration standard, QC standard and/or blank, 1.3 mL of Solution A and one Reagent B tablet were dispensed into dry reaction tubes. The reaction tubes were sealed immediately and were not inverted. The tubes were inserted into the digestion block and digested for one hour. The reaction tubes were removed from the digestion block and allowed to cool to room temperature. One Micro-cap C was added to each reaction tube. The reaction tubes were inverted several times until the reagent was thoroughly dissolved.   A volume of 0.5 mL of the sample from the reaction tube was pipetted into a test vial. A volume of 0.2 mL of Solution D was added into each test vial. The test vials were inverted several times to mix. After 15 minutes the absorbance of each test vial was measured on the HACH DR3900 spectrophotometer, set on the single wavelength option at 345 nm. Each vial was wiped to remove any oils or smudges. The spectrophotometer was zeroed using the prepared blank vial. The absorbance of each vial was measured and the concentration was calculated based on the calibration curve.

Conductivity/Salinity – The CDC401 conductivity probe was attached to the HACH HQ 440D multi-meter. The probe was calibrated using a 50,000 micro-siemen per centimeter (µS/cm) standard. A 1000 µS/cm standard was read to check the accuracy of the probe at a lower conductivity point. Samples were then read by pouring approximately 100 mL of sample into a beaker with a stir bar, placing the beaker on a stir plate and submersing the probe into the sample. The samples were read under the salinity option in the meter's list of methods. The meter can read both the salinity and conductivity of the samples and standards. Both the salinity and conductivity of samples were recorded during this study.

Samples high in turbidity or color can cause positive interferences using the Test-In-Tube method. Steps should be taken to compensate for these interferences. Follow the directions for analyzing sample blanks given in each HACH method for the individual Test-In-Tube procedures. The GBRA lab filtered samples that had high turbidity or suspended solids to remove the interferences caused by suspended material. Samples were filtered, first through a glass fiber filter then through a membrane filter, to remove turbidity and/or solids. The filtrate was analyzed for the dissolved nitrogen constituents. When using filtered samples in test runs, the samples were identified with the letter A or B indicating A) filtered using a glass filter 47 mm disk with 1.5 µm particle retention and B) if followed by filtration through a membrane filter 47 mm disk with 0.7 µm particle retention. Interferences are listed in the HACH method for each analyte.

The GBRA lab analyzed quality control samples along with the field samples. The lab purchased two known quality control samples prepared in a 14 part per thousand brine solution (NaCl) from Absolute Standards, Inc. These known QC samples were custom made by Absolute Standards, Inc. to the specifications given by the lab. Absolute Standards, Inc. was given the salinity used in the lab to make up QC and calibration standards along with the ranges of each of the Test-In-Tube vials to be used. The known QC was blind tested by the lab with actual values of the known QC being given to the lab after each analyte had been tested. Table 2 lists the values of lab quality control measurement specifications and known QC concentrations tested for each analyte.

Table 2. Concentration Ranges for Quality Control Samples.

	Nitrite-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	HR Ammonia-Nitrogen (mg/L)	LR Ammonia-Nitrogen (mg/L)	ULR Ammonia-Nitrogen (mg/L)	Total Nitrogen (mg/L)
Limit of Quantification	0.02	0.20, 0.30, 0.50	2.0	1.0	0.02, 0.1	1.0
Laboratory Control Standard	0.10	1.0	15.0	5.0	0.50, 1.0	5.0
Quality Control Known	1)0.135-0.285 2)0.039-0.072	1)3.98-7.38 2)0.994-1.85	n/a	4.05-7.53	1) 4.05-7.53 2)1.02-1.89	n/a

Sample Sites

Table 3 lists the sample locations used in the study and associated water quality conditions. Water quality conditions were taken in the field at the time of sample collection using an YSI water quality data sonde. Figure 1 is a map of the sampling locations in San Antonio and Guadalupe Bays.

Table 3. Sample locations and water quality data.

	Water Temperature (°C)	pH (s.u.)	Dissolved Oxygen (mg/L)	Conductivity (μmhos/cm)	Salinity (ppt)
Guadalupe Bay @ Pipe NO.3 5/5/13	20.6	8.2	9.2	10420	5.91
San Antonio Bay Mosquito to Grassy Midpoint 5/5/13	21.0	8.4	7.7	38810	24.74
San Antonio Bay @ San Antonio Bay Foundation (SABF) Lodge 5/5/13	21.2	8.1	9.0	41150	26.40
Guadalupe Bay @ Redfish Bayou 5/5/13	20.3	8.2	9.0	14890	8.67
Guadalupe Delta Observatory 6/4/13	28.1	7.5	1.2	455	0.22
Seadrift Pier 6/4/13	29.2	8.1	8.3	15616	9.08
Seadrift Pier 7/8/13	29.8	8.1	7.7	28800	17.67
Hynes Bay @ Austwell Pier 6/4/13	30.2	8.4	9.0	28234	17.3
Hynes Bay @ Austwell Pier 7/8/13	30.2	8.0	6.5	25000	15.14
Hypersaline Creek @ SH35 6/4/13	28.5	7.5	1.1	35052	21.97
Hypersaline Creek @ SH35 7/8/13	30.4	7.7	0.9	57300	38.01
Victoria Barge Canal 6/4/13	29.5	7.8	5.2	18027	10.6
Victoria Barge Canal 7/8/13	30.9	8.1	7.1	18700	11.00

Figure 1. Map of sample locations.

Observations

  The test runs used in the study can be found in Appendix A. The following observations were made based on the test runs. An example of what was observed can be found in the reference given with each observation.

1. Sample salinities ranged from 5 parts per thousand to 30 parts per thousand.
2. Test-In-Tube methods have occasional inconsistencies in coloration of test vials (Appendix A-Run I-1: pg. 9).
3. Analytes from a known QC sample in a NaCl solution can be recovered using Test-In-Tube methods. (Appendix A-Run III1-3: pgs. 24-26)
4. ISE probes showed difficulties measuring standards and samples in a NaCl solution. (Appendix A-Run I5-6: pgs. 13-14; and Run IV4-5: pgs. 33-34)
5. Matrix spikes can be recovered using Test-In-Tube methods with samples in a salt matrix (Appendix A-Run II-3: pgs. 20-21).
6. Sample results varied widely between Test-In-Tube and ISE method for analytes tested. (Appendix A-Run I: pgs. 9-14; and Run IV: pgs. 27-34)
7. Test-In-Tube methods showed repeatability when running several repetitions of a single sample or standard. (Appendix A-Runs V1-3: pgs. 36-38)
8. According to HACH, Beer's Law does not apply to this spectrophotometer. Absorbencies greater than 0.3 were accurate and recovered known concentrations accurately. (Appendix A-Run I-2:pg. 10)

9. Variable salinities seem to have little to no effect on recovery of calibration standards, quality control standards or samples made in a saline matrix. (Appendix A-Runs VI1-4: pgs. 39-43)
10. When creating a salt matrix using NaCl the amount of salt to DI water is not an exact grams to liters ratio to achieve a certain salinity value.
11. Multiple ranges of Test-In-Tube are available for each analyte. Testing should be done to examine which is an appropriate concentration range for sample sites being studied. (Appendix A-Runs II3-4: pgs. 20-23; and Runs IV2-3: pgs. 29-32)
12. Samples high in color, turbidity, or suspended solids should be filtered before testing with the Test-In-Tube procedure as all of these interferences have the ability to produce positive interferences or difficulties in achieving coloration needed to properly recover results. (Appendix A-Run II: pgs. 16-23; and Run IV: pgs. 27-34)

Conclusion

The study showed that the Ion Selective Electrodes are not suited for use in testing samples in a salt matrix. Ion Selective Electrodes could not consistently achieve successful calibrations and when comparing the recoveries of known quality control samples to the Test-In-Tube methods, they were not comparable. Test-In-Tube methods are viable options for analysis of nitrite-nitrogen, nitrate-nitrogen and ammonia-nitrogen in a salt matrix in quality control samples. According to the runs that were analyzed by the Test-In-Tube methods, these Hach methods showed excellent calibration curves and good recoveries on quality control standards and external known QC samples. Samples and standards with variable salinities also gave good recoveries.

There were, on occasion, some inconsistencies in the coloration of the test vials. It is not known what the causes of these inconsistencies were. According to Hach, there may be possible interferences caused by chloride and sodium. However, we did not observe any interferences at concentrations of 30,000 mg/L of these ions used to produce the 14 part per thousand salt matrix for making calibration and QC standards.

Some low recoveries were seen on matrix spikes. This could be due to the number of different unknown dissolved ions in the bay water. Samples were not characterized for their make-up. Characterization of the samples collected from estuaries or streams with high dissolved solids could lead to a better understanding of the poor matrix recoveries.

The limits of quantitation for the nitrogen analytes achievable by the GBRA laboratory are 0.05 mg/L nitrite-nitrogen, 0.05 mg/L nitrate-nitrogen, and 0.1 mg/L for non-distilled ammonia-nitrogen in fresh water matrix. Test-In-Tube methods could consistently achieve limits of quantitation of 0.02 mg/L nitrite-nitrogen, 0.3 mg/L nitrate-nitrogen, and 0.10 mg/L ammonia-nitrogen. HACH does not make a Test-In-Tube set with a range equal to that of the existing laboratory method detection limit for nitrate-nitrogen. Further testing or a different method would need to be selected to achieve a lower nitrate-nitrogen limit of quantitation.

Each Test-In-Tube procedure took approximately 15 minutes to process multiple samples plus time taken to read vials on the spectrophotometer. When testing large numbers of samples (greater than 15 samples) the time taken to create standards and add samples to each vial made the Test-In-Tube procedure a lengthy process. The success of the Test-In-Tube procedure in a laboratory would be dependent on how many samples would be tested at one time. Table 3 compares the costs associated with the methods evaluated. Each box of Test-In-Tube vials contains 25 vials and costs between $30 and $65 and includes all reagents necessary to complete the color reaction within the test vials. Standards and quality control samples are prepared by the laboratory. Test-In-Tube methods are fairly economic analyses unless doing a large number of samples due to the labor involved in the preparation and analysis of samples. If large numbers of tests are to be done it would be more economical to utilize an automated system .

Table 4. Comparison of costs of equipment, reagents and QC.

	Hardware (probes, spectrophotometer)	Consumables	Reagents	Known QC Samples
Nitrite-nitrogen TNT	HACH DR3900 spectrophotometer- $3875	TNT 839 vials – $32.15	10ppm NO2 std – $40.00	Absolute Standards, Inc. - $475
Nitrate-nitrogen TNT	HACH DR3900 spectrophotometer- $3875	TNT 835 vials – $37.35	100ppm NO3 std – $65.00	Absolute Standards, Inc. - $475
HR Ammonia-nitrogen TNT	HACH DR3900 spectrophotometer- $3875	TNT 832 vials – $46.99	100ppm NH3 std – $40.00	Absolute Standards, Inc. - $475
LR Ammonia-nitrogen TNT	HACH DR3900 spectrophotometer- $3875	TNT 831 vials – $46.99	100ppm NH3 std – $40.00	Absolute Standards, Inc. - $475
ULR Ammonia-nitrogen TNT	HACH DR3900 spectrophotometer- $3875	TNT 830 vials – $46.99	100ppm NH3 std – $40.00	Absolute Standards, Inc. - $475
Total Nitrogen TNT	HACH DR3900 spectrophotometer- $3875	TNT 826 vials – $64.45, Digestion vials – $15.69	100ppm NH3 std – $40.00	Absolute Standards, Inc. - $475
Conductivity/ Salinity	HACH HQ440D Multi-meter - $1390 CDC 401 probe - $352	n/a	1000µS/cm – $64.92, 50000µS/cm – $64.92	n/a
Nitrate-nitrogen ISE	HACH HQ440D Multi-meter - $1390 ISENO3181 probe - $715	ISA packets – $45.88	100ppm NO3 std – $65.00	n/a
Ammonium ISE	HACH HQ440D Multi-meter - $1390 ISENH4181 probe - $669	ISA packets - $49.49	100ppm NH3 std – $40.00	n/a

Note: Each procedure takes approximately 0.25% of a full time employee per day to complete analyses of one batch of field and QC samples.

Appendix A

TNT 839 Nitrite-Nitrogen Range 0.015-0.60 mg/L NO$_2$-N

Run I-1

NO$_2$-N Curve (mg/L)	Absorbance	Absorbance (w/o NaCL)	Absorbance (w NaCl) Run 1	Absorbance (w NaCl) Run 2
0.02	----	0.032	0.025	0.005
0.1	----	0.148	0.139	0.022
0.6	----	0.889	0.126	0.134
r^2	----	0.999996804	0.520002149	0.999981834
Blank	----	0.00	0.00	0.00
		Concentration w/o NaCL (mg/L)	Concentration w NaCl (mg/L)	Concentration w NaCl (mg/l)
LCS 0.10	----	0.10mg/L	0.65mg/L	0.10mg/L
Sample 1	0.062	0.04	-0.1	0.28
Sample 1A	0.037	0.02	-0.34	0.16
Sample 2	0.019	0.01	-0.51	0.08
Sample 2A	0.001	0.00	-0.69	0.004
Sample 3	0.035	0.02	-0.36	0.16
Sample 3A	0.018	0.01	-0.52	0.08
Sample 4	0.116	0.08	0.43	0.52
Sample 4A	0.047	-0.03	-0.24	0.21

Sample 1: Guadalupe Bay @ Pipe NO.3 - S. Fork
Sample 1A: Guadalupe Bay @ Pipe NO.3 - S. Fork (Filtered)
Sample 2: San Antonio Bay Mosquito to Grassy Midpoint
Sample 2A: San Antonio Bay Mosquito to Grassy Midpoint (Filtered)
Sample 3: San Antonio Bay @ SABF Lodge
Sample 3A: San Antonio Bay @ SABF Lodge (Filtered)
Sample 4: Guadalupe Bay @ Redfish Bayou
Sample 4A: Guadalupe Bay @ Redfish Bayou (Filtered)

TNT 835 Nitrate-Nitrogen Range 0.23-13.5 mg/L NO$_3$-N

Run I-2

NO$_3$-N Curve (mg/L)	Absorbance	Absorbance (w/o NaCL)	Absorbance (w NaCl)
0.5	----	0.078	0.025
5.0	----	0.767	0.241
10.0	----	1.499	0.445
r^2	----	0.999916687	0.998901721
Blank	----	0.00	0.00
		Concentration w/o NaCL (mg/L)	Concentration w NaCl (mg/L)
LCS 1.0	----	0.98mg/L	1.07mg/L
Sample 1	0.009	0.001	0.002
Sample 1A	0.005	-0.02	-0.09
Sample 2	-0.134	-0.96	-3.24
Sample 2A	-0.138	-0.98	-3.33
Sample 3	-0.132	-0.94	-3.19
Sample 3A	-0.136	-0.97	-3.28
Sample 4	-0.026	-0.23	-0.79
Sample 4A	-0.041	-0.33	-1.13

Sample 1: Guadalupe Bay @ Pipe NO.3 - S. Fork
Sample 1A: Guadalupe Bay @ Pipe NO.3 - S. Fork (Filtered)
Sample 2: San Antonio Bay Mosquito to Grassy Midpoint
Sample 2A: San Antonio Bay Mosquito to Grassy Midpoint (Filtered)
Sample 3: San Antonio Bay @ SABF Lodge
Sample 3A: San Antonio Bay @ SABF Lodge (Filtered)
Sample 4: Guadalupe Bay @ Redfish Bayou
Sample 4A: Guadalupe Bay @ Redfish Bayou (Filtered)

TNT 832 Ammonia-Nitrogen HR Range 2.0-47.0 mg/L NH$_3$-N

Run I-3

NH$_3$-N Curve (mg/L)	Absorbance	Absorbance (w/o NaCL)	Absorbance (w NaCl) 1
2	----	0.087	0.069
8.0	----	0.349	0.318
16.0	----	0.669	0.646
30.0	----	1.248	1.221
45.0	----	1.773	1.862
r^2	----	0.999265038	0.999959789
Blank	----	0.00	0.00
		Concentration w/o NaCL (mg/L)	Concentration w NaCl (mg/L)
LCS 15.0	----	15.4	15.5
Sample 1	-0.002	-0.83	0.37
Sample 1A	0.00	-0.78	0.41
Sample 2	-0.004	-0.88	0.32
Sample 2A	-0.006	-0.93	0.27
Sample 3	-0.004	-0.88	0.32
Sample 3A	-0.001	-0.80	0.39
Sample 4	0.001	-0.75	0.44
Sample 4A	0.002	-0.73	0.46

Cal curve ranged from light to dark green
Samples and Blanks both turned yellow in color

Sample 1: Guadalupe Bay @ Pipe NO.3 - S. Fork
Sample 1A: Guadalupe Bay @ Pipe NO.3 - S. Fork (Filtered)
Sample 2: San Antonio Bay Mosquito to Grassy Midpoint
Sample 2A: San Antonio Bay Mosquito to Grassy Midpoint (Filtered)
Sample 3: San Antonio Bay @ SABF Lodge
Sample 3A: San Antonio Bay @ SABF Lodge (Filtered)
Sample 4: Guadalupe Bay @ Redfish Bayou
Sample 4A: Guadalupe Bay @ Redfish Bayou (Filtered)

TNT 826 Total Nitrogen Range 1.0-16.0 mg/L N

Run I-4

TN Curve (mg/L)	Absorbance	Absorbance (w/o NaCL)	Absorbance (w NaCl)
1	----	0.044	0.04
2.0	----	0.092	0.055
8.0	----	0.398	0.23
16.0	----	0.81	0.494
r^2	----	0.999986583	0.998683687
Blank	----	0.00	0.00
		Concentration w/o NaCl (mg/L)	Concentration w NaCl (mg/L)
LCS 5.0	----	5.09	4.70
Sample 1	0.152	3.15	5.02
Sample 1A	0.145	3.02	4.8
Sample 2	0.004	0.26	0.18
Sample 2A	-0.015	-0.11	-0.44
Sample 3	-0.015	-0.11	-0.44
Sample 3A	-0.014	-0.09	-0.4
Sample 4	0.134	2.80	4.44
Sample 4A	0.119	2.51	3.95

Sample 1: Guadalupe Bay @ Pipe NO.3 - S. Fork
Sample 1A: Guadalupe Bay @ Pipe NO.3 - S. Fork (Filtered)
Sample 2: San Antonio Bay Mosquito to Grassy Midpoint
Sample 2A: San Antonio Bay Mosquito to Grassy Midpoint (Filtered)
Sample 3: San Antonio Bay @ SABF Lodge
Sample 3A: San Antonio Bay @ SABF Lodge (Filtered)
Sample 4: Guadalupe Bay @ Redfish Bayou
Sample 4A: Guadalupe Bay @ Redfish Bayou (Filtered)

ISENH4 Ammonia-Nitrogen Probe

Run I-5a

Calibration (w/o NaCl)	Concentration (mg/L)	Concentration (mV)	Temp (°C)
2.00	----	171.8	21.7
8.0	----	208.2	21.6
16.0	----	217.2	21.7
45.0	----	250.3	21.6
slope	104%		
LCS 15.0	18.1	----	21.5
Sample 1	6.23	198.1	20.4
Sample 1A	6.19	198.0	20.7
Sample 2	27.0	235.2	20.9
Sample 2A	27.5	235.8	21.0
Sample 3	30.8	238.7	21.0
Sample 3A	31.8	239.5	21.0
Sample 4	9.69	209.1	21.0
Sample 4A	9.56	208.8	21.0

Run I-5b

Calibration (w NaCl)	Concentration (mg/L)	Concentration (mV)	Temp (°C)
2.00	----	208.5	21.4
8.0	----	224.2	21.5
16.0	----	236.9	21.4
45.0	----	258.6	21.3
slope	99%		
LCS 15.0	16.1	236.7	21.3
Sample 1	(0.624) <DL	202.7	21.0
Sample 1A	(0.0996) <DL	200.1	21.1
Sample 2	16.4	237.1	21.0
Sample 2A	15.8	236.3	21.0
Sample 3	17.7	238.5	21.0
Sample 3A	17.2	238.0	21.0
Sample 4	(2.07) <DL	208.6	21.0
Sample 4A	(1.87) <DL	207.9	21.0

DL= DETECTION LIMIT

Sample 1: Guadalupe Bay @ Pipe NO.3 - S. Fork

Sample 1A: Guadalupe Bay @ Pipe NO.3 - S. Fork (Filtered)

Sample 2: San Antonio Bay Mosquito to Grassy Midpoint

Sample 2A: San Antonio Bay Mosquito to Grassy Midpoint (Filtered)

Sample 3: San Antonio Bay @ SABF Lodge

Sample 3A: San Antonio Bay @ SABF Lodge (Filtered)

Sample 4: Guadalupe Bay @ Redfish Bayou

Sample 4A: Guadalupe Bay @ Redfish Bayou (Filtered)

ISENO3 Nitrate-Nitrogen Probe

Run I-6a

Calibration (w/o NaCl)	Concentration (mg/L)	Concentration (mV)	Temp (°C)
0.50	----	421.1	20.8
5.0	----	362.4	21
10.0	----	345.6	21
slope	99%		
Blank	0.116	458.0	21.2
LCS 1.0	1.09	401.1	21.1
Sample 1	8.80	348.7	20.4
Sample 1A	9.70	346.2	20.6
Sample 2	24.2	323.0	20.74
Sample 2A	24.8	322.4	20.8
Sample 3	26.8	320.4	20.9
Sample 3A	27.2	320.1	21.0
Sample 4	14.3	336.2	21.0
Sample 4A	13.9	337.0	21.0

Run I-6b

Calibration (w NaCl)	Concentration (mg/L)	Concentration (mV)	Temp (°C)
0.50	----	330.9	20.4
5.0	----	326.0	20.8
10.0	----	321.6	21.0
slope	107%		
Blank	(1.31) <DL	329.8	21.0
LCS 1.0	(2.81) <DL	328.2	21.0
Sample 1	OR	344.5	---
Sample 1A	OR	344.5	---
Sample 2	(8.50) <DL	322.9	20.6
Sample 2A	(8.65) <DL	322.8	20.7
Sample 3	(11.3) <DL	320.6	20.7
Sample 3A	(11.6) <DL	320.4	20.7
Sample 4	OR	335.8	20.8
Sample 4A	OR	336.4	20.9

DL= DETECTION LIMIT   OR= OUT OF RANGE
Sample 1: Guadalupe Bay @ Pipe NO.3 - S. Fork
Sample 1A: Guadalupe Bay @ Pipe NO.3 - S. Fork (Filtered)
Sample 2: San Antonio Bay Mosquito to Grassy Midpoint
Sample 2A: San Antonio Bay Mosquito to Grassy Midpoint (Filtered)
Sample 3: San Antonio Bay @ SABF Lodge
Sample 3A: San Antonio Bay @ SABF Lodge (Filtered)
Sample 4: Guadalupe Bay @ Redfish Bayou
Sample 4A: Guadalupe Bay @ Redfish Bayou (Filtered)

CDC401 Conductivity by Probe

Calibration Date: 5/23/13

Calibration Std: 50,000 uS/cm

Calibration Result: 44564 uS/cm @ 19.3

Calibration Check: 50,200 uS/cm

Read 1000 std: 920 uS/cm @ 22.1

Run I-7

Sample	Conductivity (uS/cm)	Salinity ($^o/_{oo}$)	Temp (°C)
1	9430	5.31	21.2
1A	9450	5.30	21.1
2	36400	23.0	21.1
2A	36100	22.8	21.1
3	38700	24.6	21.1
3A	38400	24.4	21.1
4	13270	7.65	21.1
4A	13130	7.56	21.1

Sample 1: Guadalupe Bay @ Pipe NO.3 - S. Fork
Sample 1A: Guadalupe Bay @ Pipe NO.3 - S. Fork (Filtered)
Sample 2: San Antonio Bay Mosquito to Grassy Midpoint
Sample 2A: San Antonio Bay Mosquito to Grassy Midpoint (Filtered)
Sample 3: San Antonio Bay @ SABF Lodge
Sample 3A: San Antonio Bay @ SABF Lodge (Filtered)
Sample 4: Guadalupe Bay @ Redfish Bayou
Sample 4A: Guadalupe Bay @ Redfish Bayou (Filtered)

TNT 839 Nitrite-Nitrogen Range 0.015-0.60 mg/L NO$_2$-N

Run II-1	A	B			B-A	C	
NO$_2$-N Curve (mg/L)	Absorption (no color)	Absorption (with coloring reagent)	Concentration (mg/L)	%Recovery	Absorption (minus turbidity)	Concentration (minus turbidity)	%Recovery
0.02	----	0.043	----	----	----	----	----
0.05	----	0.064	----	----	----	----	----
0.1	----	0.068	----	----	----	----	----
0.3	----	0.118	----	----	----	----	----
0.6	----	1.183	----	----	----	----	----
r^2	----	0.915535758	----	----	----	----	----
Blank	----	0.00	----	----	----	----	----
LCS 0.02	----	0.044	0.08	400	----	----	----
LCS 0.10	----	0.074	0.096	96.0	----	----	----
LCS 0.60	----	1.172	0.68	113	----	----	----
Sample 1	0.041	0.085	0.100	----	0.044	0.08	----
Sample 1A	0.008	0.051	0.084	----	0.043	0.08	----
Sample 1B	0.002	0.050	0.084	----	0.048	0.083	----
Sample 2	0.053	0.052	0.085	----	-0.001	0.056	----
Sample 2A	0.004	0.008	0.061	----	0.004	0.059	----
Sample 2B	0.000	-0.009	0.052	----	-0.009	0.052	----
Sample 2-2*	0.052	0.239	0.184	99.0	0.187	0.156	100
Sample 2-2A*	0.003	0.194	0.160	99.0	0.191	0.159	100
Sample 2-2B*	0.002	0.186	0.156	104	0.184	0.155	103
Sample 3	0.044	0.043	0.080	----	-0.001	0.056	----
Sample 3A	0.026	0.023	0.069	----	-0.003	0.056	----
Sample 3B	0.007	0.011	0.063	----	0.004	0.059	----
Sample 4	0.046	0.039	0.078	----	-0.007	0.053	----

Sample 4A	0.011	0.009	0.062	----	-0.002	0.056	----
Sample 4B	0.005	0.009	0.062	----	0.004	0.059	----
Sample 5	0.023	0.101	0.111	----	0.078	0.098	----
Sample 5A	0.003	0.086	0.103	----	0.083	0.101	----
Sample 5B	0.001	0.086	0.103	----	0.085	0.102	----

*Matrix Spike sample = 0.10mg/L spike
Sample 1: Seadrift Pier
Sample 1A: Sea Drift Pier (glass filter)
Sample 1B: Sea Drift Pier (membrane filter)
Sample 2: Hynes Bay @ Austwell Pier
Sample 2A: Hynes Bay @ Austwell Pier (glass filter)
Sample 2**B**: Hynes Bay @ Austwell Pier (membrane filter)
Sample 2-2: Hynes Bay @ Austwell Pier (used as MS 0.10mg/L)
Sample 2-2A: Hynes Bay @ Austwell Pier (glass filter)
Sample 2-2**B**: Hynes Bay @ Austwell Pier (membrane filter)
Sample 3: Guadalupe Delta Observatory
Sample 3A: Guadalupe Delta Observatory (glass filter)
Sample 3B: Guadalupe Delta Observatory (membrane filter)
Sample 4: Hypersaline Creek @ SH 35
Sample 4A: Hypersaline Creek @ SH 35 (glass filter)
Sample 4: Hypersaline Creek @ SH 35 (membrane filter)
Sample 5: Victoria Barge Canal
Sample 5A: Victoria Barge Canal (glass filter)
Sample 5B: Victoria Barge Canal (membrane filter)

TNT 835 Nitrate-nitrogen Range 0.23-13.5 mg/L NO_3-N

Run II-2

NO_3-N Curve (mg/L)	Absorption (with coloring reagent)	Concentration (mg/L)	% Recovery
0.50	0.031	----	----
1.0	0.037	----	----
3.0	0.12	----	----
5.0	0.199	----	----
10.0	0.399	----	----
r^2	0.999439734	----	----
Blank	0.00	----	----
LCS 0.50	0.019	0.39	78.0
LCS 1.00	0.039	0.90	90.0
LCS 10.0	0.391	9.83	98.3
Sample 1	0.024	0.520	----
Sample 1A	0.021	0.440	----
Sample 1B	0.031	0.700	----
Sample 2	0.020	0.420	----
Sample 2A	0.002	-0.040	----
Sample 2B	0.000	-0.090	----
Sample 2-2*	0.041	0.950	53.0
Sample 2-2A*	0.033	0.750	79.0
Sample 2-2B*	0.031	0.700	79.0
Sample 3	0.043	1.000	----
Sample 3A	0.019	0.390	----
Sample 3B	0.017	0.340	----
Sample 4	0.039	0.900	----
Sample 4A	0.040	0.920	----
Sample 4B	0.034	0.770	----
Sample 5	0.032	0.720	----
Sample 5A	0.036	0.820	----
Sample 5B	0.019	0.390	----

*Matrix Spike sample = 1.00mg/L spike
Sample 1: Seadrift Pier
Sample 1A: Sea Drift Pier (glass filter)
Sample 1B: Sea Drift Pier (membrane filter)
Sample 2: Hynes Bay @ Austwell Pier
Sample 2A: Hynes Bay @ Austwell Pier (glass filter)
Sample 2**B**: Hynes Bay @ Austwell Pier (membrane filter)
Sample 2-2: Hynes Bay @ Austwell Pier (used as MS)
Sample 2-2A: Hynes Bay @ Austwell Pier (glass filter)
Sample 2-2**B**: Hynes Bay @ Austwell Pier (membrane filter)
Sample 3: Guadalupe Delta Observatory
Sample 3A: Guadalupe Delta Observatory (glass filter)
Sample 3B: Guadalupe Delta Observatory (membrane filter)

Sample 4: Hypersaline Creek @ SH 35
Sample 4A: Hypersaline Creek @ SH 35 (glass filter)
Sample 4: Hypersaline Creek @ SH 35 (membrane filter)
Sample 5: Victoria Barge Canal
Sample 5A: Victoria Barge Canal (glass filter)
Sample 5B: Victoria Barge Canal (membrane filter)

TNT 830 Ammonia-Nitrogen LR Range 1.00-12.0 mg/L NH$_3$-N

Run II-3	A	B			B-A	C	
NH3-N Curve (mg/L)	Absorption (no color)	Absorption (with coloring reagent)	Concentration (mg/L)	%Recovery	Absorption (minus turbidity)	Concentration (minus turbidity)	%Recovery
1.00	----	0.178	----	----	----	----	----
3.00	----	0.519	----	----	----	----	----
5.00	----	0.865	----	----	----	----	----
10.00	----	1.736	----	----	----	----	----
12.0	----	2.037	----	----	----	----	----
r^2	----	0.999837494	----	----	----	----	----
Blank	----	0.00	----	----	----	----	----
LCS 1.00	----	0.176	0.97	97.0	----	----	----
LCS 5.00	----	0.855	4.96	99.2	----	----	----
LCS 12.0	----	2.031	11.8	98.3	----	----	----
Sample 1	0.000	0.041	0.180	----	0.041	0.177	----
Sample 1A	0.001	0.018	0.042	----	0.017	0.036	----
Sample 1B	0.000	0.012	0.007	----	0.012	0.007	----
Sample 2	0.005	0.083	0.420	----	0.078	0.394	----
Sample 2A	0.001	0.052	0.240	----	0.051	0.236	----
Sample 2B	-0.001	0.042	0.180	----	0.043	0.189	----
Sample 2-2*	0.007	0.894	5.180	95.2	0.887	5.14	94.9
Sample 2-2A*	0.000	0.845	4.900	93.2	0.854	4.95	94.3
Sample 2-2B*	0.000	0.814	4.710	90.6	0.814	4.71	90.4
Sample 3	0.000	0.001	-0.006	----	0.001	-0.057	----
Sample 3A	0.000	-0.001	-0.007	----	-0.001	-0.069	----
Sample 3B	0.001	0.002	-0.050	----	0.001	-0.057	----
Sample 4	0.028	0.119	0.640	----	0.091	0.471	----
Sample 4A	0.025	0.101	0.530	----	0.076	0.383	----
Sample 4B	0.021	0.069	0.340	----	0.048	0.218	----

Sample 5	0.001	0.019	0.048	----	0.018	0.042	----
Sample 5A	0.000	0.044	0.195	----	0.044	0.195	----
Sample 5B	0.000	0.049	0.224	----	0.049	0.224	----

*Matrix Spike sample = 5.00mg/L spike
Sample 1: Seadrift Pier
Sample 1A: Sea Drift Pier (glass filter)
Sample 1B: Sea Drift Pier (membrane filter)
Sample 2: Hynes Bay @ Austwell Pier
Sample 2A: Hynes Bay @ Austwell Pier (glass filter)
Sample 2**B**: Hynes Bay @ Austwell Pier (membrane filter)
Sample 2-2: Hynes Bay @ Austwell Pier (used as MS)
Sample 2-2A: Hynes Bay @ Austwell Pier (glass filter)
Sample 2-2**B**: Hynes Bay @ Austwell Pier (membrane filter)
Sample 3: Guadalupe Delta Observatory
Sample 3A: Guadalupe Delta Observatory (glass filter)
Sample 3B: Guadalupe Delta Observatory (membrane filter)
Sample 4: Hypersaline Creek @ SH 35
Sample 4A: Hypersaline Creek @ SH 35 (glass filter)
Sample 4: Hypersaline Creek @ SH 35 (membrane filter)
Sample 5: Victoria Barge Canal
Sample 5A: Victoria Barge Canal (glass filter)
Sample 5B: Victoria Barge Canal (membrane filter)

TNT 830 Ammonia-Nitrogen ULR Range 0.015-2.00 mg/L NH$_3$-N

Run II-4	A	B			B-A	C	
NH3-N Curve (mg/L)	Absorption (no color)	Absorption (with coloring reagent)	Concentration (mg/L)	%Recovery	Absorption (minus turbidity)	Concentration (minus turbidity)	%Recovery
0.02	----	-0.026	----	----	----	----	----
0.05	----	0.054	----	----	----	----	----
0.10	----	0.059	----	----	----	----	----
0.50	----	0.524	----	----	----	----	----
1.0	----	1.034	----	----	----	----	----
2.0	----	2.314	----	----	----	----	----
r^2	----	0.998791988	----	----	----	----	----
Blank	----	0.00	----	----	----	----	----
LCS 0.02	----	0.03	0.07	350	----	----	----
LCS 0.50	----	0.534	0.50	100	----	----	----
LCS 2.00	----	2.134	1.88	94.0	----	----	----
Sample 1	0.052	0.186	0.200	----	0.134	0.160	----
Sample 1A	0.027	0.078	0.110	----	0.051	0.088	----
Sample 1B	0.021	0.066	0.100	----	0.045	0.083	----
Sample 2	0.042	0.053	0.090	----	0.011	0.054	----
Sample 2A	0.012	0.031	0.071	----	0.019	0.061	----
Sample 2B	0.002	-0.016	0.031	----	-0.018	0.029	----
Sample 2-2*	0.040	0.381	0.370	56.0	0.341	0.340	57.2
Sample 2-2A*	0.002	0.305	0.310	47.8	0.303	0.300	47.8
Sample 2-2B*	0.003	0.269	0.280	49.8	0.266	0.270	48.2
Sample 3	0.015	0.006	0.050	----	-0.009	0.037	----
Sample 3A	0.005	-0.033	0.016	----	-0.038	0.012	----
Sample 3B	0.005	0.005	0.049	----	0.000	0.044	----
Sample 4	0.011	0.000	0.044	----	-0.011	0.035	----
Sample 4A	0.000	0.021	0.062	----	0.021	0.062	----
Sample 4B	0.000	-0.005	0.040	----	-0.005	0.040	----

Sample 5	0.035	0.051	0.088	----	0.016	0.058	----
Sample 5A	0.017	0.102	0.132	----	0.085	0.117	----
Sample 5B	0.016	0.162	0.184	----	0.146	0.170	----

*Matrix Spike sample = 0.50mg/L spike
Sample 1: Seadrift Pier
Sample 1A: Sea Drift Pier (glass filter)
Sample 1B: Sea Drift Pier (membrane filter)
Sample 2: Hynes Bay @ Austwell Pier
Sample 2A: Hynes Bay @ Austwell Pier (glass filter)
Sample 2**B**: Hynes Bay @ Austwell Pier (membrane filter)
Sample 2-2: Hynes Bay @ Austwell Pier (used as MS)
Sample 2-2A: Hynes Bay @ Austwell Pier (glass filter)
Sample 2-2**B**: Hynes Bay @ Austwell Pier (membrane filter)
Sample 3: Guadalupe Delta Observatory
Sample 3A: Guadalupe Delta Observatory (glass filter)
Sample 3B: Guadalupe Delta Observatory (membrane filter)
Sample 4: Hypersaline Creek @ SH 35
Sample 4A: Hypersaline Creek @ SH 35 (glass filter)
Sample 4: Hypersaline Creek @ SH 35 (membrane filter)
Sample 5: Victoria Barge Canal
Sample 5A: Victoria Barge Canal (glass filter)
Sample 5B: Victoria Barge Canal (membrane filter)

TNT 839 Nitrite-Nitrogen Range 0.015-0.60 mg/L NO$_2$-N

Run III-1

NO$_2$-N Curve (mg/L)	Absorption (with coloring reagent)	Concentration (mg/L)	%Recovery
0.02	0.039	----	----
0.05	0.089	----	----
0.1	0.188	----	----
0.3	0.513	----	----
0.6	1.003	----	----
r^2	0.999841877	----	----
Blank	0.00	----	----
LCS 0.02	0.036	0.015	75.0
LCS 0.10	0.185	0.100	100
LCS 0.60	0.978	0.580	96.7
PT 550201	0.455	0.267	----
PT 55201-2	0.457	0.269	----

PT assigned value= 0.219 mg/L
PT acceptable range= 0.153-0.285 mg/L

TNT 835 Nitrate-Nitrogen Range 0.23-13.5 mg/L NO$_3$-N

Run III-2

NO$_3$-N Curve (mg/L)	Absorption (with coloring reagent)	Concentration (mg/L)	%Recovery
0.50	0.033	----	----
1.0	0.045	----	----
3.0	0.123	----	----
5.0	0.203	----	----
10.0	0.395	----	----
r^2	0.999816609	----	----
Blank	0.00	----	----
LCS 0.50	0.023	0.350	70.0
LCS 1.00	0.046	0.940	94.0
LCS 10.0	0.383	9.700	97.0
PT 55201	0.228	5.670	----
PT 55201-2	0.224	5.570	----

PT assigned value= 5.68 mg/L
PT acceptable range= 3.98-7.38 mg/L

TNT 830 Ammonia-Nitrogen LR Range 1.00-12.0 mg/L NH₃-N
Run III-3

NH3-N Curve (mg/L)	Concentration (mg/L)	%Recovery
1.00	----	----
3.00	----	----
5.00	----	----
10.00	----	----
12.0	----	----
r^2	----	----
Blank	----	----
LCS 1.00	0.88	88.0
LCS 5.00	4.81	96.2
LCS 12.0	10.2	85.0
Sample 1	5.890	----
Sample 1A	5.810	----

PT assigned value= 5.79 mg/L
PT acceptable range= 4.05-7.53 mg/L

Runs IV-1-6 show analysis testing the effect of high turbidity/suspended solids in Test-In-Tube methods and the feasibility of ISE probes with samples in a saline matrix

TNT 835 Nitrate-Nitrogen Range 0.23-13.5 mg/L NO$_3$-N

Run IV-1	A	B			B-A	C	
NO$_3$-N Curve (mg/L)	Absorption (no color)	Absorption (with coloring reagent)	Concentration (mg/L)	%Recovery	Absorption (minus turbidity)	Concentration (minus turbidity)	%Recovery
0.50	----	0.013	----	----	----	----	----
1.0	----	0.043	----	----	----	----	----
3.0	----	0.118	----	----	----	----	----
5.0	----	0.192	----	----	----	----	----
10.0	----	0.379	----	----	----	----	----
r^2	----	0.999539015	----	----	----	----	----
Blank	----	0.00	----	----	----	----	----
LCS 1.00	----	0.036	0.92	92.0	----	----	----
Sample 1	0.015	0.020	0.500	----	0.005	0.108	----
Sample 1A	0.005	0.016	0.400	----	0.011	0.266	----
Sample 1B	0.015	0.010	0.240	----	-0.005	-0.156	----
Sample 1-2*	0.02	0.060	1.560	106	0.04	1.03	92.2
Sample 1-2A*	0.01	0.053	1.370	97.0	0.042	1.08	81.4
Sample 1-2B*	0.012	0.037	0.950	71.0	0.025	0.634	79.0
Sample 2	0.049	0.060	1.560	----	0.011	0.266	----
Sample 2A	0.044	0.048	1.240	----	0.004	0.081	----
Sample 2B	0.049	0.045	1.160	----	-0.004	-0.129	----
Sample 3	0.017	0.021	0.530	----	0.004	0.081	----
Sample 3A	0.009	0.005	0.110	----	-0.004	-0.129	----
Sample 3B	0.004	0.008	0.190	----	0.004	0.081	----
Sample 4	0.029	0.033	0.840	----	0.004	0.081	----
Sample 4A	0.013	0.016	0.400	----	0.003	0.055	----

Sample 4B	0.012	0.013	0.320	----	0.001	0.002	----
PT 55201	----	0.223	5.850	----	----	----	----
PT 55201/MS 1.00	----	0.171	4.480	-137	----	----	----
PT 55201-2	----	0.219	5.740	----	----	----	----
PT 55201-2/MS 1.00	----	0.170	4.450	-126	----	----	----

*Matrix spike = 1.00 mg/L
Sample 1: SA Bay @ Seadrift
Sample 1A: SA Bay @ Seadrift (glass filter)
Sample 1B: SA Bay @ Seadrift (membrane filter)
Sample 1-2: SA Bay @ Seadrift (used for MS)
Sample 1-2A: SA Bay @ Seadrift (glass filter)
Sample 1-2B: SA Bay @ Seadrift (membrane filter)
Sample 2: Hypersaline Creek @ SH 35
Sample 2A: Hypersaline Creek @ SH 35 (glass filter)
Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)
Sample 3: Victoria Barge Canal
Sample 3A: Victoria Barge Canal (glass filter)
Sample 3B: Victoria Barge Canal (membrane filter)
Sample 4: Hynes Bay @ Austwell Pier
Sample 4A: Hynes Bay @ Austwell Pier (glass filter)
Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

TNT 830 Ammonia-Nitrogen LR Range 1.00-12.0 mg/L NH$_3$-N

Run IV-2	A	B			B-A	C	
NH3-N Curve (mg/L)	Absorption (no color)	Absorption (with coloring reagent)	Concentration (mg/L)	%Recovery	Absorption (minus turbidity)	Concentration (minus turbidity)	%Recovery
1.00	----	0.169	----	----	----	----	----
3.00	----	0.51	----	----	----	----	----
5.00	----	0.853	----	----	----	----	----
10.00	----	1.703	----	----	----	----	----
12.0	----	2.036	----	----	----	----	----
r^2	----	0.999993293	----	----	----	----	----
Blank	----	0.00	----	----	----	----	----
LCS 1.00	----	0.171	1	100	----	----	----
Sample 1	0.001	0.078	0.454	----	0.077	0.448	----
Sample 1A	0.002	0.059	0.342	----	0.057	0.330	----
Sample 1B	0.000	0.060	0.348	----	0.060	0.348	----
Sample 1-2	0.010	0.210	1.231	77.7	0.200	1.172	72.4
Sample 1-2A	0.000	0.212	1.242	90.0	0.212	1.242	91.2
Sample 1-2B	0.001	0.209	1.225	87.7	0.208	1.219	87.1
Sample 2	0.045	0.267	1.566	----	0.222	1.301	----
Sample 2A	0.045	0.250	1.466	----	0.205	1.201	----
Sample 2B	0.030	0.248	1.454	----	0.218	1.278	----
Sample 3	0.002	0.043	0.248	----	0.041	0.236	----
Sample 3A	0.000	0.041	0.236	----	0.041	0.236	----
Sample 3B	0.000	0.031	0.177	----	0.031	0.177	----
Sample 4	0.003	0.094	0.548	----	0.091	0.530	----
Sample 4A	0.003	0.063	0.365	----	0.060	0.348	----
Sample 4B	0.000	0.056	0.324	----	0.056	0.324	----

PT 55201	-0.001	1.005	5.910	----	----	----	----
PT 55201/MS 1.00	0.001	1.140	6.705	79.5	----	----	----
PT 55201-2	0.002	0.986	5.798	----	----	----	----
PT 55201-2/MS 1.00	-0.001	1.133	6.664	86.6	----	----	----

*Matrix spike = 1.00 mg/L
Sample 1: SA Bay @ Seadrift
Sample 1A: SA Bay @ Seadrift (glass filter)
Sample 1B: SA Bay @ Seadrift (membrane filter)
Sample 1-2: SA Bay @ Seadrift (used for MS)
Sample 1-2A: SA Bay @ Seadrift (glass filter)
Sample 1-2B: SA Bay @ Seadrift (membrane filter)
Sample 2: Hypersaline Creek @ SH 35
Sample 2A: Hypersaline Creek @ SH 35 (glass filter)
Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)
Sample 3: Victoria Barge Canal
Sample 3A: Victoria Barge Canal (glass filter)
Sample 3B: Victoria Barge Canal (membrane filter)
Sample 4: Hynes Bay @ Austwell Pier
Sample 4A: Hynes Bay @ Austwell Pier (glass filter)
Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

TNT 830 Ammonia-Nitrogen ULR Range 0.015-2.00 mg/L NH₃-N

Run IV-3	A	B			B-A	C	
NH3-N Curve (mg/L)	Absorption (no color)	Absorption (with coloring reagent)	Concentration (mg/L)	%Recovery	Absorption (minus turbidity)	Concentration (minus turbidity)	%Recovery
0.02	----	0.026	----	----	----	----	----
0.05	----	0.054	----	----	----	----	----
0.10	----	0.113	----	----	----	----	----
0.50	----	0.54	----	----	----	----	----
1.0	----	1.094	----	----	----	----	----
2.0	----	2.181	----	----	----	----	----
r^2	----	0.999990818	----	----	----	----	----
Blank	----	0.00	----	----	----	----	----
LCS 1.00	----	1.054	0.97	96.5	----	----	----
Sample 1	0.075	0.101	0.091	----	0.026	0.022	----
Sample 1A	0.005	0.042	0.037	----	0.037	0.033	----
Sample 1B	0.006	0.054	0.048	----	0.048	0.043	----
Sample 1-2*	0.082	0.438	0.401	62.0	0.356	0.325	60.6
Sample 1-2A*	0.005	0.429	0.392	71.0	0.424	0.388	71.0
Sample 1-2B*	0.002	0.421	0.385	67.4	0.419	0.383	68.0
Sample 2	0.089	0.119	0.108	----	0.030	0.026	----
Sample 2A	0.040	0.054	0.048	----	0.014	0.012	----
Sample 2B	0.005	0.048	0.043	----	0.043	0.038	----
Sample 3	0.050	0.135	0.122	----	0.085	0.077	----
Sample 3A	0.019	0.113	0.102	----	0.094	0.085	----
Sample 3B	0.022	0.116	0.105	----	0.094	0.085	----
Sample 4	0.147	0.259	0.236	----	0.112	0.101	----
Sample 4A	0.006	0.125	0.113	----	0.119	0.108	----
Sample 4B	0.001	0.101	0.091	----	0.100	0.09	----
PT 55201	0.001	>3.5	----	----	----	----	----

PT 55201/MS 1.00	0.001	>3.5	----	----	----	----	----	
PT 55201-2	0.002	>3.5	----	----	----	----	----	
PT 55201-2/MS 1.00	0.001	-0.035	----	----	----	----	----	

*Matrix spike = 0.50 mg/L
Sample 1: SA Bay @ Seadrift
Sample 1A: SA Bay @ Seadrift (glass filter)
Sample 1B: SA Bay @ Seadrift (membrane filter)
Sample 1-2: SA Bay @ Seadrift (used for MS)
Sample 1-2A: SA Bay @ Seadrift (glass filter)
Sample 1-2B: SA Bay @ Seadrift (membrane filter)
Sample 2: Hypersaline Creek @ SH 35
Sample 2A: Hypersaline Creek @ SH 35 (glass filter)
Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)
Sample 3: Victoria Barge Canal
Sample 3A: Victoria Barge Canal (glass filter)
Sample 3B: Victoria Barge Canal (membrane filter)
Sample 4: Hynes Bay @ Austwell Pier
Sample 4A: Hynes Bay @ Austwell Pier (glass filter)
Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

ISENH4 Ammonia-Nitrogen by Probe

Run IV-4

Calibration (w/ NaCl)	Concentration (mg/L)	Concentration (mV)	Temp (°C)	
1.00	----	215.6	22.3	
5.0	----	226.7	22.2	slope out of range
12.0	----	238.9	22.1	
slope	99%			
LCS 1.00	0.670	214.4	22.2	
Sample 1	99.8	236	22.1	
Sample 1-2	10.5	236.7	22.1	
Sample 2	21.9	249.8	21.7	
Sample 3	3.34	222.5	21.4	< DL
Sample 4	6.39	229.6	21.7	
PT 55201	5.47	227.7	22.0	
PT 55201/ms 1.00	6.42	229.7	22.1	95% rec

DL= Detection Limit
Sample 1: SA Bay @ Seadrift
Sample 1A: SA Bay @ Seadrift (glass filter)
Sample 1B: SA Bay @ Seadrift (membrane filter)
Sample 1-2: SA Bay @ Seadrift (used for MS)
Sample 1-2A: SA Bay @ Seadrift (glass filter)
Sample 1-2B: SA Bay @ Seadrift (membrane filter)
Sample 2: Hypersaline Creek @ SH 35
Sample 2A: Hypersaline Creek @ SH 35 (glass filter)
Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)
Sample 3: Victoria Barge Canal
Sample 3A: Victoria Barge Canal (glass filter)
Sample 3B: Victoria Barge Canal (membrane filter)
Sample 4: Hynes Bay @ Austwell Pier
Sample 4A: Hynes Bay @ Austwell Pier (glass filter)
Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

ISENO3 Nitrate-Nitrogen by Probe
Run IV-5

Calibration (w/o NaCl)	Concentration (mg/L)	Concentration (mV)	Temp (°C)
0.50	----	418.3	21.8
5.0	----	360	21.9
10.0	----	340.9	22
slope	110%		
LCS 0.5	0.552	416.1	22
Sample 1	19.00	323.1	21.9
1-2 (MS 1.00)	18.90	323.4	21.8
Sample 2	30.3	310.1	22
Sample 3	14	331.7	21.9
Sample 4	17.1	326.1	21.9
PT 55201	21.2	320.8	19.5
PT 55201-2	21.6	320.5	18.6

*All attempts to calibrate with NaCl solution based standards
had failed calibrations and slopes that were out of range

Sample 1: SA Bay @ Seadrift
Sample 1A: SA Bay @ Seadrift (glass filter)
Sample 1B: SA Bay @ Seadrift (membrane filter)
Sample 1-2: SA Bay @ Seadrift (used for MS)
Sample 1-2A: SA Bay @ Seadrift (glass filter)
Sample 1-2B: SA Bay @ Seadrift (membrane filter)
Sample 2: Hypersaline Creek @ SH 35
Sample 2A: Hypersaline Creek @ SH 35 (glass filter)
Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)
Sample 3: Victoria Barge Canal
Sample 3A: Victoria Barge Canal (glass filter)
Sample 3B: Victoria Barge Canal (membrane filter)
Sample 4: Hynes Bay @ Austwell Pier
Sample 4A: Hynes Bay @ Austwell Pier (glass filter)
Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

CDC401 Conductivity by Probe

Calibration Date: 7/17/13

Calibration Std: 50,000 uS/cm

Calibration Result: 44200 uS/cm

Calibration Check: 50,400 uS/cm

Read 1000 std: 929 uS/cm

Run IV-6

Sample	Conductivity (uS/cm)	Salinity ($^o/_{oo}$)	Temp (°C)
1	25100	16.31	22.0
2	46100	32.20	21.8
3	15990	10.05	21.7
4	21530	13.98	21.5

Sample 1: SA Bay @ Seadrift
Sample 1A: SA Bay @ Seadrift (glass filter)
Sample 1B: SA Bay @ Seadrift (membrane filter)
Sample 1-2: SA Bay @ Seadrift (used for MS)
Sample 1-2A: SA Bay @ Seadrift (glass filter)
Sample 1-2B: SA Bay @ Seadrift (membrane filter)
Sample 2: Hypersaline Creek @ SH 35
Sample 2A: Hypersaline Creek @ SH 35 (glass filter)
Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)
Sample 3: Victoria Barge Canal
Sample 3A: Victoria Barge Canal (glass filter)
Sample 3B: Victoria Barge Canal (membrane filter)
Sample 4: Hynes Bay @ Austwell Pier
Sample 4A: Hynes Bay @ Austwell Pier (glass filter)
Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

Tables V-1-3 show analysis testing multiple repetitions of QC to show repeatability of Test-In-Tube methods

NO2-N TNT 839 LR 0.015-0.60 mg/L

Run V-1 Std/Sample	Salinity (ppt)	Repetition Concentrations (mg/L) 1	2	3	4	5	6	7	Mean	Std Deviation	%Recovery
LCS 0.10		0.105	0.107	0.107	0.108	0.105	0.106	0.105	0.106	0.0012	106%Rec
LOQ 0.02		0.020	0.024	0.020	0.020	0.021	0.021	0.020	0.021	0.0015	105%Rec
1B	16.31	0.066	0.068	.0.68	0.069	0.067	0.067	0.069	0.068	0.0012	---
1B/ MS 0.10		0.133	0.133	0.134	0.134	0.133	0.128	0.134	0.133	0.0021	65.0%Rec
2B	32.2	0.004	0.005	0.002	0.002	0.003	0.002	0.002	0.003	0.0012	---
3B	10.05	0.104	0.106	0.112	0.105	0.113	0.104	0.105	0.107	0.0038	---
4B	13.98	0.035	0.039	0.040	0.034	0.039	0.034	0.033	0.036	0.0029	---
PT 55201	14.39	0.216	0.225	0.230	0.236	0.225	0.226	0.222	0.226	0.0062	---
PT 55201/MS 0.10		0.325	0.321	0.337	0.325	0.334	0.339	0.337	0.331	0.0073	105%Rec

Calibration	Absorbance
0.02	0.039
0.05	0.100
0.1	0.198
0.3	0.575
0.6	1.160
r^2	0.999973975
Blank	0.000

PT assigned value= 0.219 mg/L

PT acceptable range= 0.153-0.285 mg/L

Sample 1B: SA Bay @ Seadrift (membrane filter)

Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)

Sample 3B: Victoria Barge Canal (membrane filter)

Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

Calibration standards made in 14 part per thousand NaCl matrix   MS=Matrix Spike

NO3-N TNT 835 LR 0.23-13.5 mg/L

Run V-2		Repetition Concentrations (mg/L)									
Std/Sample	Salinity(ppt)	1	2	3	4	5	6	7	Average	Std Deviation	%Recovery
LCS 1.00		0.818	0.901	1.040	0.957	0.901	0.874	0.901	0.913	0.070	91.3%Rec
LOQ 0.20		0.624	0.430	0.208	0.180	0.070	0.430	0.042	0.283	0.216	142%Rec
1B	16.31	0.180	0.125	0.180	0.153	0.208	0.402	0.375	0.232	0.110	---
1B/ MS 0.50		0.707	0.735	0.846	0.763	0.735	0.624	0.624	0.719	0.078	97.4%Rec
2B	32.2	1.290	1.345	1.400	1.456	1.373	1.484	1.428	1.397	0.067	---
3B	10.05	0.236	0.180	0.486	0.486	0.236	0.264	0.153	0.292	0.138	---
4B	13.98	0.125	0.291	0.236	0.180	0.291	0.347	0.180	0.236	0.078	---
PT 55201	14.39	6.114	6.114	6.252	6.529	6.807	6.252	6.612	6.383	0.269	---
PT 55201/MS 0.50		7.028	6.668	6.252	5.919	6.696	6.723	6.474	6.537	0.362	30.8%Rec

Calibration	Absorbance
0.20	-0.006
0.50	0.012
1.00	0.020
1.50	0.051
2.00	0.058
r^2	0.977988483
Blank	0.000

Calibration standards made in 14 part per thousand NaCl matrix

PT assigned value= 5.68 mg/L

PT acceptable range= 3.98-7.38 mg/L

Sample 1B: SA Bay @ Seadrift (membrane filter)

Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)

Sample 3B: Victoria Barge Canal (membrane filter)

Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

MS = Matrix Spike

NH3-N TNT 830 ULR 0.015-2.00 mg/L

Run V-3 Std/Sample	Salinity (ppt)	Repetition Concentrations (mg/L)							Average	Std Deviation	%Recovery
		1	2	3	4	5	6	7			
LCS 0.50		0.508	0.522	0.530	0.504	0.547	0.498	0.552	0.523	0.021	104.6%Rec
LOQ 0.10		0.097	0.098	0.100	0.096	0.105	0.104	0.095	0.099	0.004	99.0%Rec
1B	16.31	0.016	0.023	0.028	0.030	0.029	0.024	0.023	0.025	0.005	---
1B/ MS 0.50		0.218	0.247	0.231	0.216	0.227	0.206	0.226	0.224	0.013	39.8%Rec
2B	32.2	0.139	0.125	0.068	0.082	0.061	0.047	0.054	0.082	0.036	---
3B	10.05	0.098	0.094	0.087	0.087	0.098	0.099	0.091	0.093	0.005	---
4B	13.98	0.090	0.092	0.077	0.086	0.092	0.078	0.090	0.086	0.006	---
PT 55201 1:10 dil	14.39	6.030	6.040	6.000	6.110	6.030	6.150	6.010	6.053	0.056	---
PT 55201/MS 0.50		1.157	1.103	1.096	1.111	1.092	1.116	1.119	1.113	0.022	⌐ 102%Rec
PT 55201 w/o dil		0.603	0.604	0.600	0.611	0.603	0.615	0.601	0.605	0.00560769	⌐

Calibration	Absorbance
0.20	0.107
0.50	0.212
1.00	0.538
1.50	1.070
2.00	2.115
r^2	0.999975325
Blank	0.000

PT assigned value= 5.79 mg/L

PT acceptable range= 4.05-7.53 mg/L

Sample 1B: SA Bay @ Seadrift (membrane filter)

Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)

Sample 3B: Victoria Barge Canal (membrane filter)

Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

Calibration standards made in 14 part per thousand NaCl matrix   MS = Matrix Spike

Tables VI-1-4 show analysis using Test-In-Tubes with variable salinity concentrations

NO2-N TNT 839 LR 0.015-0.60 mg/L

Run VI-1

7 part per thousand NaCl matrix	
Calibration	Absorbance
0.02	0.040
0.05	0.091
0.1	0.213
0.3	0.634
0.6	1.224
r^2	0.99970634

14 part per thousand NaCl matrix	
Calibration	Absorbance
0.02	0.039
0.05	0.101
0.1	0.207
0.3	0.618
0.6	1.214
r^2	0.999946226

28 part per thousand NaCl matrix	
Calibration	Absorbance
0.02	0.041
0.05	0.104
0.1	0.206
0.3	0.625
0.6	1.246
r^2	0.999996898

Sample/Std	Absorbance	7ppt Result (mg/L)	14ppt Result (mg/L)	28ppt Result (mg/L)	7ppt %REC	14ppt %REC	28ppt %REC
LOQ 0.02 (7ppt)	0.037	0.017	---	---	85.0	---	---
LOQ 0.02 (14ppt)	0.039	---	0.018	---	---	90.0	---
LOQ 0.02 (28ppt)	0.044	---	---	0.021	---	---	105.0
PT55201	0.454	0.221	0.223	0.219	---	---	---
PT55201+MS 0.1	0.650	0.316	0.320	0.313	95.0	97.0	94.0
PT55203	0.108	0.052	0.052	0.052	---	---	---
PT55203+MS 0.1	0.317	0.154	0.155	0.153	102.0	103.0	101.0

	PT 55201	PT 55203
Assigned Value	0.219	0.055
Acceptance Limits	0.153-0.285	0.039-0.072

MS = Matrix Spike

7ppt = 15.0002g NaCL into 2L Type 1 DI water - True salinity value = 6.98ppt

14ppt = 30.0002g NaCL into 2L Type 1 DI water - True salinity value = 14.33ppt

28ppt = 55.0003g NaCL into 2L Type 1 DI water - True salinity value = 27.7ppt

NO3-N TNT 835 LR 0.23-13.5 mg/L

Run VI-2

7 part per thousand NaCl matrix	
Calibration	Absorbance
0.3	0.034
0.5	0.037
1	0.063
1.5	0.100
2	0.139
r^2	0.990457624

14 part per thousand NaCl matrix	
Calibration	Absorbance
0.3	0.004
0.5	0.011
1	0.029
1.5	0.049
2	0.070
r^2	0.999370631

28 part per thousand NaCl matrix	
Calibration	Absorbance
0.3	0.010
0.5	0.024
1	0.038
1.5	0.050
2	0.067
r^2	0.990583045

Sample/Std	Absorbance	7ppt Result (mg/L)	14ppt Result (mg/L)	28ppt Result (mg/L)	7ppt %REC	14ppt %REC	28ppt %REC
LOQ 0.30 (7ppt)	0.027	0.305	---	---	101.7	---	---
LOQ 0.30 (14ppt)	0.012	---	0.528	---	---	176.0	---
LOQ 0.30 (28ppt)	0.013	---	---	0.267	---	---	89.0
PT55201 1:10	0.110	1.622*10=16.2	3.06*10=30.6	3.37*10=33.7	---	---	---
PT55201+MS 0.5	0.061	0.844	1.790	1.802	-155.6	-254.0	-313.6
PT55203	0.054	0.733	1.612	1.578	---	---	---
PT55203+MS 0.5	0.071	1.003	2.051	2.122	54.8	87.8	108.8

	PT 55201	PT 55203
Assigned Value	5.68	1.42
Acceptance Limits	3.98-7.38	0.994-1.85

Sample 1B: SA Bay @ Seadrift (membrane filter)

Sample 2B: Hypersaline Creek @ SH 35 (membrane filter)

Sample 3B: Victoria Barge Canal (membrane filter)

Sample 4B: Hynes Bay @ Austwell Pier (membrane filter)

Re-Runs			14ppt	14ppt
Sample/Std	Absorbance	Result (mg/L)	%REC
LOQ 0.3	0.011	0.503	---
LOQ 0.3	0.007	0.399	90.0
LOQ 0.3	0.013	0.554	---
LOQ 0.3	0.01	0.477	---
SAMPLE 1B	0.006	0.037	
SAMPLE 1B+MS 0.5	0.025	0.864	165.4
SAMPLE 2B	0.038	1.199	
SAMPLE 3B	0.013	0.554	
SAMPLE 4B	0.016	0.632	

7ppt = 15.0002g NaCL into 2L Type 1 DI water - True salinity value = 6.98ppt

14ppt = 30.0002g NaCL into 2L Type 1 DI water - True salinity value = 14.33ppt

28ppt = 55.0003g NaCL into 2L Type 1 DI water - True salinity value = 27.7ppt   MS = Matrix Spike

NH3-N TNT 830 ULR 0.015-2.00 mg/L

Run VI-3

7 part per thousand NaCl matrix	
Calibration	Absorbance
0.1	0.111
0.2	0.209
0.5	0.509
1	1.030
2	2.186
r^2	0.999458652

14 part per thousand NaCl matrix	
Calibration	Absorbance
0.1	0.105
0.2	0.203
0.5	0.515
1	1.037
2	2.062
r^2	0.999991292

28 part per thousand NaCl matrix	
Calibration	Absorbance
0.1	0.118
0.2	0.215
0.5	0.524
1	1.046
2	2.086
r^2	0.999990864

Sample/Std	Absorbance	7ppt Result (mg/L)	14ppt Result (mg/L)	28ppt Result (mg/L)	7ppt %REC	14ppt %REC	28ppt %REC
LOQ 0.10 (7ppt)	0.107	0.117	---	---	117.0	---	---
LOQ 0.10 (14ppt)	0.107	---	0.104	---	---	104.0	---
LOQ 0.10 (28ppt)	0.115	---	---	0.102	---	---	102.0
PT55201 1:10	0.595	0.564*10=5.64	0.576*10=5.76	0.564*10=5.64	---	---	---
PT55201+MS 0.5	1.115	1.040	1.080	1.066	95.2	101.0	100.4
PT55203	1.498	1.391	1.452	1.435	---	---	---
PT55203+MS 0.5	2.112	1.953	2.046	2.026	112.4	118.8	118.2

	PT 55201	PT 55203
Assigned Value	5.79	1.45
Acceptance Limits	4.05-7.53	1.02-1.89

7ppt = 15.0002g NaCL into 2L Type 1 DI water - True salinity value = 6.98ppt
14ppt = 30.0002g NaCL into 2L Type 1 DI water - True salinity value = 14.33ppt
28ppt = 55.0003g NaCL into 2L Type 1 DI water - True salinity value = 27.7ppt   MS = Matrix Spike

NO3-N TNT 835 LR 0.23-13.5 mg/L

Run VI-4

7 part per thousand NaCl matrix	
Calibration	Absorbance
0.3	0.022
0.5	0.033
1	0.069
1.5	0.091
2	0.121
3	0.175
5	0.308
r^2	0.998862303

14 part per thousand NaCl matrix	
Calibration	Absorbance
0.3	0.012
0.5	0.027
1	0.048
1.5	0.065
2	0.086
3	0.126
5	0.202
r^2	0.999086896

28 part per thousand NaCl matrix	
Calibration	Absorbance
0.3	0.009
0.5	0.016
1	0.030
1.5	0.056
2	0.059
3	0.094
5	0.153
r^2	0.996783785

Sample/Std	Absorbance	7ppt Result (mg/L)	14ppt Result (mg/L)	28ppt Result (mg/L)	7ppt %REC	14ppt %REC	28ppt %REC
QC 0.30 (7ppt)	0.022	0.317	---	---	105.7	---	---
QC 0.30 (14ppt)	0.017	---	0.29	---	---	96.7	---
QC 0.30 (28ppt)	0.008	---	---	0.208	---	---	69.3
QC 0.50 (7ppt)	0.031	0.467	---	---	93.4	---	---
QC 0.50 (14ppt)	0.026	---	0.517	---	---	103.4	---
QC 0.50 (28ppt)	0.016	---	---	0.47	---	---	94.0
PT55201 1:10	0.039	0.60*10=6.00	0.844*10=8.44	1.225*10=12.2	---	---	---
PT55201+MS 0.5	0.048	0.750	1.071	1.520	30.0	45.4	59.0
PT55203	0.064	1.017	1.475	2.045	---	---	---
PT55203+MS 0.5	0.083	1.333	1.954	2.669	63.2	95.8	124.8

	PT 55201	PT 55203
Assigned Value	5.68	1.42
Acceptance Limits	3.98-7.38	0.994-1.85

MS = Matrix Spike

7ppt = 15.0000g NaCL into 2L Type 1 DI water

14ppt = 30.0000g NaCL into 2L Type 1 DI water

28ppt = 55.0000g NaCL into 2L Type 1 DI water