



MEMORANDUM

TO: Kim Michaelis, Town of Plymouth
FROM: Neal Price
DATE: February 15, 2011
RE: Nutrient Management Plan Baseline Water Quality Assessment Methods
CC:

The Horsley Witten Group, Inc. (HW) conducted a statistical assessment of baseline water quality data collected in the vicinity of the Town of Plymouth Wastewater Treatment Plant (WWTP). This assessment was conducted at the request of the Town to support water quality comparisons conducted by the Town as part of the Nutrient Management Plan (NMP) related to the WWTP Groundwater Discharge Permit (GWDP). The baseline water quality data includes groundwater data from twenty two monitoring wells, and surface water data from nine sites within the Eel River or associated water bodies. Baseline data includes data collected between 1998 and May of 2002 (when groundwater discharges from the WWTF began). Baseline statistics were calculated based upon spreadsheet compilations of data prepared by Town staff. The resulting statistics are presented in the attached excel spreadsheet “Ply WWTF baseline WQ stats.xlsx”.

Methodology for Surface Water and Groundwater Data Statistical Baseline Analyses

- Baseline data (1998 - May 2002) were analyzed independent of any post-WWTP data.
- Data were separated out by station.
- Because, in the statistical analyses, non-detect (ND) values are treated numerically as half the detection limit (DL), DL's were identified for each parameter that could be held consistent for both baseline and post-WWTP conditions, in order to allow for a fair and consistent comparison. This involved looking at all detection limits used over the course of the sampling and arriving at a common value that could be numerically applied as half the detection limit to both baseline and post-WWTP data, while including as much as possible of both data sets. The lowest possible “common” DL's were selected that would allow for a consistent analysis from baseline to post WWTP conditions. In general, baseline DL's were lower than post-WWTP DL's and, therefore, baseline DL's had to be artificially raised to match the post-WWTP DL's. In some cases, the post WWTP DL's were simply far too high to provide meaningful data and those values cannot, therefore, be used for statistical comparison to baseline data. In some places groundwater DL's differ from surface water DL's.

- For example, if there was a post-WWTP DL of 0.1 milligrams per Liter (mg/L) and a baseline DL of 0.05 mg/L, all ND results from both baseline and post-WWTP datasets were applied a “common” numeric value of 0.05 mg/L (half of the higher 0.1 mg/L value). This is because we know that any value reported as less than 0.05 mg/L must also be less than 0.1 mg/L, but we do not know that the converse is true. Likewise an actual data value originally reported lower than the new common DL was changed to be half of the new common DL. Otherwise any comparison of data would be inaccurate.
- Surface water – with the exception of dissolved inorganic nitrogen (DIN), dissolved organic nitrogen (DON), and particulate organic nitrogen (PON), baseline DL’s were used as indicated in the Camp Dresser and McKee (CDM) baseline report. For DIN, DON, and PON – 0.13 mg/L was used as a DL. That DL is based on re-issued data supplied by the lab (and provided to HW by the Town) for post-WWTP data. Earlier baseline data that had been originally analyzed with a lower DL were given a value of half of the post-WWTP DL of 0.13 mg/L in order to allow for a consistent comparison between baseline and post-WWTP conditions.
- Groundwater – DL’s for post-WWTP data were used for baseline and post-WWTP data. These DLs were derived from values in the groundwater quality database provided by the Town.
- For all data, in order to maintain consistency, where original data DL far exceeded the given DL (by an order of magnitude or greater), that data point was removed from the analysis. Where the original data DL was only slightly higher or lower, the “common” DL was used instead of the original data DL.
- Data removed from the analysis include data indicated on the original, Town-supplied spreadsheets as NA, NM, ---, 0, or where the original DL far exceeded the calculated “common” DL.
- All data that were below the “common” DL were valued at half the “common” DL.
- Statistics were calculated using the Descriptive Statistics function in Microsoft Excel.
- Where total nitrogen was not provided it was calculated as either DIN + DON + PON or Nitrate + Nitrite + TKN. If one of these options was not available, TN was not calculated. TN was calculated as DIN + DON + PON in all instances except for groundwater baseline data between May 1998 and February 1999.

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Groundwater Analytical Measurements Descriptive Statistics (Page 1 of 6)

Detection Limits

Parameter	Detection Limit	Value used in Analysis
TKN (mg/L)	0.13	0.065
Ortho P (mg/L)	0.1	0.05
Total P (mg/L)	0.005	0.003
Ammonium (mg/L)	0.13	0.065
Nitrate (mg/L)	0.13	0.065
Nitrite	0.13	0.065
Total Nitrogen (mg/L)	0.39	0.195
TDN (mg/L)	0.26	0.13
DIN (mg/L)	0.13	0.065
DON (mg/L)	0.13	0.065
PON (mg/L)	0.13	0.065
Boron (mg/L)	0.03	0.015
pH (units)	N/A	N/A

Baseline 1998 - May 2002

A-8/MW-11

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.003	0.003	4
Ortho-phosphate (mg/L)	0.050	0.050	0.050	4
Ammonium (mg/L)	0.065	0.065	0.065	4
Nitrate (mg/L)	0.77	1.08	1.31	4
Nitrite (mg/L)	0.065	0.065	0.065	3
Total Nitrogen (mg/L)	0.98	1.23	1.44	4
TDN (mg/L)	0.92	0.92	0.92	1
DIN (mg/L)	0.79	0.79	0.79	1
DON (mg/L)	0.13	0.13	0.13	1
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	3
Boron (mg/L)	0.015	0.024	0.039	4
pH (units)	5.56	5.66	5.80	3

A-9

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.009	0.022	11
Ortho-phosphate (mg/L)	0.05	0.05	0.05	11
Ammonium (mg/L)	0.065	0.065	0.065	10
Nitrate (mg/L)	0.32	0.65	1.27	11
Nitrite (mg/L)	0.065	0.065	0.065	3
Total Nitrogen (mg/L)	0.911	1.135	1.427	4
TDN (mg/L)	0.46	0.71	1.36	8
DIN (mg/L)	0.32	0.58	1.30	8
DON (mg/L)	0.065	0.14	0.21	8
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.12	0.22	3
Boron (mg/L)	NA	NA	NA	0
pH (units)	5.28	6.00	6.75	11

A-10

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.006	0.010	8
Ortho-phosphate (mg/L)	0.05	0.05	0.05	10
Ammonium (mg/L)	0.065	0.065	0.065	10
Nitrate (mg/L)	0.35	1.84	14.68	11
Nitrite (mg/L)	0.065	0.065	0.065	3
Total Nitrogen (mg/L)	0.52	0.75	0.96	4
TDN (mg/L)	0.43	2.43	15.24	8
DIN (mg/L)	0.39	2.27	14.68	8
DON (mg/L)	0.065	0.14	0.56	8
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	3
Boron (mg/L)	0.015	0.016	0.023	11
pH (units)	4.99	5.63	6.20	11

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Groundwater Analytical Measurements Descriptive Statistics (Page 2 of 6)

A-11

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.008	0.020	10
Ortho-phosphate (mg/L)	0.05	0.05	0.05	11
Ammonium (mg/L)	0.065	0.065	0.065	9
Nitrate (mg/L)	0.32	0.84	1.06	11
Nitrite (mg/L)	0.065	0.065	0.065	3
Total Nitrogen (mg/L)	1.020	1.09	1.19	4
TDN (mg/L)	0.87	1.06	1.70	8
DIN (mg/L)	0.32	0.80	0.97	8
DON (mg/L)	0.065	0.26	1.37	8
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	3
Boron (mg/L)	0.015	0.017	0.025	11
pH (units)	3.78	5.39	6.00	11

A-12

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.012	0.023	7
Ortho-phosphate (mg/L)	0.05	0.05	0.05	7
Ammonium (mg/L)	0.22	0.35	0.47	6
Nitrate (mg/L)	0.065	0.08	0.17	7
Nitrite (mg/L)	NA	NA	NA	0
Total Nitrogen (mg/L)	NA	NA	NA	0
TDN (mg/L)	0.51	0.67	0.80	7
DIN (mg/L)	0.22	0.38	0.53	7
DON (mg/L)	0.15	0.30	0.44	7
PON (mg/L)	NA	NA	NA	0
TKN (mg/L)	NA	NA	NA	0
Boron (mg/L)	0.015	0.015	0.015	7
pH (units)	4.77	5.45	7.30	7

A-13

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.024	0.091	9
Ortho-phosphate (mg/L)	0.05	0.05	0.05	9
Ammonium (mg/L)	0.065	0.091	0.160	9
Nitrate (mg/L)	0.14	0.37	1.68	9
Nitrite (mg/L)	0.065	0.065	0.065	2
Total Nitrogen (mg/L)	0.43	0.44	0.45	3
TDN (mg/L)	0.36	4.21	26.86	7
DIN (mg/L)	0.20	0.50	1.84	7
DON (mg/L)	0.065	3.69	25.03	7
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	2
Boron (mg/L)	0.015	0.016	0.023	9
pH (units)	2.19	4.92	5.60	9

A-15

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.031	0.051	8
Ortho-phosphate (mg/L)	0.05	0.05	0.05	8
Ammonium (mg/L)	0.065	0.065	0.065	8
Nitrate (mg/L)	0.065	0.28	1.60	8
Nitrite (mg/L)	NA	NA	NA	0
Total Nitrogen (mg/L)	NA	NA	NA	0
TDN (mg/L)	0.13	3.61	27.55	8
DIN (mg/L)	0.065	0.29	1.61	8
DON (mg/L)	0.065	3.35	25.94	8
PON (mg/L)	NA	NA	NA	0
TKN (mg/L)	NA	NA	NA	0
Boron (mg/L)	0.015	0.038	0.170	7
pH (units)	5.30	6.63	9.60	7

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Groundwater Analytical Measurements Descriptive Statistics (Page 3 of 6)

A-16

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.006	0.012	9
Ortho-phosphate (mg/L)	0.05	0.05	0.05	9
Ammonium (mg/L)	0.065	0.065	0.065	10
Nitrate (mg/L)	0.50	0.91	1.37	11
Nitrite (mg/L)	0.065	0.065	0.065	3
Total Nitrogen (mg/L)	0.77	0.86	0.93	3
TDN (mg/L)	0.85	1.44	2.11	8
DIN (mg/L)	0.50	1.02	1.43	8
DON (mg/L)	0.065	0.42	1.60	8
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	3
Boron (mg/L)	0.015	0.016	0.022	11
pH (units)	4.90	5.27	5.67	6

A-17/MW-7

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.008	0.020	8
Ortho-phosphate (mg/L)	0.050	0.050	0.050	7
Ammonium (mg/L)	0.065	0.065	0.065	7
Nitrate (mg/L)	0.49	1.79	3.68	8
Nitrite (mg/L)	0.065	0.065	0.065	3
Total Nitrogen (mg/L)	1.74	2.69	5.59	5
TDN (mg/L)	1.10	1.52	1.73	5
DIN (mg/L)	0.50	1.33	1.63	5
DON (mg/L)	0.065	0.20	0.61	5
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.66	1.84	3
Boron (mg/L)	0.015	0.028	0.059	7
pH (units)	4.40	5.18	5.80	7

A-19

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.012	0.020	6
Ortho-phosphate (mg/L)	0.050	0.050	0.050	6
Ammonium (mg/L)	0.065	0.065	0.065	6
Nitrate (mg/L)	0.190	0.30	0.71	7
Nitrite (mg/L)	NA	NA	NA	0
Total Nitrogen (mg/L)	NA	NA	NA	0
TDN (mg/L)	0.13	0.51	1.55	7
DIN (mg/L)	0.190	0.32	0.76	7
DON (mg/L)	0.065	0.20	0.79	7
PON (mg/L)	NA	NA	NA	0
TKN (mg/L)	NA	NA	NA	0
Boron (mg/L)	0.015	0.016	0.020	7
pH (units)	5.10	5.72	6.45	7

A-20

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.01	0.02	7
Ortho-phosphate (mg/L)	0.05	0.05	0.05	7
Ammonium (mg/L)	0.065	0.065	0.065	6
Nitrate (mg/L)	0.065	0.44	1.49	7
Nitrite (mg/L)	NA	NA	NA	0
Total Nitrogen (mg/L)	NA	NA	NA	0
TDN (mg/L)	0.13	0.94	2.28	7
DIN (mg/L)	0.065	0.45	1.49	7
DON (mg/L)	0.065	0.49	1.81	7
PON (mg/L)	NA	NA	NA	0
TKN (mg/L)	NA	NA	NA	0
Boron (mg/L)	0.015	0.016	0.022	7
pH (units)	2.40	5.22	6.46	7

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Groundwater Analytical Measurements Descriptive Statistics (Page 4 of 6)

6-S/6-SR

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.007	0.02	7
Ortho-phosphate (mg/L)	0.05	0.05	0.05	7
Ammonium (mg/L)	0.065	0.065	0.065	7
Nitrate (mg/L)	0.065	0.065	0.065	7
Nitrite (mg/L)	0.065	0.065	0.065	2
Total Nitrogen (mg/L)	0.195	0.195	0.195	3
TDN (mg/L)	0.13	0.20	0.50	5
DIN (mg/L)	0.065	0.065	0.065	5
DON (mg/L)	0.065	0.15	0.47	5
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	1
Boron (mg/L)	0.015	0.015	0.015	6
pH (units)	4.70	5.42	6.00	7

6-D

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.006	0.020	7
Ortho-phosphate (mg/L)	0.05	0.05	0.05	7
Ammonium (mg/L)	0.065	0.065	0.065	7
Nitrate (mg/L)	0.065	0.065	0.065	7
Nitrite (mg/L)	0.065	0.065	0.065	2
Total Nitrogen (mg/L)	0.195	0.195	0.195	3
TDN (mg/L)	0.13	0.13	0.13	5
DIN (mg/L)	0.065	0.065	0.065	5
DON (mg/L)	0.065	0.08	0.15	5
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	2
Boron (mg/L)	0.015	0.017	0.029	7
pH (units)	5.80	6.50	9.68	7

1-S

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.007	0.017	4
Ortho-phosphate (mg/L)	0.05	0.05	0.05	4
Ammonium (mg/L)	0.065	0.065	0.065	4
Nitrate (mg/L)	0.065	0.065	0.065	4
Nitrite (mg/L)	0.065	0.065	0.065	3
Total Nitrogen (mg/L)	0.20	0.36	0.68	3
TDN (mg/L)	0.13	0.13	0.13	1
DIN (mg/L)	0.065	0.065	0.065	1
DON (mg/L)	0.065	0.065	0.065	1
PON (mg/L)	NA	NA	NA	0
TKN (mg/L)	0.065	0.23	0.55	3
Boron (mg/L)	0.015	0.029	0.057	3
pH (units)	4.49	5.46	6.35	4

2S

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.005	0.013	0.026	3
Ortho-phosphate (mg/L)	0.005	0.005	0.005	3
Ammonium (mg/L)	0.065	0.065	0.065	3
Nitrate (mg/L)	0.923	2.67	4.00	3
Nitrite (mg/L)	NA	NA	NA	0
Total Nitrogen (mg/L)	1.09	1.09	1.09	1
TDN (mg/L)	0.97	2.85	4.22	3
DIN (mg/L)	0.96	2.69	4.02	3
DON (mg/L)	0.065	0.18	0.26	3
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	NA	NA	NA	0
Boron (mg/L)	0.015	0.028	0.044	3
pH (units)	4.80	5.96	8.20	4

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Groundwater Analytical Measurements Descriptive Statistics (Page 5 of 6)

2D

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.005	0.026	0.080	6
Ortho-phosphate (mg/L)	0.05	0.050	0.050	4
Ammonium (mg/L)	0.065	0.065	0.065	7
Nitrate (mg/L)	0.065	0.94	1.90	8
Nitrite (mg/L)	NA	NA	NA	0
Total Nitrogen (mg/L)	1.97	1.97	1.97	1
TDN (mg/L)	0.13	1.89	8.33	8
DIN (mg/L)	0.065	0.95	1.90	8
DON (mg/L)	0.065	0.95	6.61	8
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	NA	NA	NA	0
Boron (mg/L)	0.015	0.021	0.032	8
pH (units)	4.52	5.62	8.08	7

3-S

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.009	0.012	6
Ortho-phosphate (mg/L)	0.05	0.05	0.05	5
Ammonium (mg/L)	0.065	0.065	0.065	6
Nitrate (mg/L)	0.29	0.63	0.95	7
Nitrite (mg/L)	NA	NA	NA	0
Total Nitrogen (mg/L)	NA	NA	NA	0
TDN (mg/L)	0.31	0.69	0.99	7
DIN (mg/L)	0.29	0.63	0.95	7
DON (mg/L)	0.065	0.087	0.155	7
PON (mg/L)	NA	NA	NA	0
TKN (mg/L)	NA	NA	NA	0
Boron (mg/L)	0.015	0.031	0.110	6
pH (units)	5.27	5.62	5.90	6

3-D

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.021	0.061	5
Ortho-phosphate (mg/L)	0.0015	0.050	0.050	6
Ammonium (mg/L)	0.065	0.065	0.065	5
Nitrate (mg/L)	0.065	0.295	0.689	6
Nitrite (mg/L)	NA	NA	NA	0
Total Nitrogen (mg/L)	NA	NA	NA	0
TDN (mg/L)	0.13	0.43	0.79	6
DIN (mg/L)	0.065	0.30	0.69	6
DON (mg/L)	0.065	0.14	0.37	6
PON (mg/L)	NA	NA	NA	0
TKN (mg/L)	NA	NA	NA	0
Boron (mg/L)	0.015	0.015	0.015	6
pH (units)	4.94	5.49	5.93	6

USGS-467

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.159	0.876	6
Ortho-phosphate (mg/L)	0.050	0.050	0.050	5
Ammonium (mg/L)	0.065	0.082	0.166	6
Nitrate (mg/L)	0.065	0.065	0.065	6
Nitrite (mg/L)	0.065	0.065	0.065	2
Total Nitrogen (mg/L)	0.195	0.195	0.195	3
TDN (mg/L)	0.13	0.35	0.72	4
DIN (mg/L)	0.065	0.15	0.24	4
DON (mg/L)	0.065	0.21	0.58	4
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	2
Boron (mg/L)	0.015	0.015	0.015	5
pH (units)	5.80	6.16	6.86	6

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Groundwater Analytical Measurements Descriptive Statistics (Page 6 of 6)

USGS-468

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.115	0.659	6
Ortho-phosphate (mg/L)	0.050	0.050	0.050	6
Ammonium (mg/L)	0.065	0.084	0.18	6
Nitrate (mg/L)	0.065	0.094	0.24	6
Nitrite (mg/L)	0.065	0.065	0.065	2
Total Nitrogen (mg/L)	0.14	0.30	0.50	3
TDN (mg/L)	0.13	0.17	0.28	4
DIN (mg/L)	0.065	0.12	0.19	4
DON (mg/L)	0.065	0.065	0.065	4
PON (mg/L)	0.01	0.01	0.01	1
TKN (mg/L)	0.065	0.13	0.20	2
Boron (mg/L)	0.015	0.017	0.023	5
pH (units)	5.40	5.60	5.94	6

USGS-475

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.039	0.075	3
Ortho-phosphate (mg/L)	0.050	0.050	0.050	3
Ammonium (mg/L)	0.065	0.065	0.065	3
Nitrate (mg/L)	0.065	0.065	0.065	3
Nitrite (mg/L)	0.065	0.065	0.065	2
Total Nitrogen (mg/L)	0.195	0.195	0.195	3
TDN (mg/L)	0.13	0.13	0.13	1
DIN (mg/L)	0.065	0.065	0.065	1
DON (mg/L)	0.065	0.065	0.065	1
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	2
Boron (mg/L)	0.015	0.024	0.032	2
pH (units)	5.10	5.32	5.60	4

Bradford

Parameter	Minimum	Mean	Maximum	Count
Total Phosphorous (mg/L)	0.003	0.013	0.028	6
Ortho-phosphate (mg/L)	0.050	0.050	0.050	6
Ammonium (mg/L)	0.065	0.065	0.065	6
Nitrate (mg/L)	0.065	0.065	0.065	6
Nitrite (mg/L)	0.065	0.065	0.065	2
Total Nitrogen (mg/L)	0.195	0.195	0.195	3
TDN (mg/L)	0.13	0.17	0.29	4
DIN (mg/L)	0.065	0.065	0.065	4
DON (mg/L)	0.065	0.13	0.21	4
PON (mg/L)	0.065	0.065	0.065	1
TKN (mg/L)	0.065	0.065	0.065	2
Boron (mg/L)	0.015	0.016	0.020	5
pH (units)	5.40	5.93	6.40	6

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Surface Water Analytical Measurements Descriptive Statistics (Page 1 of 3)

Detection Limits

Parameter	Detection Limit	Value used in Analysis
Ortho P (mg/L)	0.01	0.005
Total P (mg/L)	0.05	0.025
TKN (mg/L)	0.2	0.1
Ammonia (mg/L)	0.1	0.05
Nitrate (mg/L)	0.05	0.025
Nitrite	0.05	0.025
Total Nitrogen (mg/L)	0.39	0.195
TDN (mg/L)	0.26	0.13
DIN (mg/L)	0.13	0.065
DON (mg/L)	0.13	0.065
PON (mg/L)	0.13	0.065
Boron (mg/L)	0.03	0.015
pH (units)	N/A	N/A
Chlorophyll (ug/L)	0.4	0.2

**Baseline 1998 -
May 2002**

S-1

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.014	0.023	0.030	10
Total P (mg/L)	0.025	0.029	0.066	11
TKN (mg/L)	0.100	0.291	0.530	4
Ammonia (mg/L)	0.050	0.079	0.145	11
Nitrate (mg/L)	0.143	0.180	0.204	11
Nitrite	NA	NA	NA	0
Total Nitrogen (mg/L)	0.195	0.506	0.697	7
TDN (mg/L)	0.299	0.456	0.635	7
DIN (mg/L)	0.213	0.275	0.320	7
DON (mg/L)	0.065	0.174	0.316	7
PON (mg/L)	0.065	0.081	0.177	7
Boron (mg/L)	0.015	0.022	0.070	10
pH (unitless)	5.600	6.350	7.000	8
Chlorophyll (ug/L)	0.200	0.790	1.600	9

S-2A

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.005	0.067	0.213	7
Total P (mg/L)	0.025	0.131	0.255	6
TKN (mg/L)	NA	NA	NA	0
Ammonia (mg/L)	0.050	0.050	0.050	7
Nitrate (mg/L)	0.025	0.025	0.025	7
Nitrite	NA	NA	NA	0
Total Nitrogen (mg/L)	0.403	0.900	1.514	7
TDN (mg/L)	0.130	0.335	0.778	7
DIN (mg/L)	0.065	0.116	0.424	7
DON (mg/L)	0.187	0.294	0.556	7
PON (mg/L)	0.151	0.523	0.936	7
Boron (mg/L)	0.015	0.020	0.030	6
pH (unitless)	6.500	6.500	6.500	1
Chlorophyll (ug/L)	3.200	13.980	31.000	6

S-3A

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.005	0.018	0.056	15
Total P (mg/L)	0.025	0.025	0.025	15
TKN (mg/L)	0.100	0.284	0.680	7
Ammonia (mg/L)	0.050	0.060	0.139	15
Nitrate (mg/L)	0.025	0.071	0.233	15
Nitrite	0.025	0.025	0.025	7
Total Nitrogen (mg/L)	0.195	0.570	2.114	15
TDN (mg/L)	0.130	0.593	1.968	8
DIN (mg/L)	0.065	0.131	0.265	8
DON (mg/L)	0.065	0.458	1.847	8
PON (mg/L)	0.065	0.125	0.199	8
Boron (mg/L)	0.015	0.022	0.068	15
pH (unitless)	5.730	6.560	7.150	15
Chlorophyll (ug/L)	0.200	5.080	38.000	15

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Surface Water Analytical Measurements Descriptive Statistics (Page 2 of 3)

S-4A

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.005	0.020	0.120	15
Total P (mg/L)	0.025	0.032	0.120	14
TKN (mg/L)	0.100	0.197	0.450	7
Ammonia (mg/L)	0.050	0.050	0.050	15
Nitrate (mg/L)	0.025	0.025	0.025	15
Nitrite	0.025	0.025	0.025	7
Total Nitrogen (mg/L)	0.195	0.243	0.540	14
TDN (mg/L)	0.130	0.154	0.318	8
DIN (mg/L)	0.065	0.065	0.065	8
DON (mg/L)	0.065	0.136	0.297	8
PON (mg/L)	0.065	0.086	0.157	8
Boron (mg/L)	0.015	0.019	0.055	15
pH (unitless)	5.710	6.390	7.000	13
Chlorophyll (ug/L)	0.200	1.400	3.200	15

S-5B

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.005	0.020	0.055	15
Total P (mg/L)	0.025	0.027	0.055	15
TKN (mg/L)	0.100	0.312	0.650	7
Ammonia (mg/L)	0.050	0.050	0.050	15
Nitrate (mg/L)	0.025	0.069	0.203	15
Nitrite	0.025	0.025	0.025	7
Total Nitrogen (mg/L)	0.195	0.418	0.826	15
TDN (mg/L)	0.130	0.207	0.376	8
DIN (mg/L)	0.065	0.117	0.318	8
DON (mg/L)	0.133	0.182	0.318	8
PON (mg/L)	0.065	0.181	0.382	8
Boron (mg/L)	0.015	0.025	0.077	15
pH (unitless)	6.100	6.750	7.400	12
Chlorophyll (ug/L)	0.200	3.700	17.000	15

S-6A

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.005	0.052	0.251	14
Total P (mg/L)	0.025	0.054	0.196	14
TKN (mg/L)	0.100	0.371	1.030	7
Ammonia (mg/L)	0.039	0.056	0.121	14
Nitrate (mg/L)	0.077	0.239	0.434	14
Nitrite	0.025	0.025	0.025	7
Total Nitrogen (mg/L)	0.328	0.639	1.327	14
TDN (mg/L)	0.230	0.464	0.928	7
DIN (mg/L)	0.065	0.248	0.410	7
DON (mg/L)	0.099	0.212	0.518	7
PON (mg/L)	0.069	0.137	0.209	7
Boron (mg/L)	0.015	0.032	0.257	15
pH (unitless)	5.600	6.185	7.110	14
Chlorophyll (ug/L)	0.200	1.690	4.100	15

S-7

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.005	0.018	0.026	7
Total P (mg/L)	0.025	0.025	0.025	3
TKN (mg/L)	0.100	0.313	0.574	7
Ammonia (mg/L)	0.050	0.050	0.050	7
Nitrate (mg/L)	0.025	0.025	0.025	4
Nitrite	NA	NA	NA	0
Total Nitrogen (mg/L)	0.195	0.328	0.615	7
TDN (mg/L)	0.130	0.230	0.414	7
DIN (mg/L)	0.065	0.065	0.065	7
DON (mg/L)	0.065	0.219	0.372	7
PON (mg/L)	0.065	0.098	0.202	7
Boron (mg/L)	NA	NA	NA	NA
pH (unitless)	NA	NA	NA	NA
Chlorophyll (ug/L)	NA	NA	NA	NA

Eel River Watershed Comparison Between Baseline (1998-2002) & Post-WWTP Conditions (2002-2008) - Surface Water Analytical Measurements Descriptive Statistics (Page 3 of 3)

S-9A

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.005	0.008	0.014	3
Total P (mg/L)	0.025	0.025	0.025	3
TKN (mg/L)	NA	NA	NA	0
Ammonia (mg/L)	0.050	0.050	0.050	3
Nitrate (mg/L)	0.191	0.285	0.381	3
Nitrite	NA	NA	NA	0
Total Nitrogen (mg/L)	0.422	0.605	0.860	3
TDN (mg/L)	0.407	0.537	0.794	3
DIN (mg/L)	0.212	0.302	0.403	3
DON (mg/L)	0.065	0.238	0.583	3
PON (mg/L)	0.065	0.065	0.065	3
Boron (mg/L)	0.015	0.077	0.200	3
pH (unitless)	5.600	6.300	7.470	3
Chlorophyll (ug/L)	0.800	5.270	13.000	3

S-10

Parameter	Minimum	Mean	Maximum	Count
Ortho P (mg/L)	0.005	0.018	0.033	8
Total P (mg/L)	0.025	0.025	0.025	3
TKN (mg/L)	0.100	0.328	0.643	8
Ammonia (mg/L)	0.050	0.050	0.050	8
Nitrate (mg/L)	0.025	0.025	0.025	5
Nitrite	NA	NA	NA	0
Total Nitrogen (mg/L)	0.195	0.317	0.696	8
TDN (mg/L)	0.130	0.243	0.578	8
DIN (mg/L)	0.065	0.065	0.065	8
DON (mg/L)	0.065	0.239	0.501	8
PON (mg/L)	0.065	0.093	0.213	8
Boron (mg/L)	NA	NA	NA	NA
pH (unitless)	NA	NA	NA	NA
Chlorophyll (ug/L)	NA	NA	NA	NA