Gary L. Kelterborn
Project Coordinator

August 25, 2009

VIA EMAIL

Mr. Ross del Rosario
U.S. EPA, Region 5
77 West Jackson Blvd.
Chicago, IL 60604-3590

RE: Administrative Order on Consent for Removal Action, Docket No. VW-05-C-810
Submittal of Baseline Ecological Investigation Report LTB CKD Release Site – August 2009

Dear Mr. del Rosario,

This letter transmits to EPA the Baseline Ecological Investigation Report for the Little Traverse Bay CKD Release Site. Due to the file size, only portions (text, figures, and tables) are being transmitted via e-mail. The entire document is being shipped to you and is posted on the Barr website at the following location:

01) Project Information
Plans and Reports
Baseline Eco Investigation Rpt

If you have any questions, please contact me at 517-788-2482.

Sincerely,

Gary L. Kelterborn
Project Coordinator

Cc: Ralph Dollhoph, EPA
Chris Liszewski, EPA Counsel
Rachel Schwarz, Odawa
Robert Wagner, MDEQ
Scott Kendzierski, Health Agency

Baseline Ecological Investigation for Benthic Organisms and Periphyton Community for Reference and CKD Leachate Release Areas
and
Mercury Bioaccumulation Assessment by Sampling and Analysis of Biomass of Dreissenid Mussels

Prepared for:

CMS Land Company
Jackson, MI

Prepared by:

Ish, Inc.
Raleigh, NC

EA Engineering, Science, & Technology, Inc
Deerfield, IL

PhycoTech, Inc.
St. Joseph, MI

August 2009

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LIST OF ACRONYMS AND SYMBOLS

°C	-	degrees centigrade
CKD	-	cement kiln dust
cm	-	centimeter
cm^2	-	square centimeter
CMC-10	-	commercial slide mounting media
EA	-	EA Engineering, Science, Technology, Inc.
ed	-	editor
EPT	-	combined number of Ephemeroptera, Plecoptera, and Trichoptera taxa
et al.	-	et alii, Latin for “and others”
ft	-	feet
>	-	greater than
gal	-	gallon
GALD	-	glutaraldehyde
GPS	-	Global Positioning System
HPMA	-	2-hydroxypropyl methacrylate
i.e.,	-	exempli gratia, Latin for “for the sake of example"
IL	-	Illinois
in	-	inch
INHS	-	Illinois Natural History Survey
KOH	-	potassium hydroxide
L	-	liter
lb(s)	-	pound(s)
Lg	-	large
LSD	-	least significant difference
m	-	meter
mg/L	-	milligram per liter
mL	-	milliliter
mm	-	millimeter
µm	-	micrometer
µS/cm	-	microsiemens per centimeter
#	-	number
No.	-	number
NTU	-	nephelometric turbidity units
OEPA	-	Ohio Environmental Protection Agency
%	-	percent

LIST OF ACRONYMS AND SYMBOLS (CONTINUED)

PA	-	Pennsylvania
pH	-	activity of hydrogen ions
PhD	-	doctor of philosophy
pp	-	pages
PVC	-	polyvinyl chloride
QA/QC	-	quality assurance/quality control
Ret.	-	retrieve
RPM	-	revolutions per minute
SEM	-	scanning electron microscopy
Sm	-	small
STL	-	Severn-Trent Laboratories
USEPA	-	United States Environmental Protection Agency
Vol.	-	volume

1. Introduction

This Baseline Ecological Investigation has been prepared on behalf of CMS Land Company and CMS Capital, LLC to describe aquatic community and mercury bioassessment surveys conducted at the Little Traverse Bay Cement Kiln Dust (CKD) Release Site. The LTB CKD Release Site is located along five miles of shoreline on Little Traverse Bay of Lake Michigan, approximately five miles west of the City of Petoskey, Michigan.

The site contains four cement kiln dust (CKD) piles that are releasing leachate into Little Traverse Bay. These CKD piles are identified as East CKD (ECKD), Seep 1 (SEEP1), Seep 2 (SEEP2), and West CKD (WCKD). Remedial investigations have been conducted to examine the subsurface geological, hydrological, and chemical conditions. In addition, removal actions have been implemented to intercept, collect, and treat leachate from the affected areas.

As part of the overall CKD leachate environmental characterization work in this area, a baseline ecological assessment focused on benthic macroinvertebrates and periphytic algae (periphyton) was conducted from May through October of 2006. In addition to the baseline ecological characterization, zebra and quagga mussel tissue was collected and analyzed to assess the potential uptake of mercury associated with the CKD leachate in Little Travese Bay. The objectives of the baseline ecological evaluation were:

1) Provide a general ecological profile of the study area,
2) Evaluate effects, if any, related to the CKD leachate, and
3) Document the progress of the site remediation.

Six study areas were selected: the four affected areas described above and two reference areas east (EREF) and west (WREF) of the leachate release areas (Figures 1 - 3). Sampling sites within the CKD affected areas were selected based on historic elevated pH readings. The reference sampling sites were selected in close proximity of the affected areas; however, historic pH readings indicate that these areas are outside of the CKD affected area. In each study area, benthic macroinvertebrates and periphytic algae (periphyton) were collected at on-shore and off-shore sampling locations. Quantitative sampling was conducted in both spring and fall while qualitative collections were only made in the fall of 2006. Likewise, mussel tissue samples were collected from the same six study areas. However, as with the qualitative ecological sampling, the tissue collections were restricted to the fall when mussel biomass and density were likely highest. All field work and analyses were conducted in accordance with work plans approved by the US Environmental Protection Agency (USEPA) (Appendix A and Appendix B).

2. Methods

2.1 Aquatic Community

The baseline ecological characterization was carried out in two phases. In January 2006, a survey of the natural substrate was conducted in the affected and reference areas to determine an appropriate approach to sampling benthic macroinvertebrates and periphyton (Appendix C). The survey included a visual inspection of all target areas and qualitative sampling the benthic macroinvertebrate community. As expected for a nearshore lacustrine environment, the study area is turbulent and lacks unidirectional flow. This factor alone renders most active sampling devices such as kick nets, sweep nets, drift nets, Surber samplers, and Hess samplers relatively ineffective at collecting accurate quantitative data. In addition, the reconnaissance survey revealed that the study area substrate largely consists of cobble, boulder, and bedrock, which limits the usefulness of dredge devices for quantitative collections. Given the dominant substrate types and lack of flow, artificial substrate samplers that approximated the native substrate were recommended as the primary sampling method.

There are a number of review papers in the literature discussing the use of artificial substrate materials for the sampling and enumeration of benthic invertebrates from habitats difficult to sample by other means (Rosenberg and Resh, 1982; Golder Associates, Ltd., undated). Although Rosenberg and Resh (1982) listed cost, colonization selectivity, and sampler loss as possible limitations, they also listed several advantages to using artificial substrates in benthic macroinvertebrate sampling.

After consideration of the various sampler designs available, basket samplers filled with manufactured material rather than native rock were proposed. The advantages of using manufactured materials as the colonizing substrate included:

- Manufactured materials provide a standardized size and shape with a surface area that is easily quantified and replicated (Rosenberg and Resh 1982).
- In this particular instance, not only are the substrate pieces standardized, they approximate the natural cobble substrate in the study area.
- Manufactured materials eliminate error and effort associated with cleaning native substrates.
- Artificial materials such as those described above are readily available from manufacturers and can be used repeatedly, if necessary.

2.1.1 General Field Approach

The second phase of the ecological characterization involved the deployment and collection of samplers from affected and reference areas. The basket samplers that were used for the study were essentially modified barbeque baskets. Each basket sampler had a diameter of 7-in and was 10-in long constructed with 0.75-in^2, 14 gauge, PVC coated, galvanized wire mesh. Each

sampler was filled with 12, 3-in porcelain spheres to provide a consistent amount of surface area among all of the samplers. The 12 spheres completely filled the basket, leaving little room for movement of the substrate material.

In each of the six sampling areas, the basket samplers were deployed at two depths: near-shore at shallow depth and off-shore at deeper depth. Therefore, sampling was conducted at two locations in each of the six areas for a total of 12 sampling locations. Four benthos and four periphyton samplers were deployed at each location (total of 96 basket samplers). However, only three of the four samplers of each type were fully processed at each location. Two extra basket samplers were deployed as a contingency for those samplers potentially lost to vandalism, storms, etc. Therefore, a total of 72 basket samplers were processed during each sampling event; 36 benthic macroinvertebrate samples and 36 periphyton samples.

The samplers were deployed perpendicular to shore, along each depth contour, and on the lake bottom. The off-shore baskets were set in the water no more than 3-ft deep while the near-shore samplers were deployed at a depth of approximately 18-in. Two galvanized unistrut rails were set approximately 4-ft apart. Each end of both rails was bolted to a 50-lb concrete block and spreader bars to prevent the rails from moving together, increase the overall weight of the assembly, and enhance sampler stability. Eight baskets were placed between the rails, spaced approximately 4-6-in apart. Each basket was attached to the rails on opposite ends using 1/8-in diameter stainless steel braided cable. In addition, to maintain tension on the cable and minimize basket movement associated with wave action, a shock cord was connected from one end of each basket to the opposing rail. The photograph below illustrates a sampler assembly after being deployed at the EREF nearshore location:

For each assembly, the samplers were numbered one through eight from left to right when facing shore. During each sampling event, the samplers remained in place for at least a six-week colonization period. During each colonization period, debris collecting on the basket mesh was removed as necessary so as not to block sunlight from reaching the artificial substrates.

Since no method completely prevents the loss of organisms, sampler retrieval was conducted as carefully as possible to minimize the loss of organisms. Starting at one end of the assembly, each basket was handled separately. The first basket was stabilized by one person using a pair of man-hole cover hooks while the second person disconnected the shock cord and cable clips that were attached to each end of the basket. Once the basket was no longer tethered to the assembly rails, the second person placed a long-handled, box-type kick net with a 500-µm mesh bag parallel to the sampler. The person holding the sampler steady then gently placed the sampler in the net bag and in one consistent motion, the sampler was brought to the surface, out of the water, and then to the shore where it was processed. Each basket was retrieved from the assemblies in the same manner. Depending on the condition of each sampler in a given assembly, three samplers were individually processed as replicates for periphyton and three samplers were individually processed as replicates for benthic macroinvertebrates. If all eight samplers were in good condition, the two extra samplers were cleaned for the next sampling event but not preserved.

In addition to the benthic macroinvertebrate and periphyton sampling, physicochemical parameters were measured using a daily calibrated YSI 556 at each of the 12 sampling locations. The measured parameters included temperature (°C), specific conductance (µS/cm), dissolved oxygen (mg/L), pH, and turbidity (NTU). All parameters were measured at each sampling location during the set and retrieval events as well as, if possible, weekly during each colonization period.

Field studies for the baseline ecological characterization were completed in 2006. The quantitative (basket sampler) collections were conducted in June and October. However, the qualitative collections were only conducted in the fall.

2.1.2 Benthos Sample Collection Processing

Field sample processing of the retrieved basket samplers was conducted differently for the benthic macroinvertebrate and periphyton samplers. The benthic macroinvertebrate samplers were brought to shore and the spheres from each basket were transferred to individual 5-gallon buckets half-full of ambient water. Using a coarse cleaning pad and forceps, each of the spheres from each sampler were individually cleaned, rinsed, and placed back in the sampler. After all the spheres from each sampler were processed, the cleaning utensils were rinsed into the sample and inspected. The sample liquid and debris were then passed through a 500-µm sieve, transferred to a 1-L jar, and preserved with 10% formalin. Internal and external labels were placed in and on each jar identifying the project, location, sample replicate, date, and time. All samples remained in the custody of EA Engineering, Science, & Technology, Inc. (EA) and were directly transported to EA's laboratory in Deerfield, Illinois.

In October, along with the basket sample collections, a qualitative sample was collected from each of the six sampling areas. The qualitative collections consisted of sweep netting and hand-picking natural substrates throughout each area until all habitat types were effectively sampled and no new taxa were observed. Qualitative sample handling and preservation was the same as the basket samplers.

In the laboratory, benthos sample handling and processing followed generally accepted methods described in Klemm et al. (1990). Upon arrival at the laboratory, the samples were logged and assigned an alpha-numeric tracking number. Prior to sorting, each sample was rinsed with water through a 500-µm mesh sieve to remove the preservative. The sample was then placed in a grided, white, photo-developing pan for sorting the organisms from the debris. All samples were examined for large and obviously rare taxa prior to sorting. For samples containing fewer than 500 organisms, the entire sample was "picked" and all benthic macroinvertebrates were removed. If the number of organisms in a given sample was excessive (>500 individuals), sub-sampling was conducted to achieve a more manageable number for analysis. Sub-sampling was conducted by randomly choosing grids and removing the entire contents of the selected grids until a minimum sample of 500 organisms was achieved (Klemm et al. 1990). All sample material that was not analyzed as part of the subsample was preserved using 70% ethyl alcohol and archived. Prior to identification, chironomids were cleared in 10% warm KOH and whole mounted on glass slides using CMC-10. The slides were allowed to set for a minimum of four to five days prior to handling.

Identifications were made to the lowest practical taxon (usually genus or species) using a 10-70X Bausch & Lomb Stereo-Zoom dissecting scope and 800-2000X Zeiss compound microscope. All identifications were made using established literature resources. Identifications and counts for each taxon were recorded on a standard laboratory data sheet. The total number of organisms for each taxon and for the sample as a whole was reported as number per sample.

2.1.3 Periphyton Sample Processing

Like the benthic macroinvertebrate samples, upon reaching shore, the periphyton samplers were opened and the spheres from each sampler were transferred into individual shallow wash basins filled with a minimum amount of water (i.e., < 1-L). A soft bristle brush and sponge were used to gently clean each of the 12 spheres in a sample before they were returned to the sampler basket. After all the spheres were processed, the cleaning utensils were rinsed into the sample and inspected. For each sample, approximately 10% was drawn off separately. This portion of the sample was preserved with 10% formalin for potential future microinvertebrate analysis. The remaining sample liquid and debris was then transferred to one or more amber 1-L jars and preserved with a 0.25% glutaraldehyde solution. Using glutaraldehyde instead of Lugol's solution as a preservative allowed for the use of fluorescence during microscopic examination of the sample. In turn, fluorescence allowed for faster and more accurate enumeration. An external label was placed on each jar identifying the project, location, replicate, date, and time. While in the field, the samples were stored in coolers to maintain dark and cool conditions until they were processed in the laboratory. If necessary, ice was used to keep the samples cool during collections. All samples remained in EA's custody during the field collections and were transported directly to Phycotech's laboratory in St. Joseph, Michigan.

As with the benthos collections, periphyton was sampled from the natural substrates in each of the six sampling areas during October. However, unlike the benthos, periphyton scrapes were collected in known quantities and thus were quantitative. The natural substrate periphyton collections consisted of collecting 10, 4-in^2 scrapes from the native substrate throughout each area. Natural substrate sample handling and preservation was the same as the basket samplers.

Upon arrival at the laboratory, each sample received was assigned an individual tracking number. The sample bottle, chain-of-custody, and sample log sheet, which accompany each sample sent, were then used in conjunction with one another, to track the individual samples. Rock basket and natural substrate samples were processed in an identical manner. The samples were permanently mounted in a multi-step process using both 2-hydroxypropyl methacrylate (HPMA) mounts for the whole sample analysis and Naphrax, acid cleaned mounts, for diatom analysis. The HPMA method for producing algal sample slides provides an optically clear background while permanently infiltrating and preserving the sample for archival purposes. Mounting distortion is minimal and the method provides the advantage of being able to go 100x to 1000x on the same specimen. Wet sample is always maintained in case clarification of identification is necessary. It offers minimal distortion and allows the use of epifluorescence on algal samples while counting, which can dramatically improve the final results. Periphyton samples in the Bay Harbor study were preserved in 0.25% glutaraldehyde final concentration, which is the preservative of choice for this method.

2.1.3.1 Slide Preparation

The general procedure for slide preparation was based on Crumpton (1987) and St. Amand (1990). The actual details of slide preparation are proprietary; however, the general sample preparation procedures are as follows:

1. The sample was sonicated for two minutes and then shaken well (200 times). Millipore 6-place stainless steel manifold and 15 mL Millipore Filtration Towers were used to mount samples. Because these samples were dominated during certain times of year by macroalgae, we stratified the mounting and counting approach to include a separate macroalgae mount to better estimate macroalgae densities. On average, microalgae samples were mounted at 0.05 mL and macroalgae samples were mounted at 1.0 mL, although test mounts for each sample were completed prior to final mounting.

2. The membrane filters were put onto filtration bases and wet with distilled water. Excess water was drained through filter. Filter towers were assembled.

3. The periphyton sample was measured using a micropipetor or macropipetor. For microalgae, the periphyton sample was removed with micropipetor (usually from 0.05-0.5 mL), diluted to 10 mL in a graduated cylinder with distilled water, and agitated to mix. A Sample volume was chosen so that each field at 1000x contains approximately 20-30 cells.

4. The sample was added to the tower and the valve was opened. The graduated cylinder was rinsed into the tower. The sample was filtered until water <u>just</u> cleared the filter surface. The valve was closed and the filtration tower was removed just after the water disappeared from the inner edge of the tower.

5. The filter was placed face down, on a cover slip (# 1.5), being careful to avoid bubbles under the filter.

6. One to two drops of clear resin was added to the back of the filter, and the cover slip was rotated until the resin covered the back of the filter.

7. The cover slips were placed on the drying rack in a drying oven for 12 to 24 hours.

8. The cover slips were then removed from oven. One drop of resin was added to the filter side of the cover slip and attached to a labeled slide. As little resin as possible was added to cover the filter surface.

9. The slides were put back in the oven and allowed to polymerize for approximately 24 hours.

10. The slides were labeled with computer generated labels. All slides were labeled with a Tracking ID. The slide labels appear on the left side of the slide, and an additional tracking code label was embedded under the cover slip with the filter.

2.1.3.2 Counting Procedure

The primary microscope was an Olympus BX51, research-grade compound microscope equipped with Brightfield optics(40x, 100x, 200x, 400x, 1000x), Nomarski optics (100x, 200x, 400x, and 1000x), Phase Optics (200x, 400x, 1000x), a 1.25-2X multiplier, epifluorescence (blue, green and UV Excitation), and a trinocular head for photography, with a SpotFlex digital camera attached

Samples were enumerated within ASA directly, a proprietary database. All calculations were completed within ASA, including concentrations, biovolumes, biomasses and diversity indices with output generated by ASA and saved in Excel format.

Periphyton samples were dominated by diatoms, therefore a minimum of 15 fields was counted at 1000x, and a minimum of 400 natural units total (when possible, maximum of 100 fields). In addition, macroalgae were counted according to size distribution for a minimum of 45 fields at either 100x and up to 30 filed at 400x. The number of fields counted was spread evenly over the three slides provided for each sample (i.e. 30 total fields, 10 fields per slide). Counting was completed when the standard error of the mean of the total number of natural units per field was less than 10%. For species identifications of diatoms, acid cleaned mounts in Naphrax were also prepared, but counts were made off of the HPMA slides.

2.1.4 Data Analysis

The benthic macroinvertebrate basket sampler data was summarized as number (per sample) and relative abundance of each taxon, total density (number per sample), total taxa richness, and Ephemeroptera, Plecoptera, Trichoptera (EPT) richness for each replicate and location. Like the

benthic data, the periphyton basket sampler results were summarized as density and relative abundance of each taxon, total density, and total richness.

Individual taxa results from the qualitative benthos collections were summarized as assigned abundance; 1 for taxa represented by ≤ 3 individuals, 3 for taxa represented by 3-9 individuals, and 10 for taxa represented by ≥ 10 individuals in a given sample. In addition, total taxa richness and EPT richness were summarized for each area.

The periphyton data were summarized as total concentration (NU/sq^2), total biovolume (um^3/sq^2) and taxa richness data for the periphyton community characterization both in June and in October 2006 samples.

These data were summarized to characterize the general composition of the benthic and periphyton communities at the Little Traverse Bay CKD leachate release sites and the nearby reference areas.

Statistically, for each sampling location, the benthic basket sampler data were used to compute the arithmetic mean values for various response variables measured for each basket. Since the data are nonparametric, a two-factor (study area and location) Fisher's Least Significant Difference (LSD) test was performed on rankits as per the Conover-Inman procedure (Conover 1998) to compare means among the sample areas (e.g., East Reference vs. Seep 1) and between sample locations (i.e., near-shore versus off-shore). All treatment comparisons were conducted with a Type I error rate of 5% (i.e., $\alpha = 0.05$).

The periphyton data were analyzed using Primer 6 to determine if there were any assemblage differences among stations as determined by multi-dimensional scaling (MDS).

2.2 Mussel Tissue

In September 2006, CMS Land submitted a work plan to the USEPA for conducting a baseline ecological monitoring program for the potential effects of mercury discharge from the CKD leachate into the Little Traverse Bay. After several discussions and clarifications, USEPA approved the work plan in October (Appendix B) for collecting and analyzing dreissenid mussels from the Little Traverse Bay area for determining mercury concentrations in the mussel tissues.

Dreissenid mussels (Zebra and Quagga) are invasive aquatic species that easily attach to natural and artificial hard substrates in freshwater. They are relatively fast growing to moderate sizes, remain stationary in the water body where exposure and potential bioaccumulation of mercury (Hg) can occur, and are typically widespread and abundant in the Great Lakes. These characteristics make dreissends a suitable test organism for Hg uptake potential.

As with the baseline ecological characterization, the mussel tissue collections were conducted in two phases. The initial phase was conducted prior to submittal of the work plan to the USEPA in September 2006. Due to concerns raised by the USEPA regarding the presence and abundance of zebra mussels in the Little Traverse Bay to assess bioaccumulation of mercury, CMS asked the Ish Inc. team to conduct a field survey of the six areas sampled as part of the baseline

ecological characterization to determine if a sufficient quantity of zebra mussel biomass was available to perform the mercury bioaccumulation study. Marty Sneen of EA Engineering, Dan Staub of Pescador, and Ish Murarka of Ish Inc. carried out a qualitative assessment of the presence/absence of mussels in the six areas of Little Traverse Bay on 9 and 10 August 2006. Observations from this survey resulted in the conclusion that replicate samples of more than 10-g of zebra mussels biomass will be feasible from at least five of the six study areas (Appendix D).

The second phase of this study involved the collection of dreissenid mussels in conjunction with the fall benthic macroinvertebrate and periphyton sampling event to assess the occurrence and extent of mercury bioaccumulation associated with the CKD leachate.

2.2.1 Tissue Sample Processing

Sample processing and analysis generally followed *USEPA's Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1, Fish Sampling and Analysis, Third Edition* (USEPA 2000). Dreissenid mussel samples were collected from the same six areas as the periphyton and benthic macroinvertibrate samples. Two replicates were collected from each sampling area. Each sampling area was divided in half (east to west) and one replicate was collected in each section of each sampling area. At ECKD, along with the replicate samples, mussels that had been originally collected from EREF and transplanted in the ECKD area during early August were collected. Finally, a field duplicate sample was collected from the WREF area. The mussels were collected whole and unshucked from the natural substrate with a preference for more mature (i.e., larger and older) specimens. Approximately 20-g of tissue was targeted for each replicate based on the relationship between whole-body and soft tissue mass and the desire to collect a minimum of 10-g of soft tissue. For each sample, the specimens were transferred to labeled bags, sealed, and placed in a cooler on ice.

Fourteen mussel tissue samples were shipped to Columbia Analytical Services in Kelso, WA for analysis of mercury in whole-body samples using USEPA method 1631 (Appendix E). The samples arrived at the laboratory on 1 November 2006 in good condition and consistent with the enclosed chain of custody form. The samples were stored by the laboratory at -20 °C immediately after they were received. Each sample was individually homogenized using a blender in the laboratory. After homogenization of the whole-body tissue, a representative aliquot was removed from the sample for freeze drying. Additional milling of the freeze dried material was necessary to homogenize the meal prior to analysis and the mercury analysis was performed on freeze dried material from each sample.

2.2.2 Data Analysis

The samples were analyzed for total mercury concentrations and were reported on a dry weight basis. The resulting mercury concentration data from each area was compared to the reference areas using a single-tailed t-test at the 95% confidence level.

3. Results and Discussion

3.1 Aquatic Community

The basket samplers were deployed and retrieved during two separate sampling events in 2006. For the spring/summer event, the samplers were deployed on 16-17 May and retrieved on 26-29 June. For the summer/fall sampling event, the samplers were deployed on 6-7 September and retrieved on 24-26 October. In addition to retrieving the basket samplers in October, the benthic macroinvertebrate and periphyton communities were sampled qualitatively in each of the six areas concurrent with the basket retrieval.

3.1.1 Benthic Macroinvertebrate Community

The combined quantitative and qualitative sample collections yielded 69 total benthic macroinvertebrate taxa (Table 1). Total taxa richness was similar between the two sample types. The rock basket samples yielded 50 total taxa while 54 taxa were observed in the qualitative samples. There were 36 taxa common to both types. Regardless of sample type, the most taxa rich major group was clearly Chironomidae with 33 taxa followed by Ephemeroptera with 11 taxa and Trichoptera with seven taxa. Ephemeroptera and Trichoptera, together with Plecoptera are collectively known as EPT taxa. EPT taxa are generally considered more environmentally intolerant than most other benthic macroinvertebrate groups. Overall, 19 EPT taxa were observed in the Little Traverse Bay collections with 16 EPT taxa each being observed in both the quantitative and qualitative samples. Raw data by area, location, and sampling event are presented in Appendix F.

3.1.1.1 June Results

In June, based on the combined replicates by location, total richness ranged from 25 taxa at SEEP2 nearshore (Table 2) to 10 taxa at ECKD offshore (Table 3). Total abundance was also lowest at ECKD offshore in June but was highest at SEEP1 offshore. EPT richness was similarly low at all locations ranging from zero at EREF offshore to five taxa at the nearshore location of SEEP1 and WCKD.

Among the nearshore samples, total abundance, total richness, and EPT richness were similarly higher at the adjacent areas SEEP1 and SEEP2 (Table 2). In contrast, total abundance and richness were lowest at ECKD while EPT richness was lowest at EREF. Two chironomid taxa, *Cricotopus bicinctus* grp. and *C. tremulus* grp. represented the first or second most abundant taxon in each of the six nearshore sampling areas. Both taxa are common to North American lakes and streams, including Lake Michigan (Winnell and White 1985). Barton (1986) found that multiple *Cricotopus* taxa were most abundant in the rocky shallows of Lake Ontario similar to the Little Traverse Bay study area. In terms of environmental tolerance, *C. tremulus* grp. is considered facultative while *C. bicinctus* is generally viewed as extremely tolerant to a variety of impact forms (Simpson and Bode 1980). The more pollution intolerant taxa such as EPT and Tanytarsini chironomids (OEPA 1987) were observed in relatively low numbers among the nearshore areas. The only exceptions to this were the chironomids *Paratanytarsus* and

Rheotanytarsus, which were collected in all nearshore samples and were particularly more abundant at EREF. Additionally, the mayfly *Caenis* and caddisfly *Hydroptila* were observed in samples from the four western areas and in abundances greater than one percent of the total at some locations.

The offshore results were similar in many respects to nearshore. For example, offshore total abundance and total richness followed a pattern identical to nearshore; these parameters were highest at SEEP1 and SEEP2, respectively, and lowest at ECKD. In addition, as was observed in the nearshore samples, EPT richness was lowest at EREF (Table 3). Like nearshore, *C. bicinctus* was fairly common offshore and was the most abundant taxon at four of the six offshore sampling areas while the facultative aquatic worm Naidinae was the most abundant taxon at SEEP1 and SEEP2. *Rheotanytarsus* was roughly as abundant offshore as nearshore and was represented by greater than one percent of the total abundance at all offshore sampling areas. *Hydroptila* was the only EPT taxon offshore that achieved greater than one percent relative abundance and that occurred at WCKD.

3.1.1.2 October Results

Overall, total abundance and total richness were lower in October compared to June while EPT richness in October was equal to or greater than in June. Although these seasonal differences were apparent over the entire study area, they were not always consistent by individual areas or locations. In October, based on the combined replicates by location, total richness ranged from 22 taxa at EREF nearshore (Table 4) to three taxa at SEEP2 offshore (Table 5). Total abundance was also lowest at SEEP2 offshore but was highest at EREF nearshore. EPT richness ranged from three to five taxa at most locations but was as high as eight taxa at WCKD offshore and as low as one taxon at SEEP2 offshore.

Among the nearshore samples, total abundance, and to a lesser extent total richness, were more or less higher in the three eastern areas compared to the three western areas (Table 4). Contrary to June when abundance and richness were highest at SEEP1 and SEEP2 and lowest at ECKD, in October, abundance, total richness, and EPT richness were all highest at EREF and second highest at ECKD (Table 4) while SEEP2 was among the lowest for all three parameters in October. Two of the most abundant taxa in June were again the most abundant taxa in October. In the EREF and ECKD areas, Naidinae was the most abundant organism while in the remaining four areas, *C. tremulus* grp. was the most abundant taxon. The more pollution intolerant EPT taxa represented a greater percentage of the total abundance during October compared to June, particularly at ECKD, WCKD, and WREF. In contrast, the abundance of Tanytarsini specifically and Chironomidae in general were noticeably lower in October compared to June.

As in June, the October offshore results were similar in many respects to nearshore. Again, total abundance, total richness, and EPT richness were highest at ECKD and EREF, respectively, and lowest at SEEP2 (Table 5). Like nearshore, Naidinae was the most abundant taxon at EREF and *C. tremulus* grp. was the dominant taxon among three of the four western areas (Table 5). Extremely low abundance and richness at SEEP2 limited the meaningful interpretation of the data from that location. As with the nearshore results, EPT abundance increased and Chironomidae abundance decreased in October compared to June. These patterns were consistent with those observed nearshore in October. The increase of EPT at ECKD both

nearshore and offshore was largely due to higher numbers of filter feeding Hydropsychidae caddisflies.

As described in the methods, qualitative samples were only collected during the October sampling event (see Section 2.1.2). Qualitative total and EPT richness values were generally much higher when compared to equivalent nearshore and offshore rock basket values. Nonetheless, taxa richness trends were similar among the two sample types. As with the October nearshore basket collections, total richness was highest at EREF and lowest at SEEP2 among the qualitative samples (Table 6). The total taxa richness values observed in the remaining four areas were relatively similar. EPT richness was also somewhat similar among the areas ranging from 10 taxa at ECKD, SEEP1, and SEEP2 to 15 taxa at WCKD, which also had the highest EPT richness among the October offshore basket collections.

3.1.1.3 Statistical Comparisons

The benthic macroinvertebrate data from both rock basket sampling events were pooled to develop more powerful comparisons. Statistical comparisons were made between locations (nearshore vs. offshore) and among areas (reference vs. CKD leachate release areas). These comparisons included total abundance, total richness, and EPT richness. These parameters were selected primarily due to their common use in benthic community studies and their utility in characterizing community production, diversity, and environmental tolerance. In addition, the total abundance of Ephemeroptera, Trichoptera, Chironomidae, and Oligochaeta were compared. As described above, Ephemeroptera and Trichoptera are generally considered relatively intolerant of environmental disturbance. In contrast, Chironomidae and Oligochaeta are generally considered more tolerant of environmental disturbance.

During both sampling events, similarities were common and differences were few between the nearshore and offshore locations in terms of composition and trends related to abundance and richness parameters. As such, it is not surprising that no significant differences were observed between the nearshore and offshore results for any of the parameters compared (Table 7).

Comparisons among the study areas revealed a few similarities. For example, mean total and mean EPT richness values were statistically similar among all six areas (Table 8). Likewise, mean Chironomidae abundance, with the similar dominant taxa and trends between sampling events, showed no significant difference among the six areas. Nonetheless, some differences were apparent.

In terms of total abundance, the samplers at EREF produced significantly higher mean numbers of organisms than SEEP2, WCKD, and WREF (Table 8). The higher abundance at EREF was primarily due to elevated density of Naidinae worms, particularly on the October nearshore samplers. Overall, mean Oligochaeta (i.e., Naidinae) abundance was significantly higher at both EREF and SEEP1 compared to WCKD and WREF. Although the significantly higher abundance at EREF was primarily due to densities observed in October, the highest Naidinae densities at SEEP1 occurred in June. As a group, worms are generally considered environmentally tolerant. However, Naidinae abundance is not necessarily related to environmental tolerance and may be a function of habitat. Naidinae prefer coarse, well

oxygenated, substrate with abundant periphyton (Learner et al. 1978), which describes the Bay Harbor study area, particularly EREF.

Despite the lack of difference in terms of EPT richness, both Ephemeroptera and Trichoptera abundance varied significantly among the areas. Ephemeroptera abundance was significantly lower at ECKD compared to WCKD, though both areas were statistically similar to the remaining four areas (Table 8). The higher abundance of Ephemeroptera at WCKD was largely due to higher numbers of *Caenis* in October when mayflies accounted for between 12 and 28 percent of the total abundance in that area. In contrast, Ephemeroptera accounted for slightly more than one percent of the total abundance at ECKD in June and slightly less than one percent in October.

Contrary to the low abundance of Ephemeroptera, Trichoptera abundance was significantly higher at ECKD compared to EREF, SEEP2, and WREF (Table 8). As described above, Hydropsychidae caddisflies were noticeably more abundant in October, particularly at ECKD. These are filter feeders that construct nets on coarse substrate in areas of flow or turbulence to capture small particles that make up their diet. Although this type of habitat exists throughout the study area, the reason for the elevated abundance at ECKD is not entirely clear.

3.1.2 Periphyton Community

Total concentration (NU/sq^2), total biovolume (um^3/ sq^2) and taxa richness data were collected for the periphyton community characterization both in June and in October 2006 samples. The resulting raw periphyton data for both sampling events are provided in Appendix G.

Several taxa common to the Great Lakes were observed during the study (Table 9). There was relatively high variation among replicates (Figures 4-15) which is not uncommon among periphyton samples due to normal differences in surface colonization and in this system, disturbance physically and potentially chemically. The samples analyzed yielded a total of 45 taxa for periphyton community, with relatively low variability. In general, the natural substrate samples had a higher biomass of green algae. This was likely due to the more complex substrate for attachment compared to the rock basket samples. Taxa richness between the two sample types in October was very similar and diatom taxa were nearly identical. Overall, based on concentration and taxa richness, the natural substrate samples were comparable to the rock baskets in October. This suggests that the rock basket samples were representative of the natural conditions.

Overall, mean total concentrations were higher in June compared to October (Tables 10-13). Although these seasonal differences were apparent over the entire study area, they were not always consistent by individual areas or locations. Multi-dimensional scaling (MDS) was used to determine if there were any assemblage differences among stations. MDS analysis did not indicate a clear difference among stations within sampling season. However, MDS did indicate 2 important trends: 1) There were distinct seasonal differences between June and October, not only in density but also assemblage structure, and 2) there was an environmental gradient from EREF towards WREF.

The gradient from EREF towards WREF was more pronounced in the offshore samples than in the nearshore samples, especially in the October sampling event with a decreasing trend in density from EREF towards WREF (Figures 16-18). In the June sampling event, this was most obvious in offshore samples (Figure 16), but in October, both nearshore and offshore showed distinct decreasing densities going toward the WREF station (Figures 17 and 18). MDS did not show as strong a pattern in biovolume, where only October samples indicated the same decreasing trend (Table 13). Taxa richness showed no significant patterns in the near or offshore samples or among seasons, except for a slight trend in the October samples (Tables 12 and 13). These patterns may reflect less of an impact of leachate in offshore vs. nearshore stations or may reflect a lack of disturbance and more established communities at the offshore sites where wave action is less of an issue. The gradient from EREF towards WREF is simply an environmental gradient which must be superimposed on any ecological analysis of the system and possibly is related more to location within Little Traverse Bay than to leachate concentrations.

Taxa differences among sites, stations and seasons appeared mostly as seasonal effects. In the June samples, diatoms and green algae dominated, with several small blue-green taxa. There were a host of general diatom taxa (Table 9, several *Cymbella* spp, *Navicula* spp, *Nitzschia* spp., Gomphonema spp. Synedra spp, and *Fragilaria* spp.) as well as several large green algae (*Cladophora fracta*, *Ulothrix zonata* and *U. aequalis, Oedogonium* sp. and *Spirogyra* sp.) and multiple species of micro-green algae (*Pediastrum* spp., *Chlorococcum* spp., *Scenedesmus* spp., and *Oocystis* spp.). There was a seasonal trend for density of mostly diatoms and green algae, with a significant component of small blue-green algae, but biovolume was almost exclusively equal biovolume of diatoms and green algae. The blue-green species present were small unicellular, colonial and filamentous taxa. In October, diatoms and blue-green algae co-dominated the assemblages (mostly small unicellular blue-greens), but diatoms dominated the biovolume. Greens represented only a small percentage of the density and almost no biovolume. Later in the season, the larger filamentous green algae (*Cladophora fracta*, *Ulothrix zonata* and *U. aequalis, Oedogonium* sp. and *Spirogyra* sp. drop out of the assemblage.

3.1.3 Physicochemical Measurements

During the 2006 ecological surveys, over 850 water quality measurements were recorded between May and October (Appendix H and Appendix I). Heavy wave action or meter malfunction occasionally prevented the measurement of some or all parameters. Water temperature measurements during the May-June colonization period ranged from 7.88 °C to 20.76 °C while those from the September-October period were slightly warmer ranging from 8.98 °C to 24.67 °C (Table 14). The observed temperatures varied greatly but largely followed natural diel and seasonal trends. During May-June, mean temperatures were generally warmer nearshore compared to offshore with the reverse being true during September-October.

Specific conductance exhibited a similar range during both colonization periods from 248 µS/cm to 356 µS/cm and mean values were fairly consistent among areas and locations as well as over time (Table 14). The observed measurements are comparable with values observed throughout Lake Michigan (Vogel et al. 1976; Bartone and Schelske 1982).

Like specific conductance, the range of dissolved oxygen (DO) was fairly consistent between the two colonization periods ranging from 8.20 mg/L to 15.55 mg/L (Table 14). However, mean values were slightly higher during May-June compared to September-October. Nonetheless, these values are similar to other Lake Michigan observations and do not appear to be a limiting factor (Vogel et al. 1976).

Given the nature of CKD leachate, pH can be a fairly reliable indicator of its presence. Measurements taken prior to remediation efforts consistently produced pH values >9.0 and as high as 12.82 in some areas affected by the CKD leachate (Barr Engineering 2009). During the surveys, no pH measurements were observed above 9.0 in any of the study areas. Measured pH ranged from 7.25 during May-June to 8.91 during September-October (Table 14). Again the range was similar between colonization periods though slightly higher during the fall. However, all measurements were below and, in some cases, well below historic high values and similar to other observations on Lake Michigan (Bartone and Schelske 1982).

Turbidity values varied widely during the study. May-June turbidity readings ranged from 0.20 NTU to 6.46 NTU while those from September-October ranged from 0.19 NTU to 3.17 NTU (Table 14). In general, turbidity was slightly higher during May-June compared to September-October and, as would be expected, with rare exception, turbidity was higher nearshore compared to offshore. These differences as well as the overall variability are likely a function of algal bloom density and wave action severity.

3.2 Mussel Tissue

Except for ECKD, dreissenid mussels were fairly common throughout the study area. The target wet biomass of 20 g was easily surpassed for 12 of the 14 tissue samples collected (Table 15). The mussels ranged in size from approximately 4 mm to 27 mm with most in the 8-12 mm range. The mussels collected from the ECKD locations were not only sparse in abundance but also of small size (4-5 mm). In EREF and ECKD, there was a mixture of zebra and quagga mussels while in the remaining areas quagga mussels were clearly the dominant species.

The complete laboratory report from Columbia Analytical Services is presented in Appendix J. Dry weight of the tissue samples was approximately 50% of the field measured wet weight (Table 15). Dry weight Hg concentration ranged from 3.3 ng/g in the ECKD transplant sample to 7.7 ng/g in the ECKD Replicate A sample (Table 15). Overall, the mean Hg concentrations were similar among most of the sampling areas and well below the mean concentration of 78 ng/g reported for Lake Michigan surficial sediments (Rossmann 2002). Between the reference areas (EREF and WREF) mean concentrations were very similar and the standard deviation of replicate values was identical. Although the mean Hg concentrations observed at SEEP1 and SEEP2 were slightly lower than the reference areas and mean concentrations from WCKD were slightly higher than the reference areas, these Hg concentrations were not significantly different from the reference areas at the 95% confidence interval (Figure 19). In contrast, the samples collected from the ECKD area showed a mean Hg concentration of 6.4 ng/g, which was significantly higher than the mean concentrations observed in the reference areas at the 95% confidence level.

4. Summary and Conclusions

4.1 Aquatic Community

Leachate collection systems have been installed and operated in the SEEP1 and SEEP2 areas since November 2005; at least six months prior to when the 2006 biological sampling activities were initiated. This assuredly resulted in a significant decrease in CKD leachate being released into Little Traverse Bay. Therefore, the result of these remedial actions may be that the 2006 ecological surveys were less a description of baseline conditions and more a characterization of the conditions in transition. If so, the results of the 2006 sampling effort suggest that the benthos and periphyton communities have made substantial initial progress toward natural conditions, as represented by results from the reference areas EREF and WREF.

4.1.1 Benthic Macroinvertebrate Community

Based on the 2006 collections, the benthic macroinvertebrate community in the vicinity of Bay Harbor contains several components and taxa common to Lake Michigan and the other Great Lakes, though it is far from being described as an especially diverse or, in some ways, productive benthic assemblage. This is likely due to natural factors such as low nutrients, lack of diversity in substrate, and maximum exposure to the prevailing winds and waves that collectively limit the fauna in this area.

The rock basket results demonstrated that there were no meaningful differences between the nearshore locations and offshore locations. These results suggest that proximity to shoreline CKD leachate source points is currently inconsequential or was not a factor affecting the benthic macroinvertebrate community. This may be a result of rapid attenuation of the leachate in Little Traverse Bay or it may be an artifact associated with remediation and reduction of leachate entering the study area.

Comparisons among the study areas exposed some differences in the benthic community during the study. However, these differences do not necessarily appear to be related to impacts associated with CKD leachate. Among the comparisons that revealed significant differences among the areas, no consistent pattern emerged that would suggest that the quality of the benthic community in the reference areas was significantly better than areas exposed to CKD leachate. In terms of richness measures, which typically decrease as the result of impairment, no meaningful difference was observed among the areas. Despite the fact that abundance was significantly higher at EREF, the total abundances observed at SEEP1 and ECKD were statistically similar while the other reference area, WREF was significantly lower.

Although there were notable differences among areas within each sampling event, particularly ECKD in June and SEEP2 in October, consistent evidence suggesting that these results were related to impacts associated with the leachate is limited.

4.1.2 Periphyton Community

Based on the 2006 collections, the periphyton community in the vicinity of Bay Harbor contains several components and taxa common to Lake Michigan and the other Great Lakes. The rock basket results demonstrated that there were no meaningful differences between the near shore locations and offshore locations. These results suggest that proximity to shoreline CKD leachate discharge was inconsequential or was not a factor affecting the periphyton community during the 2006 time period. This may be a result of the rapid attenuation of leachate in Little Traverse Bay or it may be associated with remediation via leachate collection thereby minimizing discharge of leachate in the study area. There was a strong seasonal component to the data with a shift away from macroalgae in the fall, and a strong location based gradient from EREF to WREF; however, no discernable relationship between leachate exposure and community quality was observed.

4.1.3 Physicochemical Data

No consistent trends were observed in the physicochemical data that indicate CKD leachate was a potential limiting factor in the sampling areas. In particular, pH measurements from previously affected areas were all within normal levels for Lake Michigan (Bartone and Schelske 1982).

4.2 Mussel Tissue

Based on the mussel tissue results, Hg concentrations were statistically similar among the SEEP1, SEEP2, WCKD, WREF and EREF areas. This suggests that there is no additional Hg bioaccumulation associated with the leachate relative to background and reference conditions. Therefore, it appears that further study of these areas is unnecessary.

In contrast, mussel tissue Hg concentrations were significantly higher in the ECKD area compared to the EREF and WREF areas. This suggests that Hg was continuing to bioaccumulate at the time samples were collected from ECKD in October 2006. However, installation of the leachate collection system for ECKD was completed in November 2006. Given the similar concentrations observed from the reference areas, lower levels of Hg bioaccumulation observed at SEEP1, SEEP2, and WCKD, where remediation activities were in operation one year prior to sampling, suggests that Hg bioaccumulation levels are returning to background levels.

5. Recommendations

Results of the baseline ecological characterization revealed no meaningful patterns related to CKD leachate. No significant differences among the affected sites and reference sites were observed in the benthos results. Likewise, no consistent pattern emerged from the periphyton results that suggest impairment due to CKD leachate. Physicochemical measurements were consistently within the normal range for Lake Michigan and pH was never observed above 8.91 during the study.

The lack of discernable difference among the affected and reference sites is possibly due to turbulence combined with the rapid attenuation of potential leachate impacts and/or remediation activities largely reducing the potential volume of leachate. Regardless, these results do not suggest that further study of this nature is warranted.

In contrast, the mercury concentrations observed from the ECKD tissue samples were significantly elevated at 95% confidence level compared to the EREF and WREF Areas. Therefore, in order to determine if mercury uptake by mussels in ECKD Area is statistically similar to the EREF Area, it is recommended that the collection of mussel tissues and analysis of mercury concentrations be repeated with three replicates for each of the ECKD and EREF Areas now that the collection system is operational. Three replicates are recommended due to the large variability in mercury concentrations observed in the ECKD replicate samples during 2006.

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Figures

Imagery: April 2005

Rock Basket Location
Approximate CKD Extent

Fairway
Green
Sand
Tee Boxes

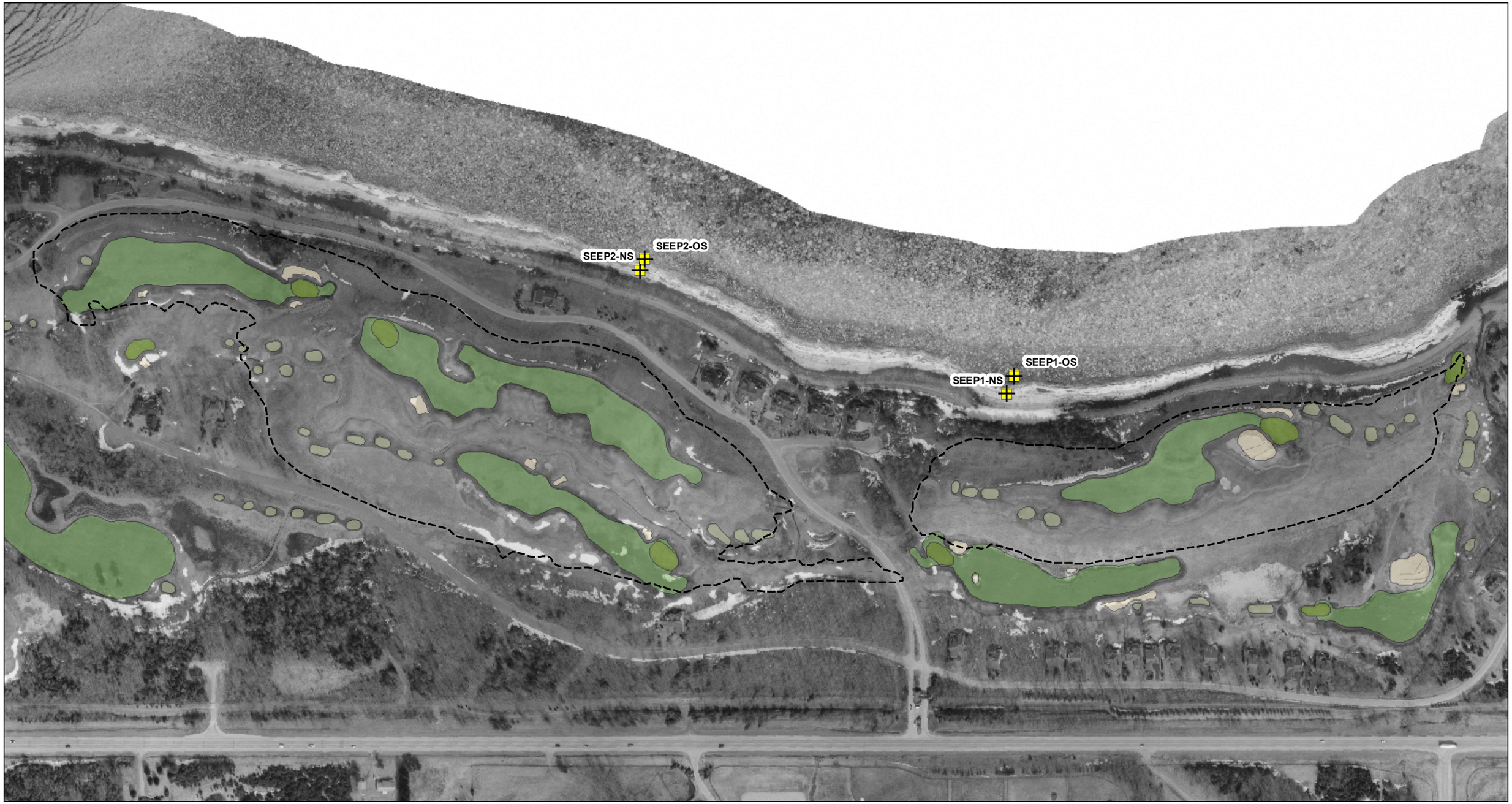
N

100 50 0 100
Feet

Figure 1

WEST CKD AREA
ROCK BASKET LOCATIONS - 2006
16-17 MAY THROUGH 26-28 JUNE AND
6-7 SEPTEMBER THROUGH 24-26 OCTOBER

Little Traverse Bay
CKD Release Site
Emmet County, Michigan



Imagery: April 2005

Rock Basket Location
Approximate CKD Extent

Fairway
Green
Sand
Tee Boxes

N

400 200 0 400
Feet

Figure 2

SEEP 1 AND SEEP 2 CKD AREAS
ROCK BASKET LOCATIONS - 2006
16-17 MAY THROUGH 26-28 JUNE AND
6-7 SEPTEMBER THROUGH 24-26 OCTOBER

Little Traverse Bay
CKD Release Site
Emmet County, Michigan

Imagery: April 2005

Rock Basket Location
Approximate CKD Extent

N

200 100 0 200
Feet

Figure 3

EAST CKD AREA
ROCK BASKET LOCATIONS - 2006
16-17 MAY THROUGH 26-28 JUNE AND
6-7 SEPTEMBER THROUGH 24-26 OCTOBER

Little Traverse Bay
CKD Release Site
Emmet County, Michigan

Figure 4. Average periphyton total concentrations data for nearshore study areas

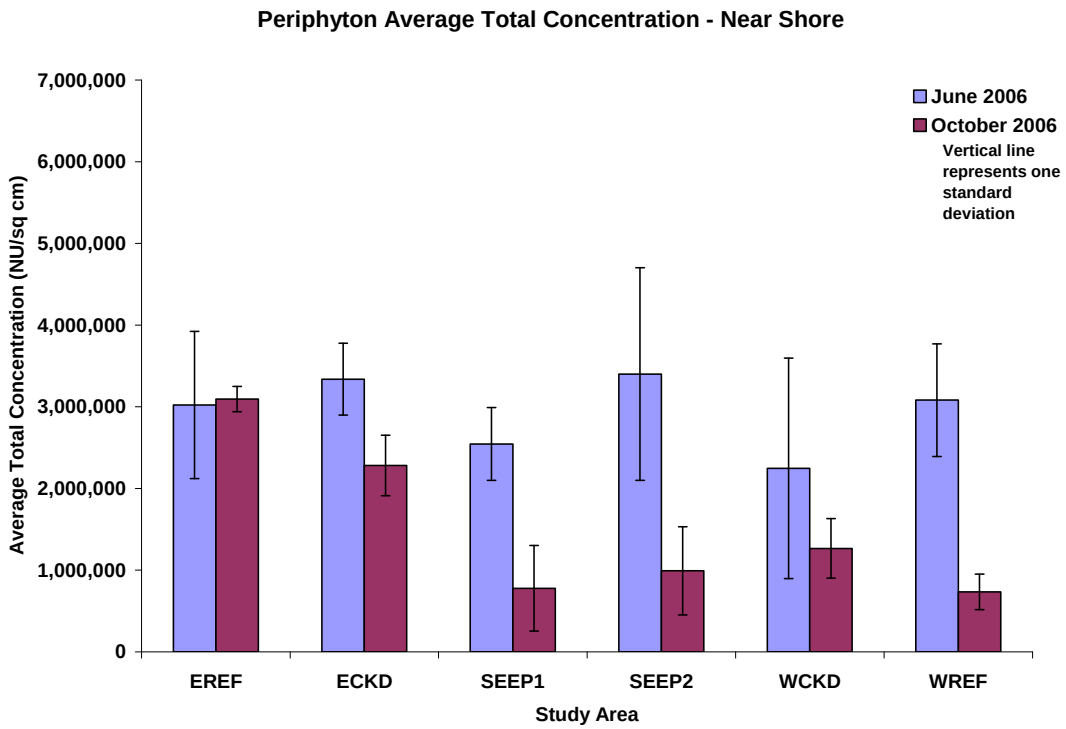


Figure 5. Average periphyton total biovolume data for nearshore study areas

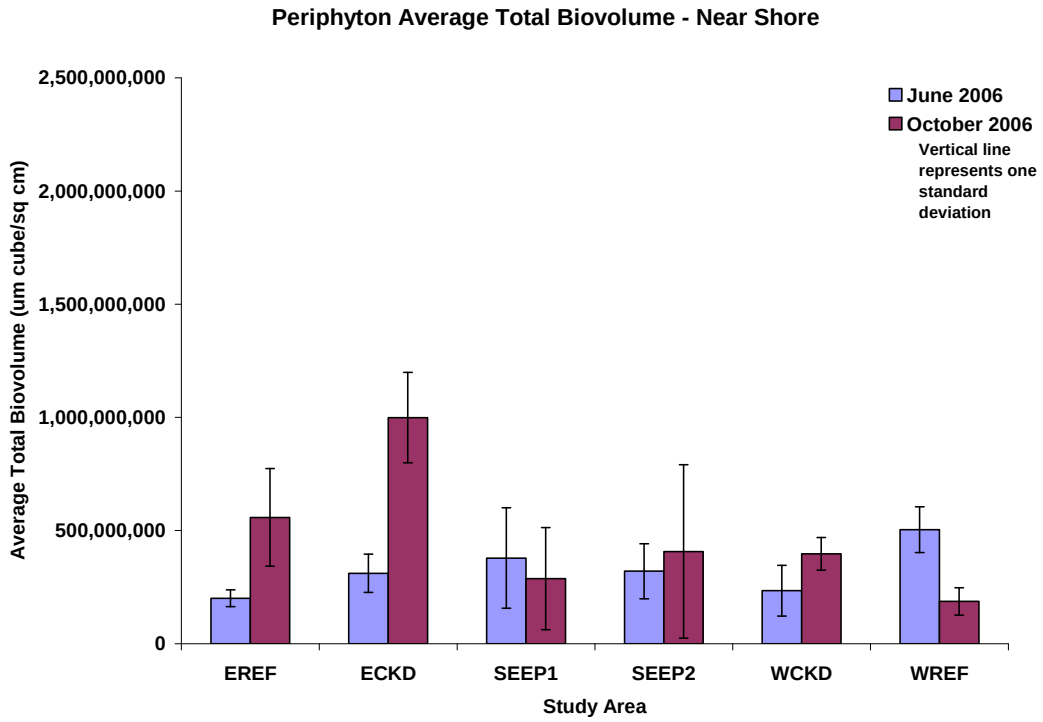


Figure 6. Average periphyton total taxa richness data for nearshore study areas

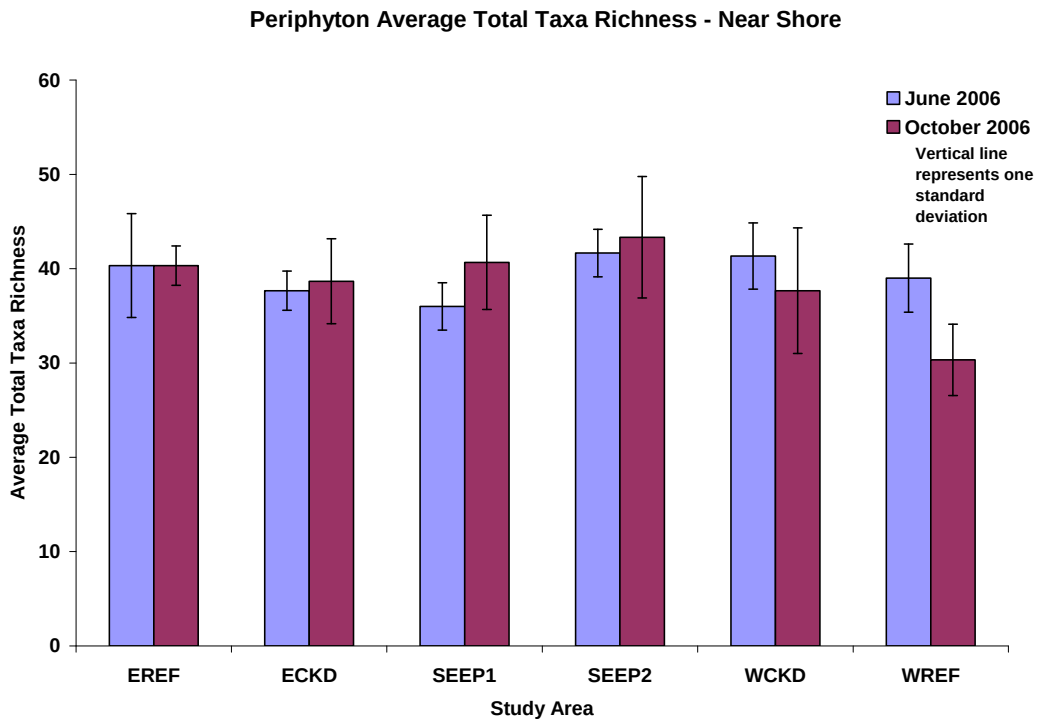


Figure 7. Average periphyton total concentration data for offshore study areas

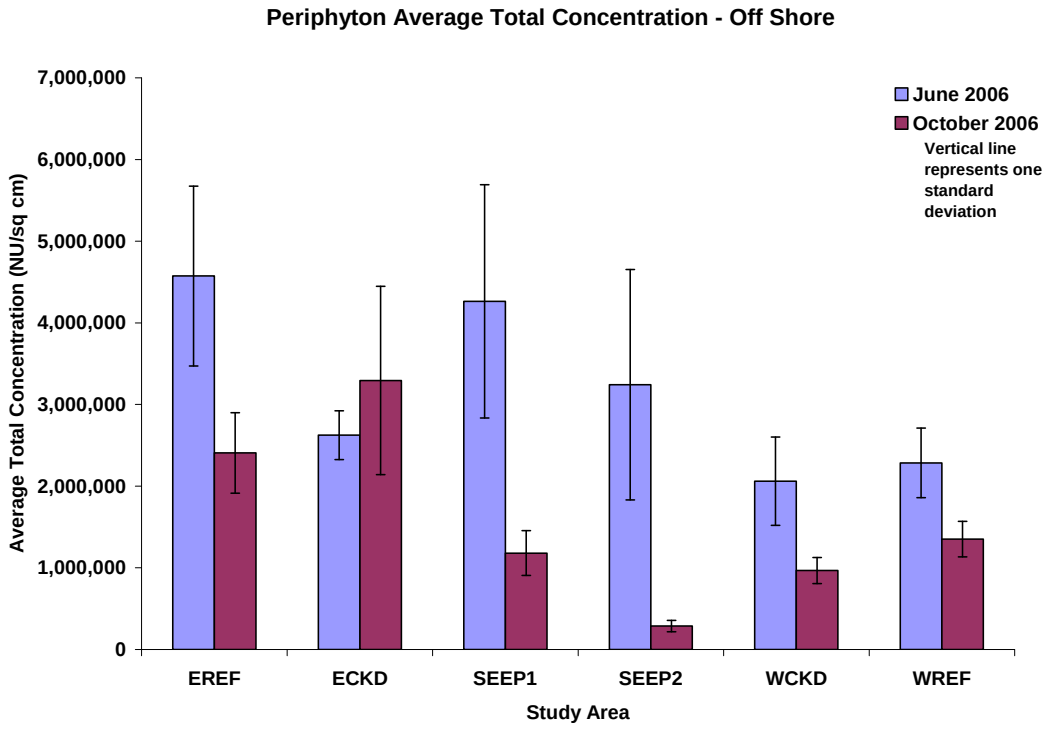


Figure 8. Average periphyton total biovolume data for offshore study areas

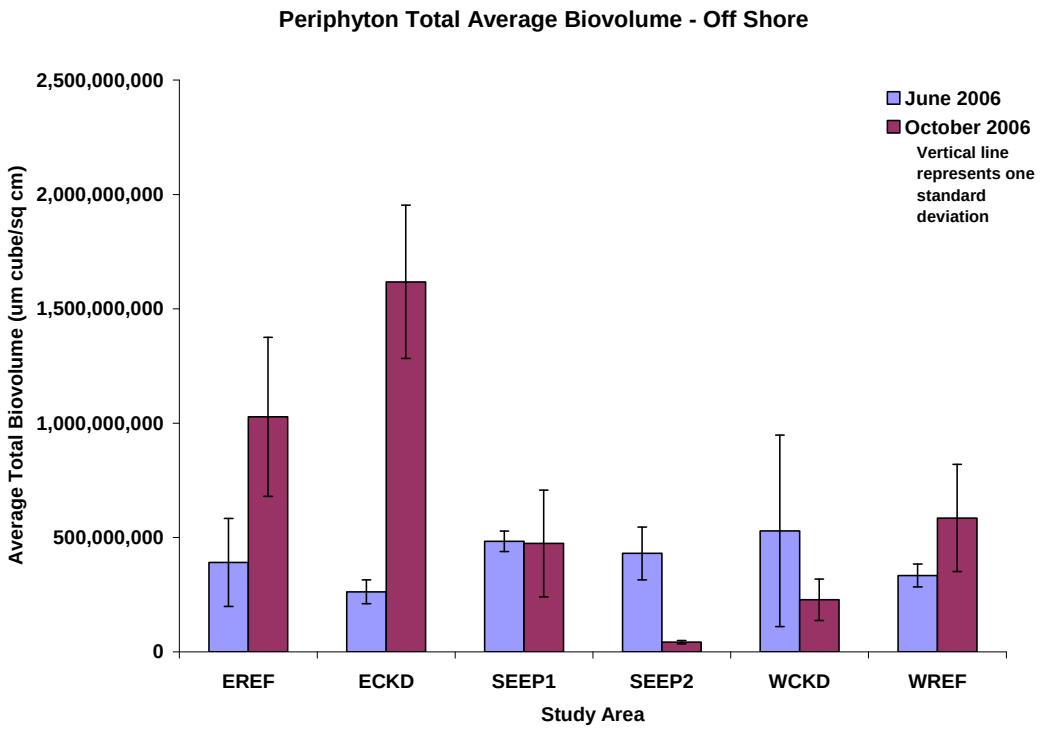


Figure 9. Average periphyton total taxa richness data for offshore study areas

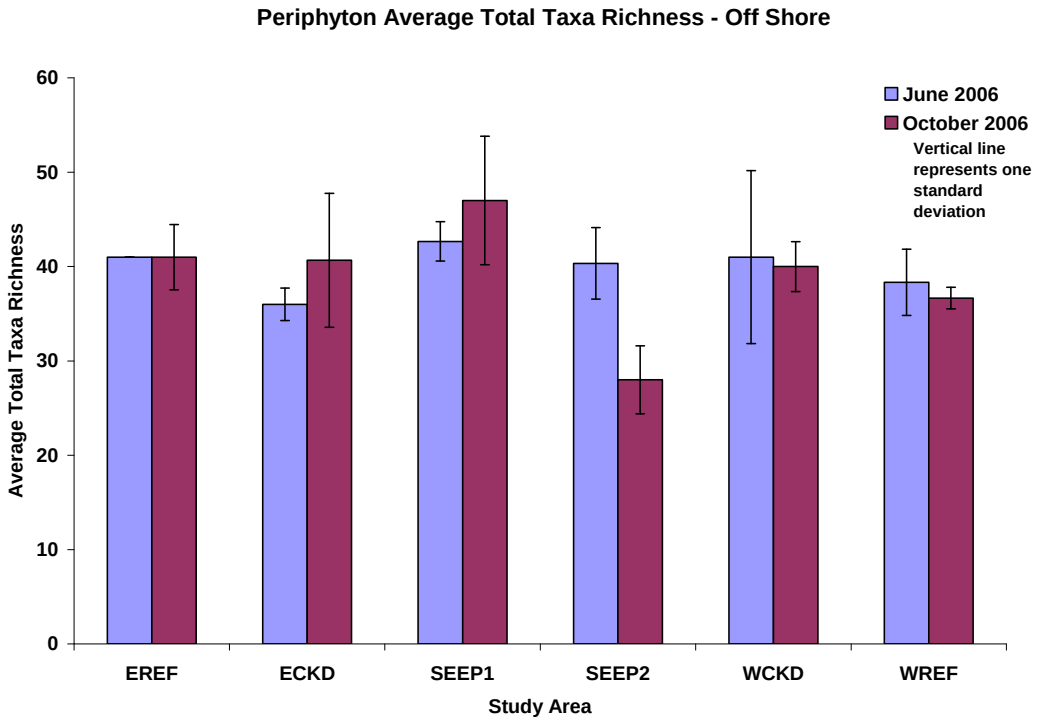


Figure 10. Average periphyton total concentration data for June 2006

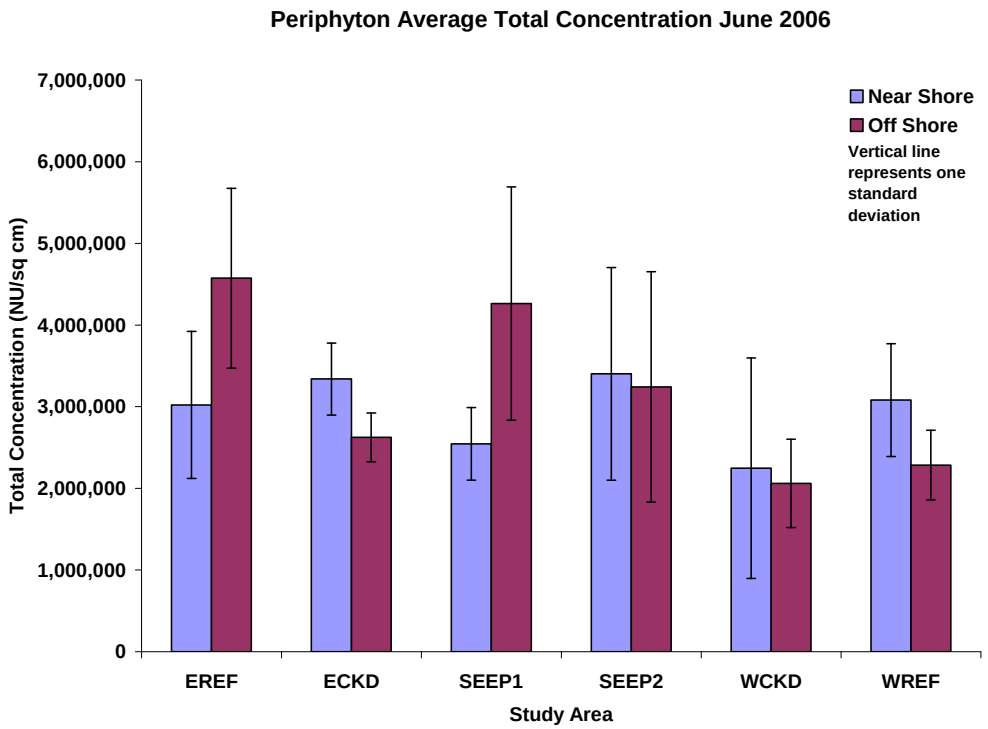


Figure 11. Average periphyton total concentration data for October 2006

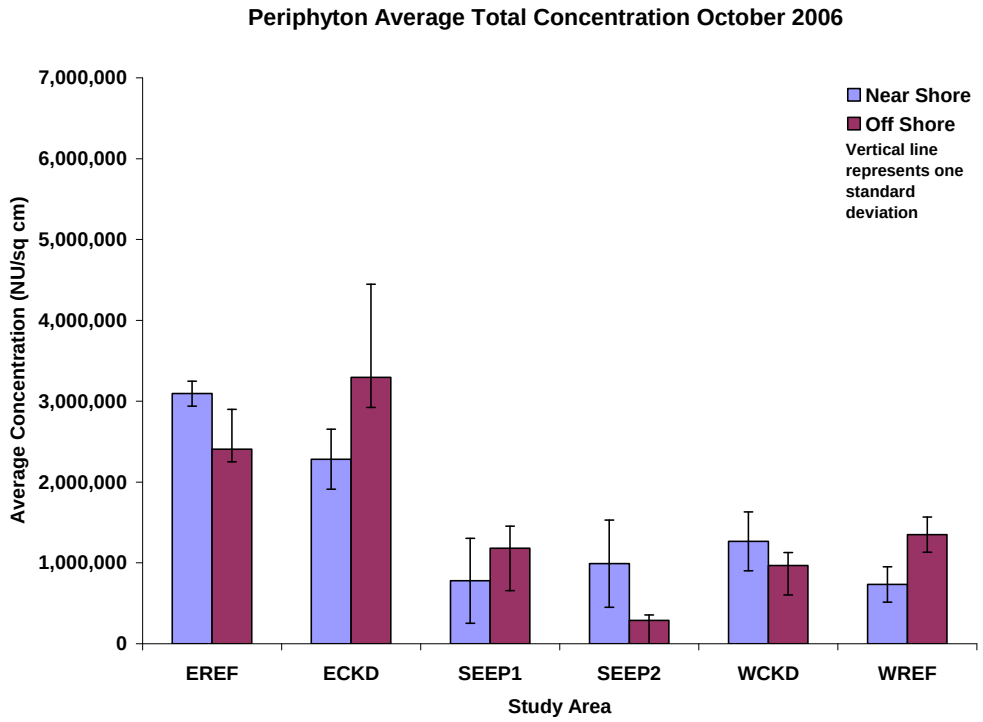


Figure 12. Average periphyton total biovolume data for June 2006

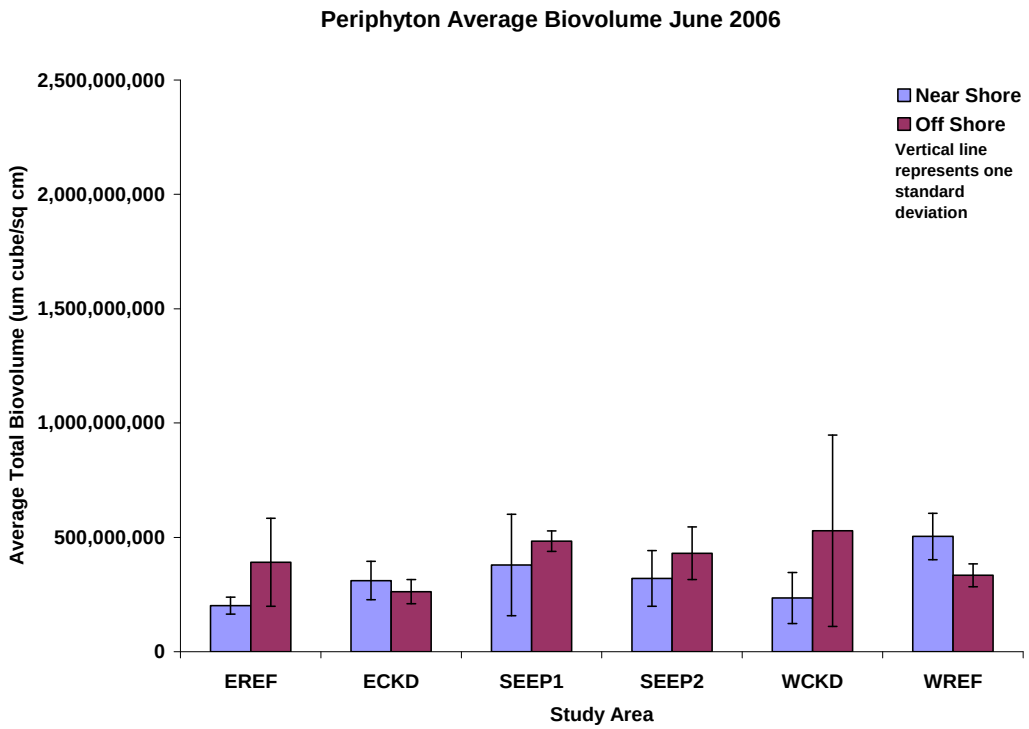


Figure 13. Average periphyton total biovolume data for October 2006

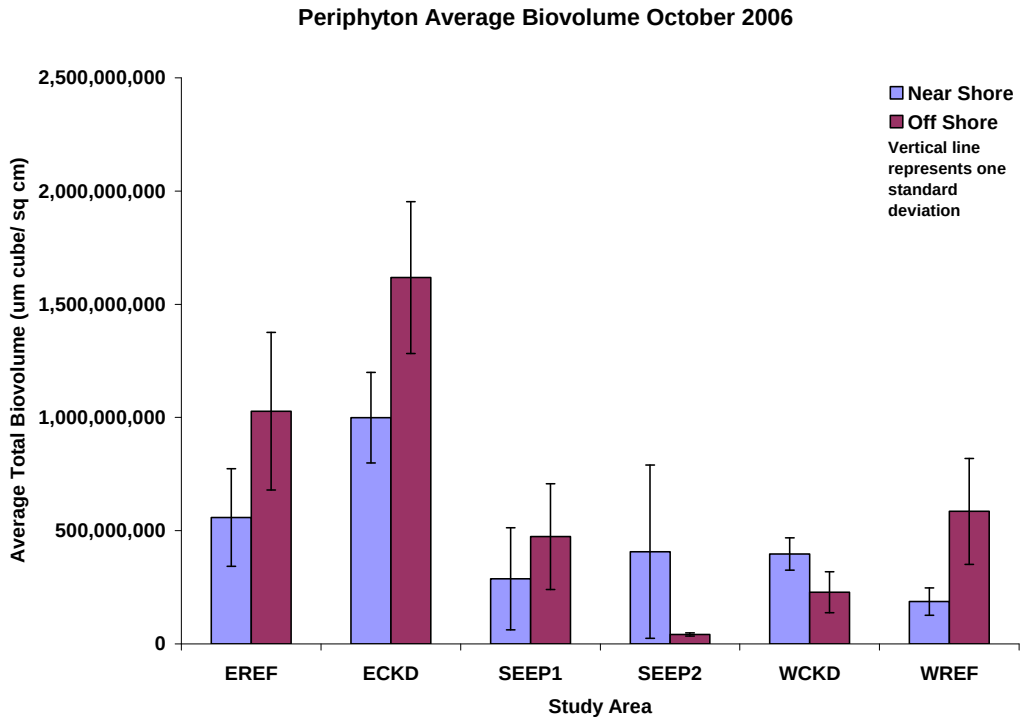


Figure 14. Average periphyton total taxa richness data for June 2006

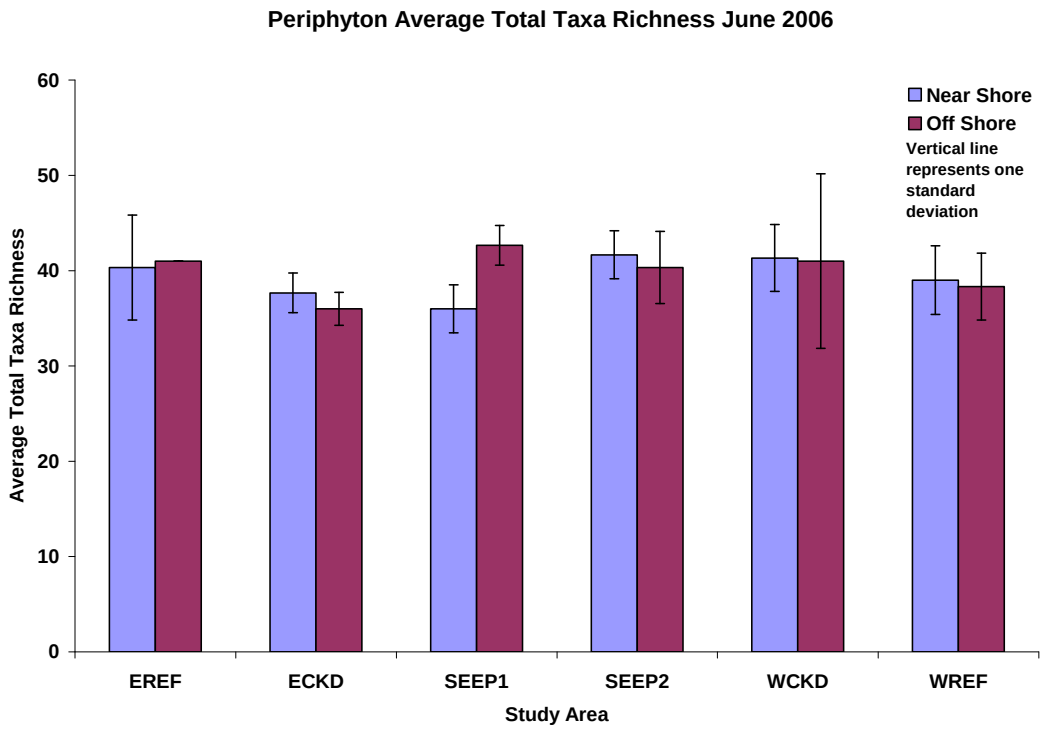


Figure 15. Average periphyton total taxa richness data for October 2006

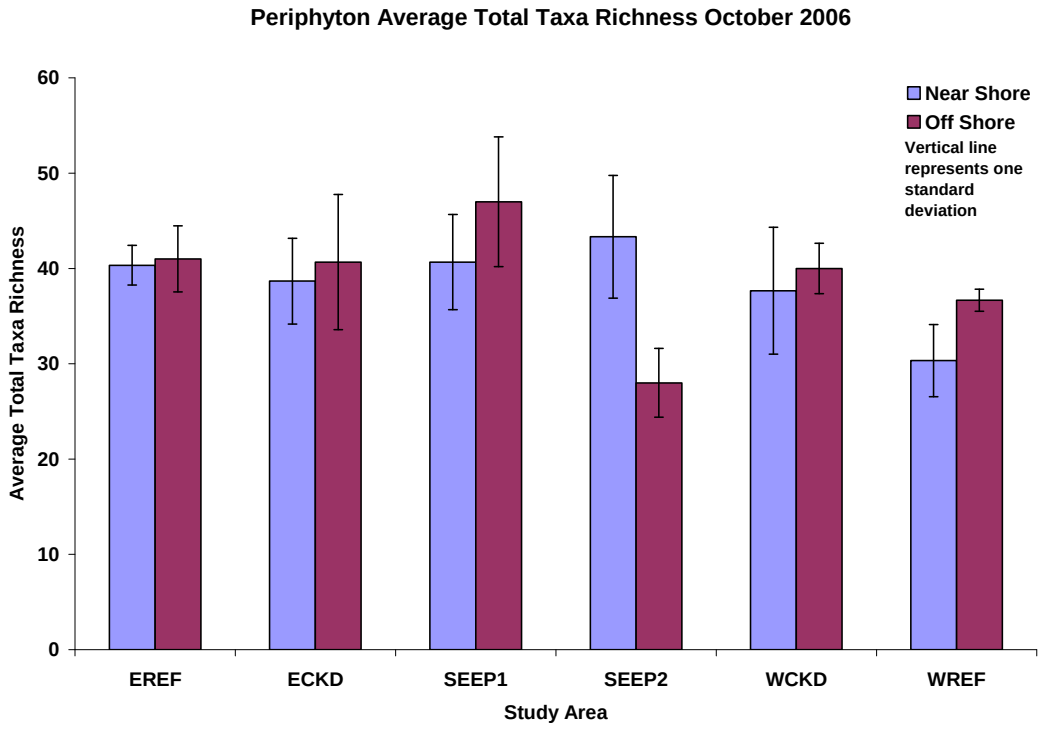


Figure 16. Periphyton total concentrations data for each offshore replicate for June 2006

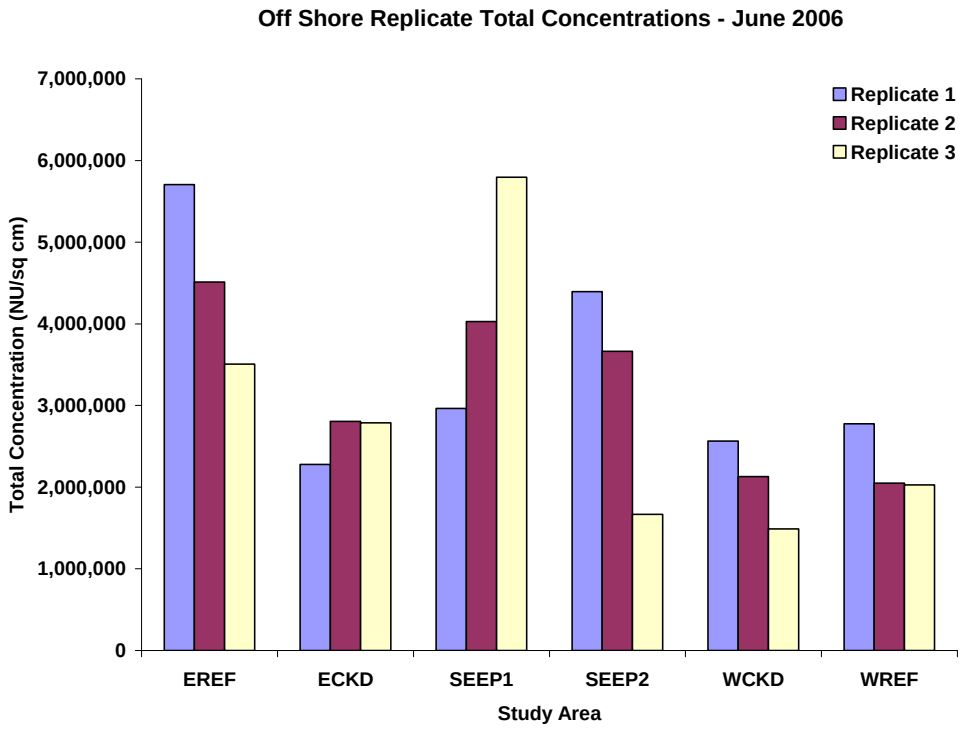


Figure 17. Periphyton total concentrations data for each nearshore replicate for October 2006

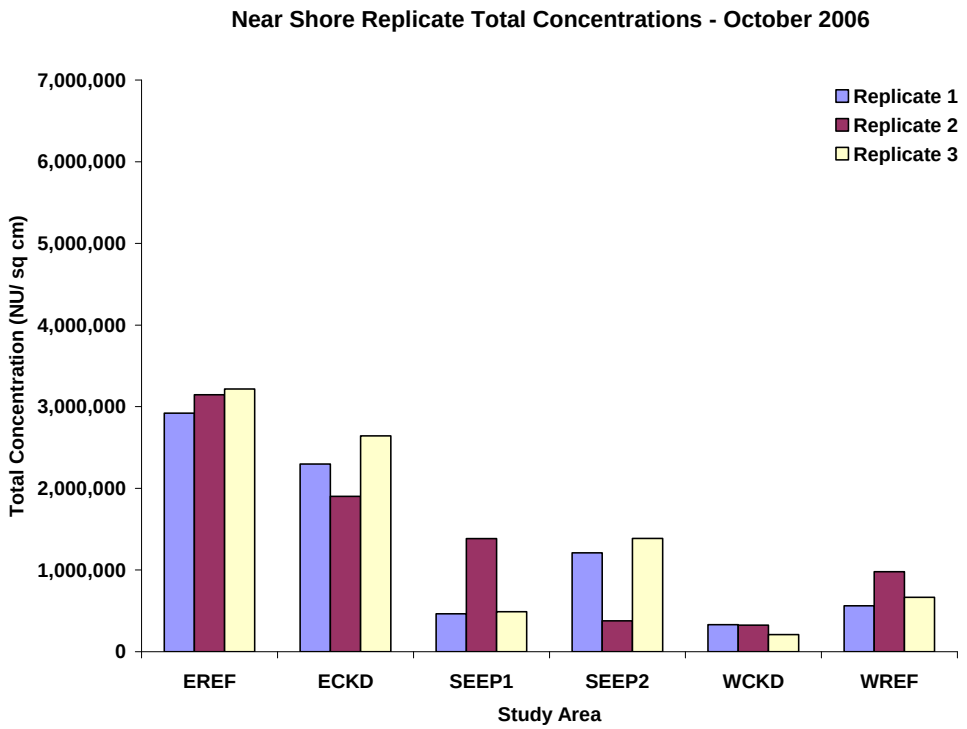


Figure 18. Periphyton total concentrations data for each offshore replicate for October 2006

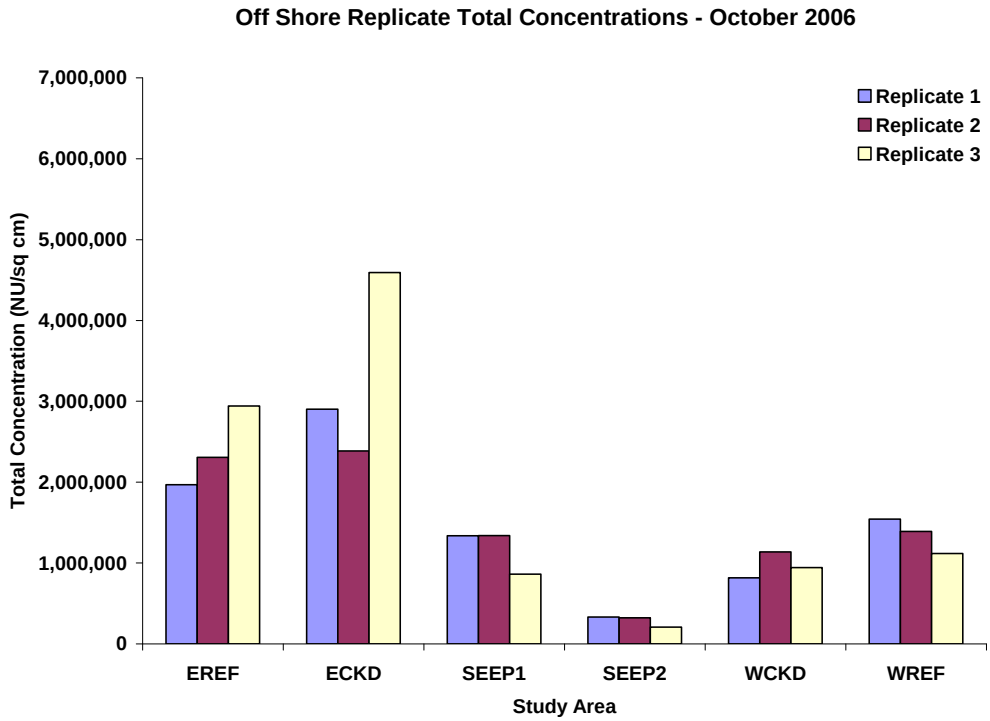
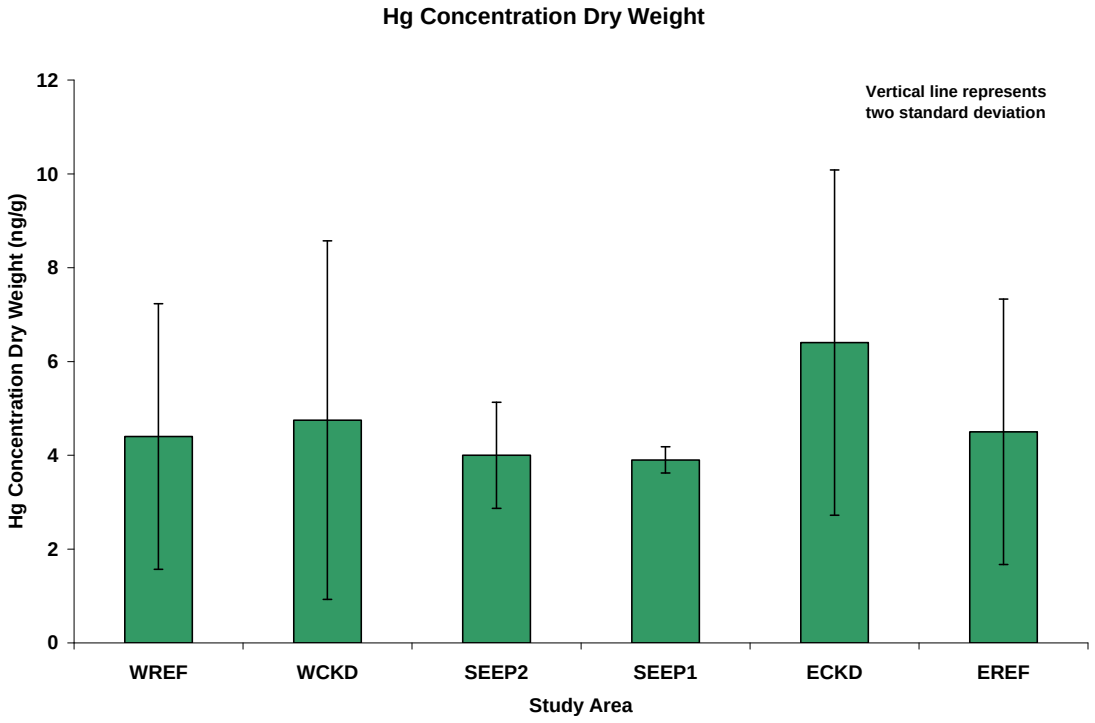


Figure 19. Measured mean mercury concentrations and two standard deviations at the 95% confidence level for the six locations in Little Traverse Bay project area.



Tables

Table 1. List of benthic macroinvertebrate taxa observed in rock basket and qualitative samples from Little Traverse Bay, MI -- June and October 2006.

	Rock Basket	Qual.		Rock Basket	Qual.
NEMERTEA (Probosics Worms)	X		Lepidoptera (Aquatic Moths)	X	
ANNELLIDA			Diptera (True Flies)		
Oligochaeta (Aquatic Worms)			Ceratopogonidae	X	X
Lumbriculidae		X	*Hemerodromia*	X	X
Naididae	X	X	*Antocha*	X	X
Tubificidae		X	Chironomidae (Midges)		
Hirudinea (Leeches)			Tanypodinae[1]	X	
Mooreobdella		X	*Ablabesmyia mallochi*	X	
CRUSTACEA			*Thienemannimyia* grp.	X	X
Isopoda (Sow Bugs)			*Pagastia*	X	X
Caecidotea	X	X	*Potthastia*	X	X
Amphipoda (Side Swimmers)			*Corynoneura lobata*	X	
Hyalella azteca	X	X	*Cricotopus bicinctus* grp.	X	X
Gammarus		X	*Cricotopus sylvestris* grp.	X	
Decapoda (Crayfish)			*Cricotopus tremulus* grp.	X	X
Orconectes		X	*Cricotopus trifascia* grp.	X	X
ARACHNOIDEA			*Eukiefferiella*[1]	X	
Hydracarina (Water Mites)	X	X	*Eukiefferiella devonica* grp.	X	X
INSECTA			*Eukiefferiella gracei* grp.	X	
Ephemeroptera (Mayflies)			*Nanocladius*[1]	X	
Baetis flavistriga	X	X	*Nanocladius spiniplenus*	X	
Acerpenna pygmaea	X	X	*Orthocladius*	X	X
Heptageniidae[1]	X		*Parakiefferiella*		X
Heptagenia	X		*Parametriocnemus*		X
Leucrocuta		X	*Psectrocladius*	X	
Nixe	X	X	*Psilometriocnemus*	X	
Stenacron	X	X	*Thienemanniella xena*	X	
Maccaffertium[1]		X	*Cryptochironomus*		X
Maccaffertium vicarium	X	X	*Dicrotendipes fumidus*	X	X
Stenonema femoratum	X	X	*Glyptotendipes*	X	
Tricorythodes	X		*Microtendipes*	X	X
Leptophlebiidae		X	*Nilothauma*	X	X
Eurylophella bicolor grp.	X	X	*Polypedilum flavum*	X	X
Caenis	X	X	*Pseudochironomus*	X	X
Plecoptera (Stoneflies)[1]	X		*Stictochironomus*		X
Acroneuria		X	*Stictochironomus caffrarius* grp.		X
Trichoptera (Caddisflies)			*Cladotanytarsus*		X
Polycentropus		X	*Paratanytarsus*	X	X
Hydropsychidae[1]	X		*Rheotanytarsus*	X	X
Cheumatopsyche	X	X	*Tanytarsus*		X
Ceratopsyche morosa grp.	X	X	*Tanytarsus glabrescens* grp.	X	X
Ceratopsyche morosa	X	X	*Tanytarsus guerlus* grp.		X
Hydropsyche	X		**PELECYPODA** (Mussels and Clams)		
Helicopsyche borealis		X	*Dreissena polymorpha*		X
Hydroptila	X	X	*Dreissena rostriformis*	X	X

[1] Taxon unidentifiable. Not counted as a discreet taxon for all samples combined. May be counted as a discreet taxon for individual samples or locations if it is the only representative of that family, order, or genus.

Table 2. The composition, number, and relative abundance of macroinvertebrates in rock basket samples from nearshore locations, Little Traverse Bay, MI -- June 2006.

Taxa	EREF		ECKD		SEEP1		SEEP2		WCKD		WREF	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Nemertea	--	--	--	--	1	0.19	--	--	--	--	--	--
Naidinae	28	5.61	19	8.52	143	26.93	123	23.88	80	19.05	59	13.05
Caecidotea	--	--	--	--	--	--	1	0.19	--	--	--	--
Hyalella azteca	1	0.20	3	1.35	26	4.90	33	6.41	11	2.62	6	1.33
Gammarus	2	0.40	--	--	--	--	--	--	--	--	--	--
Hydracarina	--	--	1	0.45	1	0.19	7	1.36	6	1.43	4	0.88
Baetis flavistriga	--	--	1	0.45	--	--	--	--	1	0.24	--	--
Acerpenna pygmaea	1	0.20	--	--	2	0.38	--	--	--	--	--	--
Eurylophella bicolor grp.	--	--	--	--	2	0.38	3	0.58	1	0.24	1	0.22
Tricorythodes	--	--	--	--	1	0.19	1	0.19	1	0.24	1	0.22
Caenis	--	--	--	--	1	0.19	11	2.14	1	0.24	1	0.22
Hydropsychidae	--	--	4	1.79	--	--	--	--	--	--	--	--
Hydropsyche	--	--	1	0.45	--	--	--	--	--	--	--	--
Hydroptila	--	--	--	--	10	1.88	10	1.94	6	1.43	2	0.44
Ceratopogonidae	--	--	--	--	--	--	--	--	2	0.48	--	--
Tanypodinae	--	--	--	--	--	--	1	0.19	--	--	--	--
Ablabesmyia mallochi	--	--	--	--	--	--	2	0.39	--	--	--	--
Thienemannimyia grp.	--	--	4	1.79	11	2.07	11	2.14	8	1.90	3	0.66
Potthastia	--	--	--	--	1	0.19	1	0.19	--	--	--	--
Corynoneura lobata	2	0.40	4	1.79	3	0.56	3	0.58	--	--	--	--
Thienemanniella xena	3	0.60	--	--	10	1.88	5	0.97	16	3.81	18	3.98
Cricotopus tremulus grp.	166	33.27	24	10.76	40	7.53	58	11.26	50	11.90	45	9.96
Cricotopus bicinctus grp.	79	15.83	121	54.26	141	26.55	125	24.27	141	33.57	245	54.20
Cricotopus trifascia grp.	--	--	--	--	--	--	--	--	2	0.48	--	--
Cricotopus sylvestris grp.	--	--	--	--	--	--	2	0.39	--	--	--	--
Orthocladius	14	2.81	3	1.35	13	2.45	8	1.55	--	--	--	--
Nanocladius	--	--	--	--	--	--	--	--	--	--	2	0.44
Nanocladius spiniplenus	--	--	--	--	--	--	1	0.19	--	--	--	--
Psectrocladius	1	0.20	--	--	5	0.94	6	1.17	--	--	--	--
Dicrotendipes fumidus	9	1.80	25	11.21	107	20.15	72	13.98	52	12.38	26	5.75
Glyptotendipes	--	--	--	--	--	--	--	--	--	--	1	0.22

Table 2 (cont.)

Taxa	EREF		ECKD		SEEP1		SEEP2		WCKD		WREF	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Microtendipes	1	0.20	1	0.45	5	0.94	6	1.17	5	1.19	--	--
Nilothauma	--	--	--	--	--	--	1	0.19	--	--	--	--
Polypedilum flavum	1	0.20	--	--	--	--	--	--	--	--	--	--
Paratanytarsus	67	13.43	3	1.35	1	0.19	6	1.17	6	1.43	4	0.88
Rheotanytarsus	124	24.85	9	4.04	6	1.13	16	3.11	31	7.38	34	7.52
Tanytarsus glabrescens grp.	--	--	--	--	--	--	2	0.39	--	--	--	--
Dreissena rostriformis	--	--	--	--	1	0.19	--	--	--	--	--	--
Total Number (reps combined)	499	100.00	223	100.00	531	100.00	515	100.00	420	100.00	452	100.00
Total Taxa Richness	15	--	14	--	22	--	25	--	18	--	16	--
EPT Taxa Richness	1	--	2	--	5	--	4	--	5	--	4	--

Table 3. The composition, number, and relative abundance of macroinvertebrates in rock basket samples from offshore locations, Little Traverse Bay, MI -- June 2006.

Taxa	EREF		ECKD		SEEP1		SEEP2		WCKD		WREF	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naidinae	55	18.71	14	11.11	239	44.67	140	36.65	29	14.01	89	31.12
Caecidotea	--	--	--	--	--	--	2	0.52	1	0.48	1	0.35
Hyalella azteca	--	--	2	1.59	37	6.92	23	6.02	12	5.80	6	2.10
Hydracarina	--	--	--	--	--	--	--	--	2	0.97	1	0.35
Baetis flavistriga	--	--	1	0.79	--	--	--	--	1	0.48	1	0.35
Acerpenna pygmaea	--	--	--	--	1	0.19	1	0.26	--	--	--	--
Eurylophella bicolor grp.	--	--	--	--	--	--	--	--	1	0.48	--	--
Tricorythodes	--	--	--	--	--	--	--	--	--	--	1	0.35
Caenis	--	--	--	--	2	0.37	3	0.79	--	--	1	0.35
Plecoptera	--	--	--	--	--	--	1	0.26	--	--	--	--
Hydroptila	--	--	--	--	2	0.37	2	0.52	7	3.38	1	0.35
Ceratopogonidae	--	--	--	--	--	--	--	--	--	--	1	0.35
Ablabesmyia mallochi	--	--	--	--	2	0.37	2	0.52	--	--	--	--
Thienemannimyia grp.	--	--	1	0.79	5	0.93	--	--	6	2.90	1	0.35
Pagastia	1	0.34	--	--	3	0.56	1	0.26	1	0.48	--	--
Potthastia	--	--	--	--	--	--	5	1.31	--	--	--	--
Corynoneura lobata	3	1.02	--	--	2	0.37	2	0.52	2	0.97	--	--
Thienemanniella xena	3	1.02	--	--	1	0.19	3	0.79	--	--	4	1.40
Cricotopus tremulus grp.	48	16.33	8	6.35	39	7.29	17	4.45	21	10.14	28	9.79
Cricotopus bicinctus grp.	77	26.19	51	40.48	83	15.51	64	16.75	52	25.12	107	37.41
Cricotopus trifascia grp.	--	--	--	--	--	--	2	0.52	--	--	--	--
Eukiefferiella	--	--	--	--	1	0.19	--	--	--	--	--	--
Orthocladius	5	1.70	7	5.56	10	1.87	11	2.88	--	--	--	--
Nanocladius	--	--	--	--	--	--	1	0.26	--	--	3	1.05
Nanocladius spiniplenus	--	--	1	0.79	--	--	--	--	--	--	--	--
Psectrocladius	--	--	--	--	6	1.12	1	0.26	2	0.97	--	--
Psilometriocnemus	--	--	--	--	--	--	1	0.26	--	--	--	--
Dicrotendipes fumidus	30	10.20	39	30.95	86	16.07	84	21.99	41	19.81	19	6.64
Microtendipes	2	0.68	--	--	--	--	3	0.79	--	--	--	--
Nilothauma	--	--	--	--	--	--	--	--	--	--	1	0.35
Polypedilum flavum	--	--	--	--	--	--	1	0.26	--	--	--	--
Pseudochironomus	--	--	--	--	--	--	--	--	--	--	1	0.35
Paratanytarsus	18	6.12	--	--	1	0.19	--	--	3	1.45	1	0.35
Rheotanytarsus	52	17.69	2	1.59	14	2.62	8	2.09	26	12.56	19	6.64
Dreissena rostriformis	--	--	--	--	1	0.19	4	1.05	--	--	--	--
Total Number (reps combined)	294	100.00	126	100.00	535	100.00	382	100.00	207	100.00	286	100.00
Total Taxa Richness	11	--	10	--	19	--	24	--	16	--	19	--
EPT Taxa Richness	0	--	1	--	3	--	4	--	3	--	4	--

Table 4. The composition, number, and relative abundance of macroinvertebrates in rock basket samples from nearshore locations, Little Traverse Bay, MI -- October 2006.

Taxa	EREF		ECKD		SEEP1		SEEP2		WCKD		WREF	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naidinae	214	60.97	70	37.43	11	9.91	--	--	--	--	--	--
Caecidotea	5	1.42	--	--	--	--	--	--	1	1.23	1	3.45
Hyalella azteca	2	0.57	--	--	--	--	--	--	--	--	--	--
Gammarus	7	1.99	1	0.53	1	0.90	--	--	--	--	--	--
Hydracarina	1	0.28	--	--	--	--	--	--	--	--	--	--
Baetis flavistriga	1	0.28	--	--	--	--	1	4.55	--	--	--	--
Leucrocuta	1	0.28	--	--	--	--	--	--	--	--	1	3.45
Heptagenia	--	--	--	--	--	--	--	--	1	1.23	--	--
Eurylophella bicolor grp.	--	--	--	--	1	0.90	--	--	2	2.47	2	6.90
Caenis	14	3.99	1	0.53	3	2.70	1	4.55	8	9.88	--	--
Hydropsychidae	--	--	11	5.88	--	--	--	--	--	--	--	--
Cheumatopsyche	--	--	2	1.07	2	1.80	3	13.64	--	--	--	--
Ceratopsyche morosa grp.	3	0.85	12	6.42	5	4.50	--	--	4	4.94	1	3.45
Ceratopsyche morosa	5	1.42	8	4.28	--	--	--	--	--	--	--	--
Lepidoptera	--	--	--	--	--	--	--	--	--	--	1	3.45
Thienemannimyia grp.	1	0.28	1	0.53	--	--	--	--	2	2.47	2	6.90
Potthastia	--	--	--	--	--	--	1	4.55	--	--	--	--
Thienemanniella xena	--	--	1	0.53	--	--	--	--	--	--	--	--
Cricotopus tremulus grp.	17	4.84	21	11.23	71	63.96	16	72.73	59	72.84	18	62.07
Cricotopus bicinctus grp.	32	9.12	5	2.67	4	3.60	--	--	1	1.23	--	--
Eukiefferiella devonica grp.	1	0.28	--	--	--	--	--	--	--	--	2	6.90
Eukiefferiella gracei grp.	--	--	--	--	1	0.90	--	--	1	1.23	--	--
Orthocladius	12	3.42	45	24.06	9	8.11	--	--	--	--	--	--
Dicrotendipes fumidus	4	1.14	1	0.53	--	--	--	--	--	--	1	3.45
Microtendipes	8	2.28	3	1.60	2	1.80	--	--	1	1.23	--	--
Polypedilum flavum	2	0.57	--	--	--	--	--	--	--	--	--	--
Paratanytarsus	10	2.85	--	--	--	--	--	--	1	1.23	--	--
Rheotanytarsus	8	2.28	4	2.14	1	0.90	--	--	--	--	--	--
Antocha	2	0.57	1	0.53	--	--	--	--	--	--	--	--
Hemerodromia	1	0.28	--	--	--	--	--	--	--	--	--	--
Total Number (reps combined)	351	100.00	187	100.00	111	100.00	22	100.00	81	100.00	29	100.00
Total Taxa Richness	22	--	15	--	12	--	5	--	11	--	10	--
EPT Taxa Richness	5	--	4	--	4	--	3	--	4	--	3	--

Table 5. The composition, number, and relative abundance of macroinvertebrates in rock basket samples from offshore locations, Little Traverse Bay, MI -- October 2006.

Taxa	EREF		ECKD		SEEP1		SEEP2		WCKD		WREF	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naidinae	150	53.76	166	55.70	16	31.37	--	--	--	--	--	--
Caecidotea	1	0.36	1	0.34	1	1.96	1	25.00	--	--	--	--
Hyalella azteca	2	0.72	--	--	1	1.96	--	--	2	5.26	--	--
Gammarus	3	1.08	--	--	--	--	2	50.00	1	2.63	--	--
Heptageniidae	1	0.36	--	--	--	--	--	--	--	--	--	--
Leucrocuta	--	--	--	--	--	--	--	--	1	2.63	1	3.70
Stenacron	--	--	--	--	--	--	--	--	1	2.63	--	--
Stenonema femoratum	1	0.36	--	--	--	--	--	--	--	--	--	--
Maccaffertium vicarium	--	--	1	0.34	--	--	--	--	1	2.63	--	--
Eurylophella bicolor grp.	--	--	--	--	1	1.96	--	--	4	10.53	--	--
Caenis	19	6.81	3	1.01	4	7.84	1	25.00	4	10.53	--	--
Hydropsychidae	--	--	13	4.36	--	--	--	--	--	--	--	--
Cheumatopsyche	--	--	7	2.35	2	3.92	--	--	1	2.63	--	--
Ceratopsyche morosa grp.	9	3.23	16	5.37	--	--	--	--	1	2.63	--	--
Ceratopsyche morosa	--	--	4	1.34	2	3.92	--	--	--	--	2	7.41
Hydroptila	--	--	--	--	--	--	--	--	1	2.63	--	--
Ceratopogonidae	1	0.36	--	--	--	--	--	--	--	--	--	--
Thienemannimyia grp.	3	1.08	1	0.34	1	1.96	--	--	1	2.63	2	7.41
Cricotopus tremulus grp.	10	3.58	37	12.42	19	37.25	--	--	17	44.74	19	70.37
Cricotopus bicinctus grp.	6	2.15	3	1.01	--	--	--	--	--	--	1	3.70
Eukiefferiella devonica grp.	--	--	3	1.01	--	--	--	--	--	--	--	--
Eukiefferiella gracei grp.	--	--	12	4.03	1	1.96	--	--	--	--	--	--
Orthocladius	12	4.30	4	1.34	--	--	--	--	--	--	1	3.70
Dicrotendipes fumidus	7	2.51	6	2.01	1	1.96	--	--	--	--	1	3.70
Microtendipes	14	5.02	6	2.01	--	--	--	--	2	5.26	--	--
Polypedilum flavum	1	0.36	5	1.68	--	--	--	--	--	--	--	--
Paratanytarsus	22	7.89	3	1.01	--	--	--	--	--	--	--	--
Rheotanytarsus	16	5.73	6	2.01	2	3.92	--	--	--	--	--	--
Hemerodromia	--	--	--	--	--	--	--	--	1	2.63	--	--
Dreissena rostriformis	1	0.36	1	0.34	--	--	--	--	--	--	--	--
Total Number (reps combined)	279	100.00	298	100.00	51	100.00	4	100.00	38	100.00	27	100.00
Total Taxa Richness	18	--	19	--	12	--	3	--	14	--	7	--
EPT Taxa Richness	3	--	5	--	4	--	1	--	8	--	2	--

Table 6. The composition and assigned abundance[1] of benthic macroinvertebrates collected qualitative samples at six locations in Little Traverse Bay, MI -- October 2006.

Taxa	EREF Abund.	ECKD Abund.	SEEP1 Abund.	SEEP2 Abund.	WCKD Abund.	WREF Abund.
Lumbriculidae	3	--	--	3	10	10
Naididae	10	10	10	3	10	10
Tubificidae	3	--	1	--	--	--
Mooreobdella	--	--	1	--	--	--
Caecidotea	10	3	10	10	10	10
Hyalella azteca	3	--	--	--	--	--
Gammarus	10	3	10	10	10	10
Orconectes	1	--	--	--	1	--
Hydracarina	3	3	3	--	3	--
Baetis flavistriga	--	--	--	1	--	--
Acerpenna pygmaea	--	--	--	--	3	1
Leucrocuta	10	10	10	10	10	10
Nixe	3	3	--	1	1	3
Stenacron	10	10	3	3	10	10
Maccaffertium	--	--	1	--	--	--
Stenonema femoratum	10	10	10	1	10	10
Maccaffertium vicarium	10	10	--	3	10	10
Leptophlebiidae	--	--	1	--	--	--
Eurylophella bicolor grp.	10	10	10	10	10	10
Caenis	10	10	10	10	10	10
Acroneuria	--	--	--	--	1	--
Polycentropus	1	--	1	--	3	1
Cheumatopsyche	10	10	10	3	10	10
Ceratopsyche morosa grp.	1	1	--	--	3	1
Ceratopsyche morosa	1	3	1	1	3	1
Helicopsyche borealis	1	--	--	--	1	--
Hydroptila	10	--	--	--	10	3
Ceratopogonidae	--	--	1	--	1	--
Thienemannimyia grp.	10	10	10	3	10	10
Pagastia	--	--	1	--	3	--
Potthastia	--	--	3	--	3	3
Cricotopus tremulus grp.	10	10	3	3	10	10
Cricotopus bicinctus grp.	3	--	1	--	--	--
Cricotopus trifascia grp.	3	--	--	--	--	--
Eukiefferiella devonica grp.	10	10	10	1	10	10
Orthocladius	10	10	1	3	--	--
Parakiefferiella	--	1	--	--	--	--
Parametriocnemus	3	--	--	--	--	--
Cryptochironomus	10	--	--	--	3	--
Dicrotendipes fumidus	10	10	--	1	10	10
Microtendipes	10	10	3	1	10	10
Nilothauma	--	--	1	--	--	--
Polypedilum flavum	10	1	--	--	3	--
Pseudochironomus	3	--	1	--	--	--
Stictochironomus	3	--	--	--	--	--
Stictochironomus caffrarius grp.	--	--	3	--	--	--
Cladotanytarsus	10	--	1	--	--	--
Paratanytarsus	10	10	--	--	3	1

Table 6. The composition and assigned abundance[1] of benthic macroinvertebrates collected qualitative samples at six locations in Little Traverse Bay, MI -- October 2006.

Taxa	EREF Abund.	ECKD Abund.	SEEP1 Abund.	SEEP2 Abund.	WCKD Abund.	WREF Abund.
Rheotanytarsus	3	3	--	--	--	1
Tanytarsus	--	--	--	--	10	--
Tanytarsus glabrescens grp.	--	--	--	--	10	1
Tanytarsus guerlus grp.	10	10	10	--	--	--
Antocha	3	3	3	1	10	10
Hemerodromia	10	3	1	--	10	10
Dreissena polymorpha	--	--	--	--	--	3
Dreissena rostriformis	1	3	10	10	1	10
Total Taxa Richness	41	28	33	22	36	30
EPT Taxa Richness	13	10	10	10	15	13

[1]Abundance assigned as 1=1-2 individuals, 3=3-9 individuals, and 10=≥10 individuals.

Table 7. Results of statistical comparisons of mean parameters between nearshore (NS) and offshore (OS) locations using pooled benthic macroinvertebrate data, June-October 2006.

Meric	Gear	Level	N	Median	Mean	t Grouping[1]
Abundance	RB	NS	36	72.00	94.94	A
Abundance	RB	OS	35	58.00	72.17	A
Taxa Richness	RB	NS	36	10.00	9.78	A
Taxa Richness	RB	OS	35	9.00	9.29	A
EPT Taxa Richness	RB	NS	36	2.00	1.92	A
EPT Taxa Richness	RB	OS	35	1.00	1.77	A
Ephemeroptera Abund	RB	NS	36	1.00	1.86	A
Ephemeroptera Abund	RB	OS	35	1.00	1.60	A
Trichoptera Abund	RB	NS	36	1.00	2.47	A
Trichoptera Abund	RB	OS	35	1.00	2.00	A
Oligochaeta Abund	RB	OS	35	16.00	25.66	A
Oligochaeta Abund	RB	NS	36	10.50	20.75	A
Chironomidae Abund	RB	NS	36	39.50	66.22	A
Chironomidae Abund	RB	OS	35	31.00	39.69	A

[1]=Comparisons with a common letter are not significantly different.

Table 8. Results of statistical comparisons of mean parameters among study areas using pooled benthic macroinvertebrate data, June-October 2006.

Meric	Gear	Level	N	Median	Mean	t Grouping[1]
Abundance	RB	EREF	12	89.50	118.58	A
Abundance	RB	SEEP1	12	59.50	102.33	AB
Abundance	RB	SEEP2	11	58.00	83.55	B
Abundance	RB	ECKD	12	50.50	69.42	AB
Abundance	RB	WREF	12	45.00	66.25	B
Abundance	RB	WCKD	12	43.00	62.17	B
Taxa Richness	RB	SEEP2	11	11.00	10.18	A
Taxa Richness	RB	EREF	12	10.00	11.17	A
Taxa Richness	RB	SEEP1	12	10.00	10.08	A
Taxa Richness	RB	WCKD	12	9.50	9.00	A
Taxa Richness	RB	ECKD	12	9.00	9.50	A
Taxa Richness	RB	WREF	12	8.00	7.33	A
EPT Taxa Richness	RB	WCKD	12	2.00	2.25	A
EPT Taxa Richness	RB	SEEP1	12	2.00	2.17	A
EPT Taxa Richness	RB	SEEP2	11	2.00	1.64	A
EPT Taxa Richness	RB	ECKD	12	1.50	2.33	A
EPT Taxa Richness	RB	WREF	12	1.50	1.33	A
EPT Taxa Richness	RB	EREF	12	1.00	1.33	A
Ephemeroptera Abund	RB	WCKD	12	2.00	2.33	A
Ephemeroptera Abund	RB	SEEP1	12	1.50	1.50	AB
Ephemeroptera Abund	RB	SEEP2	11	1.00	2.00	AB
Ephemeroptera Abund	RB	WREF	12	1.00	0.83	AB
Ephemeroptera Abund	RB	EREF	12	0.50	3.17	AB
Ephemeroptera Abund	RB	ECKD	12	0.00	0.58	B
Trichoptera Abund	RB	ECKD	12	2.00	6.50	A
Trichoptera Abund	RB	WCKD	12	1.50	1.67	AB
Trichoptera Abund	RB	SEEP1	12	1.00	1.92	AB
Trichoptera Abund	RB	EREF	12	0.50	1.42	B
Trichoptera Abund	RB	WREF	12	0.50	0.50	B
Trichoptera Abund	RB	SEEP2	11	0.00	1.36	B
Oligochaeta Abund	RB	EREF	12	24.00	37.25	A
Oligochaeta Abund	RB	SEEP2	11	23.00	23.91	CAB
Oligochaeta Abund	RB	SEEP1	12	19.00	34.08	A
Oligochaeta Abund	RB	ECKD	12	9.50	22.42	AB
Oligochaeta Abund	RB	WREF	12	5.50	12.33	CB
Oligochaeta Abund	RB	WCKD	12	0.00	9.08	C
Chironomidae Abund	RB	EREF	12	69.00	74.33	A
Chironomidae Abund	RB	WCKD	12	36.50	45.83	A
Chironomidae Abund	RB	ECKD	12	35.00	39.08	A
Chironomidae Abund	RB	SEEP1	12	32.00	59.00	A
Chironomidae Abund	RB	SEEP2	11	31.00	49.55	A
Chironomidae Abund	RB	WREF	12	29.50	50.75	A

[1]=Comparisons with a common letter are not significantly different.

Table 9. List of algae taxa collected from rock basket samplers and natural substrates, Little Traverse Bay, MI, June and October 2006.

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1010	Achnanthes	spp	.	.	.	.	Vegetative	(Greg.) Hust.
108135	Achnanthes	deflexa	.	.	.	.	Vegetative	C. W. Reimer in Patrick & Reimer
10939	Achnanthes	laevis	.	.	.	.	Vegetative	Ostrup
108169	Achnanthes	lanceolata	.	lanceolatoides	.	.	Vegetative	(Sovereign) Reimer
9338	Achnanthes	lanceolata	lanceolata	.	.	.	Vegetative	(de Brebisson) Grunow
1013	Achnanthes	minutissima	.	.	.	.	Vegetative	Kutzing
9765	Achnanthes	taeniata	.	.	.	.	Vegetative	Grunow in Cleve & Grunow
1341	Amphora	ovalis	.	.	.	.	Vegetative	(Kutzing) Kutzing
1343	Amphora	pediculus	.	.	.	.	Vegetative	(Kutzing) Grunow
1347	Amphora	veneta	.	.	.	.	Vegetative	Kutzing
108384	Anomoeneis	vitrea	.	.	.	.	Vegetative	(Grunow) Ross
9351	Bacillaria	paradoxa	.	.	.	.	Vegetative	Gmelin
1066	Cocconeis	pediculus	.	.	.	.	Vegetative	Ehrenb.
9212	Cocconeis	placentula	.	lineata	.	.	Vegetative	(Ehrenb.) Van Heurck
1000073	Cyclotella	hakanssoniae	.	.	.	.	Vegetative	Wendker
1085	Cyclotella	meneghiniana	.	.	.	.	Vegetative	K□tz.
9361	Cyclotella	pseudostelligera	.	.	.	.	Vegetative	Hust.
9854	Cyclotella	sp. 1	.	(small) Job 07	.	.	Vegetative	(Kutzing) de Brebisson
1090	Cymbella	spp	.	.	.	.	Vegetative	(Schmidt) Cleve
1862	Cymbella	affinis	.	.	.	.	Vegetative	K□tz.
1098	Cymbella	caespitosa	.	.	.	.	Vegetative	(Kutzing) Brun
9955	Cymbella	cf cistula	.	.	.	.	Vegetative	(Ehrhenberg) Kirchner
1099	Cymbella	cistula	.	.	.	.	Vegetative	(Ehrenberg in Hemprich & Ehrenberg) Kirchner in

1111	Cymbella	delicatula	.	.	.	.	Vegetative	K□tz.
1000572	Cymbella	excisa	.	.	.	.	Vegetative	Kutzing
9371	Cymbella	gracilis	.	.	.	.	Vegetative	(Ehrenberg) Kutzing
9379	Cymbella	helmckei	.	.	.	.	Vegetative	Kramer
1113	Cymbella	hustedtii	.	.	.	.	Vegetative	Krasske
1091	Cymbella	microcephala	.	.	.	.	Vegetative	Grunow
1115	Cymbella	minuta	.	.	.	.	Vegetative	Hilse
1094	Cymbella	naviculiformis	.	.	.	.	Vegetative	Auersw. ex Heib.
1095	Cymbella	silesiaca	.	.	.	.	Vegetative	Bleisch
1096	Cymbella	tumida	.	.	.	.	Vegetative	(Br,b.) Van Heurck
9952	Cymbella	tumidula	.	.	.	.	Vegetative	Grunow
109032	Cymbella	turgidula	.	.	.	.	Vegetative	Grunow
109036	Cymbella	ventricosa	.	ventricosa	.	.	Vegetative	C. A. Agardh
10400	Cymbellonitzschia	spp	.	.	.	.	Vegetative	Hust.
109046	Denticula	tenuis	.	.	.	.	Vegetative	K□tz.
1109	Diatoma	tenuis	.	.	.	.	Vegetative	Agardh
4272	Diatoma	vulgaris	.	.	.	distorta	Vegetative	Grunow in Van Heurck
1108	Diatoma	vulgaris	.	vulgaris	.	.	Vegetative	Bory
1354	Epithemia	turgida	.	.	.	.	Vegetative	(Ehrenb.) K□tz.
1355	Epithemia	turgida	.	westermannii	.	.	Vegetative	(Ehrenb.) Grunow
109195	Eucocconeis	flexella	.	.	.	.	Vegetative	(K□tz.) Cleve
1140	Eunotia	spp	.	.	.	.	Vegetative	N”rpell-Schempp & Lange-Bert. in Lange-Bert.
9407	Fragilaria	berolinensis	.	.	.	.	Vegetative	(Lemmermann) Lange-Bertalot
9397	Fragilaria	capucina	.	vaucheriae	.	.	Vegetative	(Kutzing) Lange-Bertalot
10379	Fragilaria	capucina	.	mesolepta	.	.	Vegetative	Rabenh.
9395	Fragilaria	capucina	.	gracilis	.	.	Vegetative	(ostrup) Hustedt
10372	Fragilaria	capucina	.	distans	.	.	Vegetative	Sippe

1159	Fragilaria	construens	.	.	construens	.	Vegetative	(Ehrenberg) Hustedt
9045	Fragilaria	construens	.	.	venter	.	Vegetative	(Ehrenberg) Hustedt
1152	Fragilaria	crotonensis	.	.	.	.	Vegetative	Kitton
1155	Fragilaria	leptostauron	.	.	.	.	Vegetative	(Ehrenberg) Hustedt
109340	Fragilaria	radians	.	.	.	.	Vegetative	(K□tz.) D. M. Williams & Round
9321	Gomphoneis	herculeana	.	.	.	.	Vegetative	(Ehrenb.) Cleve
1160	Gomphonema	spp	.	.	.	.	Vegetative	C. Agardh
1166	Gomphonema	affine	.	.	.	.	Vegetative	K□tz.
9058	Gomphonema	augur	.	.	.	.	Vegetative	Ehrenb.
1169	Gomphonema	clavatum	.	.	.	.	Vegetative	Ehrenberg
1163	Gomphonema	clevei	.	.	.	.	Vegetative	Fricke
9053	Gomphonema	minutum	.	.	.	.	Vegetative	(Agardh) Agardh
9286	Gomphonema	olivaceum	.	.	.	.	Vegetative	(Lyngbye) Desmazieres
1161	Gomphonema	parvulum	.	.	.	.	Vegetative	(K□tz.) K□tz.
9055	Gomphonema	pumilum	.	.	.	.	Vegetative	(Grunow) Reichardt & Lange-Bertalot
9057	Gomphonema	truncatum	.	.	.	.	Vegetative	Ehrenb.
9411	Mastogloia	smithii	.	.	.	.	Vegetative	Thwaites
1210	Navicula	spp	.	.	.	.	Vegetative	Bory .
1214	Navicula	cryptocephala	.	.	.	.	Vegetative	K□tz.
9072	Navicula	cryptotenella	.	.	.	.	Vegetative	Lange-Bert.
1000065	Navicula	cryptotenelloides	.	.	.	.	Vegetative	.
9305	Navicula	decussis	.	decussis	.	.	Vegetative	Ostrup
9686	Navicula	erifuga	.	.	.	.	Vegetative	Lange-Bertalot
9076	Navicula	goeppertiana	.	goeppertiana	.	.	Vegetative	(Bleisch) H.L. Smith
1216	Navicula	halophila	.	.	.	.	Vegetative	(Grunow) Cleve
9086	Navicula	minuscula	.	.	.	.	Vegetative	Grunow
10356	Navicula	radiosafallax	.	.	.	.	Vegetative	Lange-Bert.

9101	Navicula	subminuscula	.	.	.	.	Vegetative	Manguin
9102	Navicula	tripunctata	.	.	.	.	Vegetative	(O. F. M□ll.) Bory
9223	Navicula	viridula	.	linearis	.	.	Vegetative	Hust.
1220	Nitzschia	spp	.	.	.	.	Vegetative	Hassall
1221	Nitzschia	acicularis	.	.	.	.	Vegetative	(Kutzing) W. Smith
9236	Nitzschia	constricta	.	.	.	.	Vegetative	(Kutzing) Ralfs .
9113	Nitzschia	dissipata	.	.	.	.	Vegetative	(K□tz.) Grunow
9114	Nitzschia	fonticola	.	.	.	.	Vegetative	Grunow
1222	Nitzschia	gracilis	.	.	.	.	Vegetative	Hantzsch
9117	Nitzschia	intermedia	.	.	.	.	Vegetative	Hantzsch
9123	Nitzschia	palea	.	.	.	.	Vegetative	(K□tz.) W. Sm.
1223	Nitzschia	perminuta	.	.	.	.	Vegetative	(Grunow) M. Perag.
9124	Nitzschia	recta	.	.	.	.	Vegetative	Hantzsch
1271	Rhoicosphenia	curvata	.	.	.	.	Vegetative	(kutzing) Grunow
1752	Rhopalodia	brebissonii	.	.	.	.	Vegetative	Krammer
1754	Rhopalodia	gibba	.	minuta	.	.	Vegetative	Krammer
1314	Synedra	delicatissima	.	.	.	.	Vegetative	W. Smith
1477	Synedra	filiformis	.	.	.	.	Vegetative	Grunow
1316	Synedra	nana	.	.	.	.	Vegetative	F. Meister
1000481	Synedra	radians	.	.	.	.	Vegetative	Kutz
1000541	Synedra	radians	.	.	.	.	Vegetative	.
1000540	Synedra	tenera	.	.	.	.	Vegetative	.
9504	Synedra	tenera	.	.	.	.	Vegetative	W. Sm.
1315	Synedra	ulna	.	.	.	.	Vegetative	(Nitzsch) Ehrenb.

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
129642	*Chlorococcaceae	spp	.	.	.	.	Vegetative	.

2687	*Chlorococcaceae	spp	.	.	.	> 1 um ovoid	Vegetative	(Brandt) Beijerinck
8190	Bulbochaete	spp	.	.	.	.	Vegetative	Transeau and Brown In Tiff.
2100	Chlorococcum	spp	.	.	.	.	Vegetative	(Naegeli) Rabenhor
2101	Chlorococcum	humicola	.	.	.	.	Vegetative	(Naegeli) Rabenhor
2791	Cladophora	fracta	.	.	.	.	Vegetative	(Dillw.) Kuetzing
2180	Cosmarium	spp	.	.	.	.	Vegetative	Corda
2211	Dictyosphaerium	pulchellum	.	.	.	.	Vegetative	Wood
2961	Dispora	crucigenioides	.	.	.	.	Vegetative	Printz
2246	Euastrum	spp	.	.	.	.	Vegetative	Nordstedt
10170	Geminella	spp	.	.	.	.	Vegetative	Prescott
8041	Monoraphidium	capricornutum	.	.	.	.	Vegetative	(Printz) Nygaard
2340	Mougeotia	spp	.	.	.	.	Vegetative	Kisselew
2350	Oedogonium	spp	.	.	.	.	Vegetative	De Bary
2369	Oocystis	lacustris	.	.	.	.	Vegetative	Chodat
2363	Oocystis	parva	.	.	.	.	Vegetative	West & West
2380	Pediastrum	spp	.	.	.	.	Vegetative	(Ehrenberg) Meneg.
2382	Pediastrum	boryanum	.	.	.	.	Vegetative	(Turpin) Meneghini
2389	Pediastrum	boryanum	.	longicorne	.	.	Vegetative	Raciborski
1000013	Pediastrum	duplex	.	.	.	.	Vegetative	West & West
102560	Pediastrum	integrum	.	.	.	.	Vegetative	Naeg.
2387	Pediastrum	tetras	.	tetraodon	.	.	Vegetative	(Corda) Rabenhorst
8451	Protoderma	viride	.	.	.	.	Vegetative	Kuetzing
2471	Rhizoclonium	hieroglyphicum	.	.	.	.	Vegetative	(C. Agardh) Kuetzing
2484	Scenedesmus	abundans	.	.	.	.	Vegetative	(Kirchn.) Chodat
8399	Scenedesmus	acutus	.	.	.	.	Vegetative	Lagh. Chodat
2483	Scenedesmus	bijuga	.	.	.	.	Vegetative	(Turpin) Lagerh.
2488	Scenedesmus	denticulatus	.	.	.	.	Vegetative	Lagerhiem

8393	Scenedesmus	dispar	.	.	.	.	Vegetative	(Brebisson) Rabenhorst .
8303	Scenedesmus	opoliensis	.	carinatus	.	.	Vegetative	Lemmermann
2884	Scenedesmus	quadricauda	.	.	.	.	Vegetative	(Turpin) Breb.
8302	Scenedesmus	quadricauda	.	longispina	.	.	Vegetative	(Chodat) G. M. Smith
8221	Scenedesmus	quadricauda	.	quadrispina	.	.	Vegetative	(Chodat) Smith
2500	Selenastrum	spp	.	.	.	.	Vegetative	Lagerheim
2950	Spirogyra	spp	.	.	.	.	Vegetative	Skuja
2540	Stigeoclonium	spp	.	.	.	.	Vegetative	(Hazen) Collins Em Cox and Bold
2550	Tetraedron	spp	.	.	.	.	Vegetative	(Reinsch) De Toni
2554	Tetraedron	minimum	.	.	.	.	Vegetative	(Braun) Hansgirg
130069	Trentepohlia	spp	.	.	.	.	Vegetative	(Flotow) Hansgrig
103684	Ulothrix	aequalis	.	.	.	.	Vegetative	Kuetzing
103704	Ulothrix	variabilis	.	.	.	.	Vegetative	Kuetzing
103705	Ulothrix	zonata	.	.	.	.	Vegetative	(Weber and Mohr) Kuetzing
8211	Uronema	elongatum	.	.	.	.	Vegetative	Hodgetts
2740	Zygnema	spp	.	.	.	.	Vegetative	Czurda

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1653	*.	spp	.	.	.	.	Cyst	N/A
1000035	*Chrysocapsaceae	spp	.	.	.	>1 um spherical	Vegetative	N/A
1611	Stichogloea	olivacea	.	.	.	.	Vegetative	Chodat

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
3015	Cryptomonas	erosa	.	.	.	.	Vegetative	Ehrenberg .
3040	Rhodomonas	spp	.	.	.	.	Vegetative	Karsten .

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
4050	Aphanocapsa	spp	.	.	.	.	Vegetative	W. and G. S. West
4054	Aphanocapsa	delicatissima	.	.	.	.	Vegetative	West & West
4051	Aphanocapsa	elachista	.	.	.	.	Vegetative	West & West
4052	Aphanocapsa	koordersi	.	.	.	.	Vegetative	Strom
4053	Aphanocapsa	pulchra	.	.	.	.	Vegetative	(Kutz.) Rabenh.
4055	Aphanocapsa	rivularis	.	.	.	.	Vegetative	(Carm.) Rabenhorst
4062	Aphanothece	nidulans	.	.	.	.	Vegetative	P. Richter
4069	Aphanothece	stagnina	.	.	.	.	Vegetative	(Spreg.) A. Br. .
4310	Calothrix	spp	.	.	.	.	Vegetative	(Naeg.) Born. and Flah.
4080	Chroococcus	spp	.	.	.	.	Vegetative	(Breb.) Naegeli
4512	Chroococcus	cohaerens	.	.	.	.	Vegetative	(Breb.) Naegeli
4083	Chroococcus	minimus	.	.	.	.	Vegetative	(Keis.) Lemmermann
4086	Chroococcus	minutus	.	.	.	.	Vegetative	(Kuetzing) Naegeli
4085	Chroococcus	prescottii	.	.	.	.	Vegetative	Drouet and Daily
4511	Chroococcus	turgidus	.	.	.	.	Vegetative	(Kutzing) Nageli .
4720	Cyanosarcina	spp	.	.	.	.	Vegetative	Kovacik
4150	Lyngbya	spp	.	.	.	.	Vegetative	Agardh
1000544	Lyngbya	spp	.	.	.	sp. 4	Vegetative	.
107564	Lyngbya	birgei	.	.	.	.	Vegetative	.
4157	Lyngbya	diguetii	.	.	.	.	Vegetative	Lemmermann
4309	Lyngbya	perelegans	.	.	.	.	Vegetative	Lemmermann
4421	Lyngbya	subtilis	.	.	.	.	Vegetative	West & West .
107595	Lyngbya	subtillissima	.	.	.	.	Vegetative	.
4169	Merismopedia	elegans	.	.	.	.	Vegetative	A. Br. In Kutz 1849
4168	Merismopedia	punctata	.	.	.	.	Vegetative	Meyer In Wiegmann

4170	Oscillatoria	spp	.	.	.	.	Vegetative	Gomont
4617	Oscillatoria	angustissima	.	.	.	.	Vegetative	West and West
4252	Oscillatoria	hamelii	.	.	.	.	Vegetative	Fremy 1930
4174	Oscillatoria	tenuis	.	.	.	.	Vegetative	Agardh
4190	Phormidium	spp	.	.	.	.	Vegetative	Lemmermann
4460	Pseudanabaena	spp	.	.	.	.	Vegetative	Lauterborn
4463	Pseudanabaena	galeata	.	.	.	.	Vegetative	Bocher .
4321	Synechococcus	elongatus	.	.	.	.	Vegetative	Nageli
4323	Synechococcus	sp. 1	.	.	.	< 1um ovoid	Vegetative	Nageli
4660	Synechocystis	spp	.	.	.	.	Vegetative	C. Sauvageau 1892
4285	Synechocystis	spp	.	.	.	>1 um spherical	Vegetative	N/A

Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
6034	Gymnodinium	sp. 3	.	.	.	.	Vegetative	Stein

Table 10. Nearshore – June 2006 Average Total Concentration, Average Total Biovolume, and Average Total Taxa Richness; Includes Standard Deviation and CV%

Nearshore - June 2006							
		EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
TOTAL Conc (NU/sq cm)	Average	3,021,075	3,338,150	2,544,291	3,401,787	2,246,753	3,081,203
	Std. Dev	900,431	440,240	445,485	1,301,703	1,350,654	690,367
	CV(%)	30	13	18	38	60	22
Total Biovolume (um cube/sq cm)	Average	200,901,692	310,924,043	378,548,085	320,352,570	234,304,658	503,826,585
	Std. Dev	37,312,951	84,396,124	221,727,438	121,464,678	111,976,396	101,465,890
	CV(%)	19	27	59	38	48	20
Taxa Richness	Average	40	38	43	42	41	39
	Std. Dev	6	2	3	3	4	4
	CV(%)	14	6	6	6	8	9

Table 11. Offshore – June 2006 Average Total Concentration, Average Total Biovolume, and Average Total Taxa Richness; Includes Standard Deviation and CV%

Offshore - June 2006							
		EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
TOTAL Conc (NU/sq cm)	Average	4,573,481	2,624,324	4,263,329	3,241,900	2,060,600	2,284,116
	Std. Dev	1,100,858	298,715	1,430,039	1,411,504	541,217	426,715
	CV(%)	24	11	34	44	26	19
Total Biovolume (um cube/sq cm)	Average	391,005,757	262,539,300	483,455,145	430,142,831	529,069,329	333,700,880
	Std. Dev	192,235,719	52,473,170	44,837,753	115,362,764	418,595,109	50,095,907
	CV(%)	49	20	9	27	79	15
Taxa Richness	Average	41	36	41	40	41	38
	Std. Dev	0	2	2	4	9	4
	CV(%)	0	5	5	9	22	9

Table 12. Nearshore – October 2006 Average Total Concentration, Average Total Biovolume, and Average Total Taxa Richness; Includes Standard Deviation and CV%

Nearshore - October 2006							
		EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
TOTAL Conc (NU/sq cm)	Average	3,094,511	2,281,611	778,351	991,839	1,266,863	733,770
	Std. Dev	155,015	371,233	524,327	539,211	363,966	217,725
	CV(%)	5	16	67	54	29	30
Total Biovolume (um cube/sq cm)	Average	558,299,571	999,078,423	287,508,140	407,149,878	397,353,856	187,064,176
	Std. Dev	215,684,020	199,732,586	225,904,089	383,149,191	71,841,201	60,581,083
	CV(%)	39	20	79	94	18	32
Taxa Richness	Average	46	39	47	43	38	30
	Std. Dev	2	5	5	6	7	4
	CV(%)	5	12	11	15	18	12

Table 13. Offshore – October 2006 Average Total Concentration, Average Total Biovolume, and Average Total Taxa Richness; Includes Standard Deviation and CV%

Offshore - October 2006							
		EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
TOTAL Conc (NU/sq cm)	Average	2,406,401	3,294,258	1,180,103	287,072	966,675	1,350,940
	Std. Dev	493,340	1,153,880	274,313	68,623	160,185	216,537
	CV(%)	21	35	23	24	17	16
Total Biovolume (um cube/sq cm)	Average	1,027,492,173	1,617,902,233	474,073,318	41,918,889	228,032,265	585,156,157
	Std. Dev	348,016,137	335,368,219	233,595,369	7,180,421	90,472,978	233,979,356
	CV(%)	34	21	49	17	40	40
Taxa Richness	Average	47	41	44	28	40	37
	Std. Dev	3	7	7	4	3	1
	CV(%)	7	17	15	13	7	3

TABLE 14

MEAN (AND ACTUAL RANGE) WATER TEMPERATURE (C), SPECIFIC CONDUCTANCE (µS/cm),
DISSOLVED OXYGEN (mg/L), pH, AND TURBIDITY (NTU)
AT BASKET SAMPLER LOCATIONS NEAR BAY HARBOR, LITTLE TRAVERSE BAY, MI
MAY - JUNE AND SEPTEMBER - OCTOBER 2006

May - June					
Location	**Temp.**	**Sp. Cond.**	**DO**	**pH**	**Turbidity**
EREF-NS	14.64	274	12.37	8.55	1.46
EREF-OS	14.19	271	12.19	8.45	0.87
ECKD-NS	13.84	272	11.90	8.45	1.05
ECKD-OS	13.50	269	11.94	8.36	0.91
SEEP1-NS	14.95	271	11.84	8.46	1.11
SEEP1-OS	13.72	266	12.14	8.37	1.10
SEEP2-NS	13.72	273	11.62	8.36	1.90
SEEP2-OS	13.08	268	11.73	8.32	1.52
WCKD-NS	13.82	282	12.00	8.31	1.19
WCKD-OS	13.08	268	12.00	8.27	1.21
WREF-NS	13.19	271	11.45	8.08	1.68
WREF-OS	12.66	268	11.53	8.10	1.24
Min	7.88	248	8.59	7.25	0.20
Max	20.76	356	15.55	8.72	6.46
September - October					
Location	**Temp.**	**Sp. Cond.**	**DO**	**pH**	**Turbidity**
EREF-NS	13.99	282	12.05	8.48	1.32
EREF-OS	14.26	284	11.97	8.47	0.69
ECKD-NS	13.96	274	10.63	8.29	1.19
ECKD-OS	13.92	270	10.46	8.28	0.89
SEEP1-NS	13.08	272	11.04	8.35	0.81
SEEP1-OS	13.43	269	10.64	8.45	0.79
SEEP2-NS	13.12	276	10.75	8.31	0.85
SEEP2-OS	13.55	270	10.28	8.32	0.59
WCKD-NS	13.17	281	10.00	8.22	1.24
WCKD-OS	13.20	279	10.15	8.24	1.04
WREF-NS	13.21	276	10.19	8.20	0.61
WREF-OS	13.46	273	10.10	8.26	0.58
Min	8.98	248	8.20	7.67	0.19
Max	24.67	320	14.87	8.91	3.17

Table 15. Little Traverse Bay Zebra/Quagga Mussels Mercury Concentrations Data from Fall 2006 Sampling

Location	Replicate	Field Wet Wgt. (g)	Dry Wgt. (%)	Dry Wgt. Hg Conc. (ng/g)	Mean (ng/g)	Std. Dev. (ng/g)
EREF A	1	32.7	48.3	5.5	4.5	1.4142
EREF B	2	31.8	53.8	3.5		
ECKD A	1	5.7	40.5	7.7	6.4	1.8385
ECKD B	2	4.0	69.4	5.1		
SEEP1 A	1	31.9	45.5	4.0	3.9	0.1414
SEEP1 B	2	32.4	49.7	3.8		
SEEP2 A	1	38.7	48.0	4.4	4.0	0.5657
SEEP2 B	2	35.2	50.0	3.6		
WCKD A	1	33.5	49.9	6.1	4.8	1.9092
WCKD B	2	33.8	52.7	3.4		
WREF A	1	31.9	55.6	3.4	4.4	1.4142
WREF B	2	32.3	49.5	5.4		
WREF Dup	Field Dup	32.4	47.9	4.0	--	--
ECKD Transplant	--	32.7	52.9	3.3	--	--
MEAN	**--**	**29.2**	**51.0**	**4.5**	**4.7**	--

Mean and Standard Deviations are calculated using the replicate values for each sampling area

Appendices

Appendix A

Baseline Ecological Characterization Workplan

Work Plan for Baseline Ecological Investigation for Benthic Organisms and Periphyton Community for Little Traverse Bay for Reference and the CKD Leachate Release Areas (Revision 4.0)

June 2006

Prepared for:

CMS Land Company
Jackson, Michigan

Prepared by:

Ish Inc.
Raleigh, NC,
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Chicago, IL

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Work Plan for Baseline Ecological Investigation for Benthic Organisms and Periphyton Community for Little Traverse Bay for Reference and the CKD Leachate Release Areas

(Revision 4.0)

1.0 Introduction

There are four areas where CKD leachate has been released into Little Traverse Bay. These CKD leachate release areas are identified as Seep 1, Seep 2, East CKD, and West CKD. Remedial investigations are underway to examine the subsurface conditions from the standpoints of geological, hydrological, and chemistry of groundwater. A removal action has been implemented to intercept and collect leachate from Seeps 1 and 2. As part of the overall CKD leachate areas environmental characterization work, an ecological investigation focused on benthic organisms of an area of Little Traverse Bay is contemplated. This draft work plan is provided to allow for review and revision(s) by the various participants so that a final work plan can be established and the ecological assessment work can be implemented.

2.0 Study Objectives

A baseline ecological evaluation focusing on benthic macroinvertebrate and periphyton communities will be conducted for the Little Traverse Bay CKD leachate release site with the previously agreed to objectives:

1) Provide general ecological profile for the study area,
2) Evaluate affects, if any, from the leachate release, and
3) Document the progress of remediation measures employed.

3.0 Study Area

Little Traverse Bay, in the vicinity of the CKD leachate release sites, is the proposed study area for the benthic and periphyton baseline characterization study. Sampling will be conducted in four target areas of the Little Traverse Bay CKD leachate release sites. Seep 1, Seep 2, West CKD, and East CKD segments will comprise the areas potentially impacted in the Little Traverse Bay. These four areas are targeted for the ecological study based on the historical data showing high pH measurements in the shoreline surveys. Sample locations within these impacted areas have been identified based on two criteria:

1) Locations with the highest pH measured during the targeted shoreline survey conducted in May/June 2005, and

2) Similar natural substrate conditions.

The restoration-based objective of the Eco Baseline Work Plan requires evaluation of the impacted shoreline in the most impacted zone based on historical pH measurements. Our purpose is to monitor the area's return to normal in the area that experienced the highest pH. In addition, two un-impacted reference areas (East reference and West Reference) will be sampled adjacent to the two nearby impacted areas. These two reference areas are located outside of known CKD leachate impacted areas and are selected to be similar to substrate conditions in the impacted areas. In each of these six areas, basket samplers will be deployed at two depths: near-shore at shallow depth and off-shore at deeper depth. Therefore, a total of twelve proposed sampling locations are distributed in the study area as shown on (Ish Inc. et al. 2009, Figures 1-3).

4.0 Methods

This baseline ecological characterization will be carried out in two steps and will focus on the benthic invertebrates and periphyton components of the aquatic ecosystem. The first step will involve a survey of the substrate in the Little Traverse Bay CKD leachate release area to determine the suitability of conventional sampling for benthic invertebrates in the affected and reference areas. Qualitative evaluation of the abundance of benthic invertebrates will be carried out during this initial survey of the substrate. The second step will consist of developing and implementing a sampling and analysis program utilizing the appropriate substrate and biological enumeration methods for collection of samples from the two reference areas and the four impacted areas near the CKD leachate release site.

4.1 Substrate Survey Results

A substrate survey of the target areas at the Little Traverse Bay CKD leachate release site was carried out on January 31, 2006 for ascertaining the similarity and suitability of natural substrates for sampling and analysis of benthic invertebrates and periyphyton communities in the reference and the potentially CKD leachate impacted areas. A summary report on the survey is included as Ish Inc. et al. (2009), Appendix C in this work plan for sharing the observations made. This survey effort included entering and observing in the Little Traverse Bay the conditions of the bottom materials present in the near-shore and off-shore areas at several different locations including reference and potentially impacted areas. Based on the evaluation of the ecologists who conducted the survey, sampling of the naturally occurring substrate material for the enumeration of benthic invertebrates will not be very productive for achieving the objectives of this project. Therefore, artificial substrate material in the form of baskets will be utilized in the baseline sampling and analysis efforts. This survey was conducted on a calm weather day prior to ice formation in the lake.

4.2 Use of Artificial Substrates

There are a number of review papers in the literature discussing the use of artificial substrate materials for the sampling and enumeration of benthic invertebrates from habitats difficult to sample by other means (Rosenberg and Resh, 1982; Golder Associates, Ltd., undated). Although Rosenberg and Resh (1982) listed cost, colonization selectivity and sampler loss as possible limitations, they also listed several advantages to using artificial substrates in benthic macroinvertebrate sampling. The primary reason for sampling the Little Traverse Bay benthic macroinvertebrate community using artificial substrates is due to the fact that the study area lacks unidirectional flow as a result of wave action. This factor alone renders most active collection devices such as kick nets, sweep nets, drift nets, Surber samplers, and Hess samplers relatively ineffective at collecting quantitative and accurate data. In addition, the natural substrate is generally cobble or bedrock, limiting the usefulness of dredge devices in this area. Therefore, we believe that the artificial substrate samplers are the preferred choice for the baseline ecological characterization work.

We propose to use artificial substrate basket samplers filled with manufactured material rather than native rock. The material that will be used in the basket samplers will be 3-in diameter porcelain spheres. The advantages of using manufactured materials as the colonizing substrate include:

- Manufactured materials provide a standardized size and shape with a surface area that can be easily quantified and replicated (Rosenberg and Resh 1982).
- In this particular instance, the substrate pieces would not only be standardized, they would be representative of natural substrate given the predominance of coarse and hard cobble substrate in the study area.
- Manufactured materials will ensure that each sampler will receive the same treatment and will eliminate any error and effort associated with cleaning native substrates.

- Artificial materials such as those described above are readily available from manufacturers.

The samplers described above will be used to sample both the benthic macroinvertebrate community and the periphyton community. Although the periphyton community includes a variety of autotrophic and heterotrophic organisms, this study will focus on the autotrophic organisms (algae). A portion of the samples will be preserved and archived for potential examination of other components of the periphyton community.

In the following subsections details are presented for conducting the benthic macroinvertebrate and periphyton sampling and analysis using artificial substrate samplers for the baseline ecological assessment in the area of Little Traverse Bay CKD leachate release site. Since no single established guidance exists for this type of monitoring on the Great Lakes, the methods have been developed from multiple sources and incorporate generally acceptable techniques for sampling, processing the samples, and reporting the data.

4.2.1 Sampler Design

Benthic macroinvertebrate and periphyton community samples will be collected during spring (early-May to late-June) and fall (late August to mid-October). Artificial substrate basket samplers will be used to collect samples of the benthic macroinvertebrate and periphyton communities. The basket samplers are essentially modified barbeque baskets that are 18-cm in diameter and 27-cm in length with 2-cm^2, 14 gauge, PVC coated, galvanized wire mesh. Each sampler will be filled with 12, 7.5-cm porcelain spheres to provide a consistent amount of surface area among all of the samplers. The 12 spheres fill the basket volume completely, leaving little room for movement of the substrate material during the colonization period. Visual observation will be made at the time of retrieval as to the extent of substrate movement and the potential impact on colonization of the substrate.

4.2.2 Sampling Locations and Artificial Basket Samplers

In each of the six deployment areas, basket samplers will be deployed at two depths: near-shore at shallow depth and off-shore at deeper depth. Therefore, sampling will be conducted at two locations in each of the six areas for a total of 12 sampling locations. Four benthos and four periphyton samplers will be deployed at each location to collect samples for characterization of the respective communities (total of 96 basket samplers). At each sampling location one extra basket sampler for each community is being deployed as a contingency for those potentially lost to vandalism, storms, or other unavoidable events. Therefore, a total of 72 basket samplers will be processed. Three replicate benthic macroinvertebrate basket samples and three replicate periphyton basket samples will be collected and processed from each location (total of 36 benthic macroinvertebrate samples and 36 periphyton samples).

4.2.2.1 Deployment of Basket Samplers

The samplers will be deployed perpendicular to shore, along each depth contour, and on the lake bottom. The baskets will be set no deeper than waist deep water. The near-shore assembly will be in water slightly deeper than the baskets. Historically, lake levels have varied by as much as 12” during the deployment period. In order to maintain water cover, the near-shore baskets will be deployed in water depth of approximately 18”. Two galvanized unistrut rails will be set approximately 1.25-m apart. Each end of both rails will be bolted to a 50-lb concrete block. Eight baskets will be placed between the rails spaced approximately 10 to 15-cm apart. Each basket will be attached to the rails on opposite ends using 3-mm diameter stainless steel braided cable. In addition, to maintain tension in the cable and minimize basket movement associated with wave action, a shock cord will be used to connect one end of the basket to one rail. Spreader bars will be used to attach the ends of the rails to each other. These will prevent the rails from moving together, increase the overall weight of the assembly, and enhance sampler stability. Figures 1 and 2 show a sampler assembly before and after being deployed at the East Reference near-shore location.

Samplers will be numbered one through eight from left to right when facing shore. The samplers will remain in place for approximately a six-week colonization period during each sampling event. During the colonization period, debris collecting on the basket mesh will be removed so as not to reduce the amount of sunlight reaching the substrates.

Figure 1 – Sampler assembly before deployment

Figure 2 – Sampler assembly after deployment

4.2.2.2 Retrieval of Basket Samplers

Since no method will completely prevent the loss of organisms, sampler retrieval will be conducted as carefully as possible so as to minimize the loss of organisms. Starting at one end of the assembly, each basket will be handled separately. The first basket will be stabilized by one person using a pair of man-hole cover hooks while the second person disconnects or cuts the shock cord and cable clips attached to each end of the basket. Once the basket is no longer tethered to the assembly rails, the second person will place a long-handled, box-type kick net with a 500-µm mesh bag parallel to the sampler. The person holding the sampler steady with the man-hole cover hooks will then gently place the sampler in the net bag and in one consistent motion, the sampler will be brought to the surface, out of the water, and then to the shore where it will be processed. Each basket will be retrieved from the assemblies in the same manner. Depending on the condition of each sampler in a given assembly, three samplers will be individually processed as replicates for periphyton and three samplers will be individually processed as replicates for benthic macroinvertebrates. If all eight samplers

are in good condition, the two extra samplers will be cleaned for the next sampling event but will not be preserved.

Although it is possible that some organisms, either periphyton or benthos, will be lost during retrieval, the intent of the retrieval method is to secure the samplers with the least amount of disturbance and transport the samplers to shore for processing. Furthermore, the method is designed to treat all samplers in the same manner. Therefore, if loss occurs for one, it would be expected to be similar for all samplers. The 500-µm net is not designed to filter either sample type. Since the focus of the investigation is on communities living and growing on and around the spheres and not on the basket or in the water column, it is likely that loss of material through this method of retrieval will result in a minimal loss of organisms from the surface of the spheres. Any loss that does occur should be consistent among all samplers regardless of location.

Odd numbered samplers will be processed for periphyton and even numbered baskets will be processed for benthic macroinvertebrates (e.g., from left to right when facing shore, samplers 1, 3, 5, or 7 will be processed for algae while samplers 2, 4, 6, or 8 will be processed for benthos).

4.2.2.3 Field Processing of the Basket Samplers

Field sample processing of the retrieved basket samplers will be conducted differently for the periphyton and benthic macroinvertebrate samplers. Upon reaching shore, the periphyton samplers will be opened and the spheres contained within will be transferred into a shallow wash basin filled with a minimum amount of water (i.e., < 1-L). A soft bristle brush and sponge will be used to gently clean each of the 12 spheres to minimize organism damage. Each sphere will be rinsed and placed back in the sampler. After all the spheres have been processed, the cleaning utensils will be cleaned, rinsed into the sample, and inspected. Approximately 10% of the sample will be removed and preserved separately using 10% formalin. The remaining sample liquid and debris will then be transferred whole to one or more amber 1-L jars and preserved with 0.25% glutaraldehyde solution in water. Using glutaraldehyde instead of Lugol's solution as a

preservative allows for the use of fluorescence during microscopic examination of the sample. In turn, fluorescence allows for faster and more accurate enumeration. Glutaraldehyde will be added to the sample as follows: 1-mL of 25% glutaraldehyde solution for every 100-mL of sample to obtain a 0.25% concentration of preservative in the sample. An external label will be placed on each jar identifying the project, location, replicate, date, and time. While in the field, the samples will be stored in coolers to maintain dark and cool conditions until they can be processed in the laboratory. If necessary, ice will be used to keep the samples cool during collections.

Benthic macroinvertebrate samplers will be brought to shore and the contents of the basket will be transferred to a 5-galllon bucket half-full of water. Using a coarse cleaning pad and forceps, each of the 12 spheres will be individually cleaned, rinsed, and placed back in the sampler. After all the spheres have been processed, the cleaning utensils will be cleaned, rinsed into the sample, and inspected. The sample liquid and debris will then be passed through a 500-µm sieve and transferred whole to a 1-L jar and preserved with 10% formalin solution in water. Internal and external labels will be placed in and on each jar identifying the project, location, replicate, date, and time. No special precautions need to be taken to protect the benthic samples from light or heat.

All samples will remain in the custody of EA Engineering, Science, & Technology, Inc. (EA) until transfer at their final destination. No secondary shipping agent will be used at any point to transport the samples from the work site to the respective laboratories. Algae samples will be packaged in coolers with ice and transported directly to Phycotech's laboratory in St. Joseph, Michigan. Benthic macroinvertebrate samples will be directly transported to EA's laboratory in Deerfield, Illinois.

4.2.2.4 Measurement of Water Quality Parameters and Characterization of Substrate Near Deployed Baskets

In addition to the benthic macroinvertebrate and periphyton sampling, a qualitative characterization of the substrate will be made during each sampler deployment and recorded on field data sheets (Ish Inc. et al. 2009, Appendix I). Physical and chemical

measurements will be recorded by a YSI556 for water depth (tenths of ft), turbidity (NTU), pH, dissolved oxygen (mg/L), temperature (°C), and specific conductance (µS/cm) for each of the 12 locations. The YSI556 will be calibrated and post calibrated each field day. Water depth will be reported for each sampler during the set and retrieval events. All other parameters will be recorded and photographs will be taken during the set and retrieval as well as on a weekly basis during the colonization period for the Spring sampling event. The weekly water quality data will be evaluated for correlation with the biological data. If significant correlations are not found, then CMS will submit a request to EPA to discontinue weekly water quality measurements for the Fall sampling event. Inspections will be conducted on a weekly basis to assure that the deployed sampling baskets have not been damaged by storm conditions, if encountered.

4.2.2.5 Laboratory Analysis

Benthic Macroinvertebrate Enumeration: Benthic macroinvertebrate laboratory sample processing and analysis will be conducted by EA Engineering, Science, & Technology, Inc. at their laboratory in Deerfield, Illinois. In the laboratory, sample handling and processing will follow generally accepted methods described in Klemm et al. (1990). Upon arrival at the laboratory, the samples will be logged and assigned a alpha-numeric tracking numbe. All steps during the course of sample processing (i.e., sort, chironomid mounting, and identification) will be recorded for each sample by log number and the log number for a given sample will be recorded on each vial and slide produced for that sample. Prior to sorting, each of the benthic macroinvertebrate samples will be opened, poured into a 500-µm mesh sieve, and rinsed with water to remove the preservative. The sample will then be placed in grided, white, photo-developing pan for sorting the organisms from the debris. For samples containing fewer than 500 organisms, the entire sample will be “picked” and all benthic macroinvertebrates will be removed. For a given sample, if it is determined that the number of organisms is excessive (>500 individuals), sub-sampling will be conducted to achieve a more manageable number for analysis. For samples with more than 500 organisms, the number of organisms in the sample will be reduced for analysis by

randomly choosing grids and removing the entire contents of the selected grids until a minimum of 500 organisms have been removed (Klemm et al. 1990). All sub-samples will be "post-picked" to remove large and rare taxon observed in the sample. All sample material not used will be preserved using 70% ethyl alcohol and archived. Prior to identification, chironomids will be cleared in 10% warm KOH and whole mounted on glass slides using CMC-10. The slides will be allowed to set for a minimum of four to five days prior to handling. Identifications will be made to the lowest practical taxon (usually genus or species) using a 10-70X Bausch & Lomb Stereo-Zoom dissecting scope and 800-2000X Zeiss compound microscope. All identifications will be made using established literature resources. Identifications and counts for each taxon will be recorded on a standard laboratory data sheet. The total number of organisms for each taxon and for the sample as a whole will be reported as number per sample.

EA's principal benthic taxonomist is Marty Sneen. Mr. Sneen has 15 years of experience collecting and identifying aquatic benthic macroinvertebrates throughout the United States. He has worked on over 60 biological monitoring projects in over 25 states. Many of these projects have been conducted over several years.

Periphyton Enumeration: Periphyton laboratory sample processing and analysis will be conducted by taxonomist at PhycoTech at its laboratory in St. Joseph, Michigan. Upon arrival at the laboratory, each sample received will be assigned an individual tracking number. All laboratory operations and analysis for each sample will be fully documented in PhycoTech's proprietary data management software, ASA. The sample bottle, chain-of-custody, and sample log sheet, which accompany each sample sent, are then used in conjunction with one another, to enter the sample's individual tracking number and all available sample information, into ASA.

PhycoTech is the only commercial lab in North America to utilize a unique proprietary permanent mounting technique for archiving and preparing samples for enumeration. These mounts allow further examination at a later date, as well as maintain a permanent archive of the sample that is easily stored, maintains fluorescence, and does not degrade with time (100+ years). Permanent algal mounts allow archiving of diatoms

and soft algae. All periphyton samples include both 2-hydroxypropyl methacrylate (HPMA) mounts for the whole sample and Naphrax, acid cleaned mounts, for diatom identification to species level. The HPMA method provides an optically clear background while permanently infiltrating and preserving the sample for archival purposes (Standard Methods, 1992). Mounting distortion is minimal and the method provides the advantage of being able to go 100x to 1000x on the same specimen. A wet sample is always maintained in case clarification of identification is necessary.

The first step of sample preparation, the sample will be removed from the refrigerator and set out to warm to room temperature before mounting. Next an ice bath will be prepared in a plastic tub. Under a ventilation hood while wearing gloves, 25 mL of HPMA and 0.025 g of catalyst (azo-bis-iso-butyronitrile) will be measured into a 150 mL beaker. Over a Bunsen burner set to high flame the HPMA (with catalyst added) will be heated until density currents begin to form. The mixture will be cooled by swirling in ice bath and returned to flame. The mixture will not be brought to boil. Alternating heat and cool periods will continue until the mixture is approximately the thickness of Karo syrup. Once the mixture is cooled, it will be transferred to a clean glass jar for storage until usage. The entire procedure typically takes 1 to 2 hours.

Two amber dropper bottles will be filled with resin and crystalline iodine will be added to one of the bottles until the resin is nearly opaque. The iodine-resin will be slightly thicker than normal resin. Since the resin is light sensitive, it will need to be covered with foil.

Three slides will be made for each sample. All samples are initially test mounted for counting density before final mounting. In order to evenly distribute the material in the sample, the sample bottle will be shaken 200 times. Using a Millipore 6-place stainless steel manifold and Millipore filtration towers, membrane filters will be placed onto the filtration bases and wet with distilled water. Excess water will be drained through the filters. If a filter has any opaque areas, the filter will be replaced. After the filter towers have been assembled, approximately 0.05-0.5 mL of sample will be drawn with a micropipette, diluted to 10 mL in a graduated cylinder with distilled water, and agitated

to mix thoroughly. An adequate sample volume will have approximately 20-30 cells in each field at 200x. The sample will then be added to the tower and the filter valve opened. For periphyton samples, the graduated cylinder will be rinsed into the tower. The sample will be filtered until water just clears the filter surface before closing the valve. The filtration tower will be removed just after the water disappears from the inner edge of the tower. Avoiding bubbles under the filter, the filter will be placed, face down, on a cover slip (# 1.5).

One to two drops of clear resin will be added to the back of each filter and the cover slip will be rotated until the resin covers the back of the filter. The cover slips will be placed on a drying rack and put in a drying oven. After 12 to 24 hours the cover slips will be removed from the oven and 1 drop of resin will be added to the filter side of the cover slip and attached to a labeled slide. It is important that as little resin as possible be added to cover the filter surface. The slides will be put in the oven and left to polymerize for approximately 24 hours. If the resin is not completely polymerized after 24 hours, the slides will be returned to the oven for as long as 2-3 days. The slides must be completely polymerized before being stored or they will run and/or evaporate.

Slides will be labeled with ASA generated labels. All slides will be labeled with the Tracking ID, which appears on all reports, data files and in all databases associated with that sample bottle and associated data.

Two microscopes will be used to process algal samples: 1) an Olympus BX60, research-grade compound microscope equipped with Nomarski optics (40x, 100x, 200x, 400x, and 1000x), Phase Optics (400x, 1000x), a 1.25-2X multiplier, epifluorescence (blue, green and UV Excitation), and a trinocular head for photography, with a Microfire digital camera attached. For larger material, a dissecting microscope will be used for counts and identifications. The BX60 is the primary microscope used for algal identification. There is also an Olympus BHT, research-grade compound microscope equipped with Nomarski optics (100x, 200x, 400x, and 1000x), Phase Optics (400x), epifluorescence (blue, green and UV Excitation), and a trinocular head for photography,

with a Ricoh Camera Back attached using traditional slide and print film. In addition, access to Notre Dame's SEM facility is available, if necessary.

The magnification used will depend on the dominant taxa. If the sample is dominated by diatoms, the majority of counting will be completed at 1000x. If the sample is dominated by soft algae, the majority of counting will be completed at 200-400x, whichever is appropriate considering cell size and particulates. The goal is to count at multiple magnifications in order to correctly enumerate and identify taxa present that may vary by several orders of magnitude in size.

The general counting method is as follows. Only one method will be used depending on sample composition:

Dominated by soft algae: If the sample is dominated by soft algae greater than 10-20 µm in GALD, a minimum of 300 natural units and 15 fields at 200x (when possible, maximum of 100 fields) will be counted. In addition, for taxa below 10 µm or fragile, difficult to identify taxa a minimum of 100 natural units and 10 fields at 400x will be counted. The number of fields counted will be spread evenly over the three slides provided for each sample (i.e., 30 total fields, 10 fields per slide).

Dominated by soft algae: If the sample is dominated by soft algae less than 10-20 µm in GALD or is dominated by fragile, difficult to identify taxa, a minimum of 400 natural units and 15 fields at 400x (when possible, maximum of 100 fields) will be counted. In addition, for taxa above 10-20 µm a minimum of 15 fields GALD at 200x will be counted. The number of fields counted will be spread evenly over the three slides provided for each sample (i.e., 30 total fields, 10 fields per slide).

Dominated by diatoms: If the sample is dominated by diatoms, a minimum of 15 fields at 1000x, and a minimum of 400 natural units total (when possible, maximum of 100 fields) will be counted. In addition, soft algae according to size distribution (see above) will be counted for a minimum of 15 fields at either 200x or 400x. The number of fields counted will be spread evenly over the three slides provided for each sample (i.e. 30 total fields, 10 fields per slide).

Counting is completed when the standard error of the mean of the total number of natural units per field is less than 10%. For large taxa (200+ µm): scan at least one whole slide at 100x. This tiered counting method should yield a minimum of 400 natural units per sample (well over 400 cells per sample). Extremely sparse samples or samples with high particulates will yield less than 400 natural units. The goal, regardless of magnification, is to enumerate and identify a minimum of 400 natural units per sample exclusive of miscellaneous microflagellates.

If species identifications for diatoms are required or unknown diatom taxa are present, acid cleaned mounts in Naphrax will be prepared. A 5-20mL draw of sample will be transferred to a clean, 250mL Pyrex beaker under a hood. Room-temperature nitric acid will be added to a total volume of 40-60mL and covered with a watch glass. After at least 24 hours have elapsed, the acid will be carefully siphoned off using a glass siphon and discarded. The remaining sample will be transferred to a centrifuge tube and brought up to a volume of 14mL with distilled water. The tube will be capped, mixed well, and settled in a centrifuge at 3000 RPM for 5 minutes. Once settling is complete, the supernatant will be removed to the 2mL volume marker with a micropipette. The volume will be brought back up to 14mL with distilled water, mixed well, and the process will be repeated. A minimum of 6 centrifuge cycles will be completed. If pH is lower than 7, the centrifuging process will be repeated until the pH reaches 7.

On the final cycle, the supernatant will be removed to the 1 mL volume marker and refilled to 5 mL. The sample will be mixed well to suspend the pellet and decant into the storage bottle. The centrifuge tube will be rinsed two more times with 5 mL of distilled water and decanted into the storage bottle. The total volume of the cleaned sample should be 15 mL. If the sample is very sparse, a lower final volume will be achieved. Using a pasture pipette, enough sample to cover a slip (#1, 22mm square) will be transferred to cover the entire area and placed in a vibration-free area until dry. Once dry, 1 small drop of Naphrax will be added to the cover slip and inverted onto a slide. The cover slip will be compressed with a clean object and placed in the oven for 1 to 3 hours at 60°C or finished on a hot plate. Finally, the cover slip will be ringed with fingernail polish and stored.

Taxonomic identifications will be conducted at 1000x under oil immersion. Reference taxa will be identified using a diamond scribing objective and permanent ink labels.

The principal algal taxonomist, Dr. Ann St. Amand, has over 20 years of experience and has processed over 20,000 periphyton, phytoplankton, bacteria and zooplankton samples from both freshwater and marine systems. Dr. St. Amand is the only person who enumerates algal samples at PhycoTech, ensuring data integrity and consistency. PhycoTech's in-house key and publication library numbers in the thousands, including the most current references. PhycoTech has processed several state-wide surveys in the Mid-West, West and Florida for phytoplankton and periphyton, each comprised of several hundreds of samples. PhycoTech also consults with Federal and State Agencies, including the Corps of Engineers, on experimental design and QA/QC issues. PhycoTech processes samples for general water quality, as well as the determination of exotic, toxic or taste and odor producing blue-green and chrysophyte algae. PhycoTech has extensive experience enumerating Prymesium parvum, a difficult to identify, toxic haptophyte from the Southwestern United States.

4.2.2.6 Data Development and Analysis

The benthic macroinvertebrate community data will be summarized as number (per sample) and relative abundance of each taxon by replicate and location, total density (number per sample), total taxa richness, Ephemeroptera, Plecoptera, Trichoptera (EPT) richness, and relative abundance of functional feeding groups. Additional data analyses may become necessary after an initial review of the results (e.g., similarity, diversity, or a biotic index based on tolerance values). These data will be summarized and mapped to define the general profile and diversity of the benthic and periphyton communities at the Little Traverse Bay CKD Leachate release site and the nearby reference areas.

For algae samples, the raw data will be enumerated within ASA directly. ASA is a database driven program with an integrated virtual TallyMeter module, containing over 130 databases. Up to 400 taxa can be enumerated within any one sample, and the entire database currently contains over 33,000 taxa. All calculations will be completed

within ASA, including concentrations, biovolumes, biomasses and diversity indices. In addition, ASA has the capability to calculate over 72 different diversity indices and summary statistics, including Shannon, Maragalef, Alpha and Berger Parker Diversity measures, Species Richness and Evenness, Pollution Tolerance for diatoms, Environmental Tolerance for algae, Siltation Index for diatoms, Pollution Tolerance for diatoms, Palmer Index, ACC:CMN for diatoms, in addition to others. All taxonomic information from organism down to coloniality and structure is provided in the data set. All indices are calculated on an abundance (both Natural units/mL and Cells/mL) and total biovolume, biomass, volume and area basis, if biovolume/biomass is measured. Data files also will be generated by ASA and saved in Excel format, while reports will be formatted and saved to PDF format utilizing Microsoft Access, including summary graphics on a per sample basis. Then data files can be formatted in any format requested, either horizontally or vertically oriented.

Summary tables will be prepared to present the mean, median, minimum and maximum values for each treatment for each response variable. For each sampling location, the three replicate values will be used to compute either arithmetic or logarithmic mean values for the various response variables measured for each basket. In order to maximize the power to detect significant differences among treatment means for the response variables, the Fisher's least significant difference (LSD) procedure will be used to compare mean periphyton biomass, macroinvertebrate abundance, diversity, and taxa richness among sample areas (East Reference, East CKD, Seep 1, Seep 2, West CKD, and West Reference) and between sample locations (near-shore versus off-shore). After initial analyses are completed, as described above, additional comparisons may be required to further describe the baseline conditions. All treatment comparisons will be conducted with a Type I error rate of 5% (i.e., = 0.05).

The assumption of normality will be tested for each dataset using the Shapiro-Wilks test (Gilbert 1987) at the 95% significance level. In cases where sample data are not normally distributed, the data will be log-transformed and re-tested for normality. In cases where the sample data are nonparametric, they will be transformed into ranks

before conducting the nonparametric LSD test as described by Conover and Iman (1979), and Iman (1982).

The assumption of equality of variances will be tested using Levene's F-test (Levene 1960) at the 95% significance level. If variances for treatments are found to be unequal, then comparisons will be conducted using the Satterhwaite approximation (Sokal and Rohlf 1981).

All statistical analyses will be completed using programs from the Statistical Analysis System (SAS©), Version 8.

4.2.2.7 Quality Assurance

In order to maintain a standard level of quality, 10% of all benthic samples will be re-sorted to check for thoroughness. If the number of specimens found during the re-sort is greater than 5% of the total number of organisms originally sorted, the sample will be rejected. All samples sorted by that individual prior to the rejected sample but after their last accepted re-pick will also be re-picked. Results of the re-pick will be recorded on a laboratory quality assurance record form. In addition, a voucher collection will be created and will consist of several representative specimens of each macroinvertebrate taxon observed among all the samples collected during that event. These vouchers will be verified by another expert and any corrections, if identified, will be documented and incorporated into the data. Finally, all data entry will be 100% proofed for accuracy against the laboratory bench sheets. Documentation of all these quality assurance procedures will be maintained.

For algae, QA/QC on counts involves conducting a recount on approximately 10% of the samples. Recounts will be performed by the principle taxonomist. ASA produces a QA/QC report comparing the original sample and the recount sample (quantitatively and qualitatively), including the distribution check. Samples pass when they are quantitatively within 10% of the QA/QC recount. Percent similarity may vary up to 20% on exceptionally diverse or sparse samples. Voucher specimens will be kept on photograph or slide and sent to another expert for verification. Distribution is checked

on approximately every tenth sample, during the counting process. All biovolume calculations have been verified by comparing with current literature, and by comparing calculations using outside mathematical consultations.

5.0 Proposed Sampling and Analysis Plan for Mercury Bioaccumulation Assessment

5.1 Justification

Dreissenid mussels (Zebra and Quagga) are invasive aquatic species that attaches to natural and artificial substrates easily in the waters such as Little Traverse Bay area and remain stationary in the water body where exposure and bioaccumulation potentials for mercury can be relatively easily obtained. Therefore, dreissenid mussels will be collected in conjunction with the fall benthic macroinvertebrate and periphyton sampling event to obtain the biomass for mercury bioaccumulation assessment. Sample processing and analysis will generally follow *USEPA's Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1, Fish Sampling and Analysis, Third Edition* (USEPA 2000).

5.2 Field Collections

The proposed plan is to collect and analyze the mussel samples from the six areas used for the periphyton and benthic macroinvertibrate characterization, with two replicates per area. Mussels will be collected from the natural substrate, and mature specimens will be targeted for collection. Specimens will be collected whole and unshucked. The specimens will be hand picked from each location and will be transferred to labeled pre-cleaned glass jars and kept on ice for shipment to a qualified laboratory. Approximately 20 grams of the tissues for each replicate mercury analysis will be collected.

Concurrent with the fall sampling event, water samples will be collected at each location to obtain data on exposure concentrations of mercury in the water. The water samples will be analyzed for low-level mercury concentrations following the USEPA approved method (1631/7471) for low level mercury analysis.

5.3 Laboratory Analysis

Sample processing and analysis of zebra mussel tissues will follow USEPA approved methods. Lab analysis standard operating procedures for mercury in tissue can be found in Ish Inc. et al. (2009), Appendix E. The specimens will be shucked in the laboratory and prepared for analysis via digestion. The laboratory will analyze the zebra mussel biomass for total mercury concentrations and report the concentrations on dry weight basis.

Water samples will be analyzed following USEPA 1631/7471 approved method for low-level mercury concentrations.

5.4 Data Analysis

Statistical summaries consisting of mean, minimum, maximum and standard deviations will be prepared for the mercury concentration data in the mussels. Additional exploratory data analysis will be conducted as appropriate. These statistical analyses could include t-testing, one-way analysis of variance, or non-parametric statistical tests. There are three possible outcomes of this initial mercury data assessment:

1) All mercury concentrations are similar;

2) One or more of the six areas have dissimilar concentrations; and

3) Mercury concentrations are highly variable.

Outcome 1 results in no further mercury studies. Either outcome 2 or 3 will require additional study. Data from this initial study will also be used to develop a statistically robust design for a future assessment of mercury accumulation, as needed.

6.0 Proposed Detail Schedule for the Baseline Ecological Assessment and Mercury Bioaccumulation Assessment

Task/Activity being performed	Schedule
Submission of WP to EPA	March 31, 2006
Approval of work plan by EPA	April 30, 2006
Construct and assemble baskets with artificial substrates	March 30 through April 30, 2006
Installation of baskets at sampling locations for the Spring sampling event	May 2 through May 15, 2006
Measurement of water quality parameters at the beginning and at the end of six week period	May and June 2006
Recovery of baskets	End of June, 2006
Sample processing and enumeration for Spring sampling event	July-October, 2006
Installation of baskets at the sampling locations for the Fall sampling event	August 20 through September 10, 2006
Measurement of water quality parameters at the beginning and at the end of six week period	August-September and October, 2006
Recovery of baskets	End of October 2006
Collection of zebra mussels from the retrieved baskets and shipment to analytical laboratory	End of October 2006
Meeting and discussion of preliminary results from Spring sampling event	Mid-November, 2006
Sample processing and enumeration for the Fall sampling event	November 2006 through January 2007
Analysis of zebra mussel tissues by lab and also analysis of mercury concentrations for water samples completed	Mid December, 2006
Data Synthesis, Analysis and Evaluation completed	February 2007
Draft Report submission	March 2007

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Appendix B

U.S. EPA Approval of Workplan Correspondence

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

July 21, 2006

REPLY TO THE ATTENTION OF:

SR-6J

Mr. David Sporer
Project Coordinator
CMS Energy Enterprises
One Energy Plaza, Room EP5-253
Jackson, MI 49201

Re: Administrative Order on Consent (V-W-'05-C-810) Little Traverse Bay CKD Release Site, Work Plan for Baseline Ecological Investigation for Benthic Organisms and Periphyton Community

Dear Mr. Sporer:

U.S. EPA has reviewed the Work Plan for Baseline Ecological Investigation for Benthic Organisms and Periphyton Community for Little Traverse Bay for Reference and the CKD Leachate Release Areas (Revision 4.0), dated June 2006. This work plan was submitted in accordance with Section 5.2.8 of the approved Removal Action Work Plan.

Pursuant to Paragraph 16.b of the above-referenced Administrative Order on Consent (AOC), we are approving Section 1 through Section 4 of the Work Plan for Baseline Ecological Investigation for Benthic Organisms and Periphyton Community.

Conceptually we agree with the work proposed under Section 5 for the mercury bioaccumulation assessment; however, we are unable to approve Section 5 at this time because we are unsure if the suggested approach (collecting Dreissenid mussels to assess mercury bioaccumulation) is appropriate for the current site conditions. We understand the recent informal survey for Dreissenid mussels conducted at the time of the artificial sampler retrieval indicated these mussels were not present at all study locations nor were they present in sufficient biomass to fulfill the analytical objectives without expending substantial effort. After we have had an opportunity to review the data collected during the Spring event, we would like to discuss with you alternate approaches for collecting mercury bioaccumulation data, such as the use of a surrogate species deployed at each location in enclosures. At the conclusion of these discussions, we will approve, disapprove or require revisions to Section 5 of the Work Plan for Baseline Ecological Investigation for Benthic Organisms and Periphyton Community in accordance with Paragraph 16.b of the AOC.

We request you process the benthos and periphyton samples as soon as possible. Additionally, we request that you process a limited number of replicates from each sampling location and provide us with this data rather than processing all the samples

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from each location in sequence so that we can get an early indication of what the entire data set will look like. We will approve a schedule for the Fall sampling event after we have all had an opportunity to determine if the data collected during the Spring event can be used to fulfill the study objectives and if the technical approach used for periphyton and benthos sampling requires revision or modification. Please let me know when we can expect to receive the data from the Spring event.

Lastly, we will need to review the results of the additional work conducted at the Village Harbor Marina to determine if any ecological assessment activities are needed at Village Harbor Marina as part of the baseline ecological investigation.

We appreciate the cooperation CMS has shown in developing and implementing a strategy for conducting this initial phase of the ecological investigation at the site. Please feel free to call me at (312) 886-7275 if you have any questions.

Sincerely,

Diana Mally

Diana Mally
Remedial Project Manager

cc: Robert Wagner, MDEQ

Mally.Diana@epamail.epa.gov

09/19/2006 12:27 PM

To "David R. Sporer" <drsporer@cmsenergy.com>

cc ishinc@murarka.com, Gary L Kelterborn <glkelterborn@cmsenergy.com>, pescadorrh@charter.net, Dollhopf.Ralph@epamail.epa.gov, erichard@barr.com

bcc

Subject Re: Zebra Mussels - where are they?

History: This message has been replied to.

Sounds good to me to go ahead with the mussels as planned.

-----"David R. Sporer" <drsporer@cmsenergy.com> wrote: -----

To: DIANA MALLY/R5/USEPA/US@EPA
From: "David R. Sporer" <drsporer@cmsenergy.com>
Date: 09/19/2006 07:53AM
cc: ishinc@murarka.com, Gary L Kelterborn <glkelterborn@cmsenergy.com>, pescadorrh@charter.net, RALPH DOLLHOPF/R5/USEPA/US@EPA, erichard@barr.com
Subject: Zebra Mussels - where are they?

Diana
Attached is a report on the presence of zebra mussels in the four study and two reference areas. It indicates that there are sufficient quantities in all but the ECKD area to conduct the mercury analysis described in section 5 of the Eco Work Plan. At the time of this survey, rocks colonized with mussels were relocated from other areas of the lakeshore and relocated to the ECKD area. These transplanted mussels were observed to be doing fine at the time of eco basket deployment, approximately 4 weeks following relocation. In order to collect some base line information on mercury in mussels this year, I propose that mussels be collected this fall in accordance with section 5 of the Work Plan. Ish will contact you soon to discuss this plan.
Dave

20060904 Summary of Observations on Zebra Mussels in the Little Traverse Bay.pdf

Mally.Diana@epamail.epa.gov

09/25/2006 12:40 PM

To "David R. Sporer" <drsporer@cmsenergy.com>
cc Dollhopf.Ralph@epamail.epa.gov, ishinc@murarka.com, Gary L Kelterborn <glkelterborn@cmsenergy.com>
bcc
Subject Re: Mercury study

Dave,

Thank you for the clarification. I agree that the purpose you have described for the transplanted mussels would not need a work plan modification or discussion.

Please let me know about the SOP for tissue analysis for mercury. Thanks.
-----"David R. Sporer" <drsporer@cmsenergy.com> wrote: -----

> To: DIANA MALLY/R5/USEPA/US@EPA
> From: "David R. Sporer" <drsporer@cmsenergy.com>
> Date: 09/25/2006 11:25AM
> cc: RALPH DOLLHOPF/R5/USEPA/US@EPA, ishinc@murarka.com, Gary L Kelterborn <glkelterborn@cmsenergy.com>
> Subject: Re: Mercury study
>
> Diana,
> Perhaps we were not clear about the purpose of the transplanted mussels. CMS never intended to harvest the transplanted mussels for the mercury study. The purpose of transplanting these specimens was, first, to identify whether there was something in this area that precluded mussels from surviving, and secondly, to possibly recruit new specimens. The transplants were put in mesh bags to ensure we would be able to tell the "immigrants" from the native specimens. Since the transplants seem to be doing well, we know that mussels can survive in the ECKD area. As you know, some shoreline areas support a robust mussel community, while other areas of the shore are devoid of mussels. CMS proposes to execute the work plan as negotiated with EPA and presented in Revision 4, dated June 27. Since we did not propose to modify the work plan, I didn't think it warranted a discussion.
> Dave

Mally.Diana@epamail.epa.gov
09/21/2006 05:50 PM

To drsporer@cmsenergy.com
cc Dollhopf.Ralph@epamail.epa.gov
Subject Mercury study

Dave,

We have some comments regarding the transplanted mussels used at the ECKD Area. Since we do not know how long it takes "clean" mussels to reach equilibrium or steady state concentrations of accumulated mercury when transplanted to a contaminated location, there will be a great deal of uncertainty associated with a one time recovery of transplanted animals. Equilibrium is usually determined by transplanting a boat load of individuals to a contaminated location and then collecting multiple samples over a period of time (say one sample every two weeks), doing chemical analyses, and tracking the accumulation until an equilibrium concentration is reached.... that is, when the tissue concentration over time does not increase any more. If you are planning on a one time sampling event, you may be incorrectly assuming that the transplanted individuals have reached equilibrium when in fact they have not - there is no way to tell with a one time event. Because of this, the mussel study will be flawed and we will not be sure the tissue concentrations truly reflect what would be the case if animals were present at the ECKD location for their entire life. A way around this is to collect a time series mentioned above or use a different organism (such as algae) that is present at all locations in sufficient numbers to meet analytical requirements.

On the other hand, if you can search the literature and find studies on mercury accumulation in Zebra mussels, the rate of accumulation, and the time required to reach equilibrium, that would help validate your approach and then we can seriously consider this one time sampling event.

Also, it is not clear why the mussels were put into mesh bags at the ECKD location. If this somehow interferes with the feeding of the transplanted mussels (if it effects the particles reaching the animals or somehow interferes with their filtering rate), their exposure may be less than normal and their tissue concentrations less than what would be expected. The mesh bags also add a variable to the ECKD location, making it difficult to compare results across locations.

Lastly, transplanting mussels to the ECKD area from the east reference area was a deviation from the approach outlined in the work plan. I would prefer to discuss and agree to changes in approach as least via email before the changes are implemented so that I have the opportunity to get the input I need to ensure the data will be useable.

Let me know if you have any questions. Thanks.

Appendix C

Preliminary Ecological Characterization Field Study

EA Engineering, Science and Technology

444 Lake Cook Rd., Suite 18
Deerfield, IL 60015
Telephone: 847-945-8010
Fax: 847-945-0296

06 February 2006

Mr. Ishwar Muracka
Ish Inc.
804 Salem Woods Dr.
Suite 201 B
Raleigh, NC 27615

Dear Ishwar:

As per our discussions during the weeks 16 and 24 January 2006, EA conducted an initial site reconnaissance and characterization of the Little Traverse Bay cement kiln dust (CKD) seep areas near Petoskey, MI. The purpose of this reconnaissance was to determine methods for conducting a benthic macroinvertebrate sampling that would evaluate potential impacts associated with the CKD seeps into Little Traverse Bay.

The reconnaissance was conducted on 31 January 2006. Observations were made in each of the four main CKD seep areas: West CKD, Seep 2 CKD, Seep 1 CKD, and East CKD. Since the substrate largely consisted of coarse and hard substrates (e.g., cobble and boulder), a kick net was used to sample approximately a one square meter area of the bottom at each location. Collections were made at a minimum of two locations within each identified seep area and one location in each reference area. Samples were collected near-shore and off-shore in all but the West CKD area. The macroinvertebrates collected in each sample were identified to higher taxonomic levels (class or order) and were released. In addition to benthic macroinvertebrate sampling a qualitative assessment of the substrate (approximate to the Wentworth Scale) was made in the general seep area.

Results of the reconnaissance are summarized in the attached tables. In general, the substrate in the study area largely consists of cobble, boulder, and bedrock with isolated pockets of large gravel, small gravel, and sand. Benthic macroinvertebrates were collected in all seep and reference areas. Amphipods, or side swimmers, likely of the genus *Gammarus*, were by far the most common benthic organism observed in the study area.

Although benthic macroinvertebrates were collected in each of the seep areas, they were not collected at all of the individual sampling locations. Furthermore, although this was purely a qualitative exercise, gross differences in the abundance of macroinvertebrates were noted at some locations. Overall, the abundance of macroinvertebrates appeared to be relatively lower near-shore compared to off-shore. This was particularly true in the East CKD area where in the western end of the seep area, extending approximately 10 meters from shore, there were no benthic macroinvertebrates or periphyton observed. Additionally, in the Seep 2 CKD area,

macroinvertebrate abundance appeared to be lower both near-shore and off-shore compared to both other seep areas and the reference areas.

The most obvious difference between the reference areas and seep areas was with regard to periphyton abundance. Periphyton appeared to cover a greater aerial extent of the substrate in the reference areas relative to the seep areas. This was fairly consistent throughout the study area. Although in most of the seep areas, the lower abundance of periphyton was more apparent in near-shore areas compared to off-shore, in each seep area there were small to large areas extending off-shore that appeared to have substantially less periphyton.

Based on this qualitative reconnaissance effort, it is impossible to draw any meaningful conclusions with regard to near-shore versus off-shore differences in the benthic community and reference area versus seep area differences in the periphyton community. Although it is possible that these differences may be related to the CKD seeps, it is also reasonable to consider that the differences near-shore and off-shore are related to the fact that the near-shore locations are in the more turbulent "surf" zone. Likewise, differences in periphyton between the reference areas and seep areas as well as near-shore and off-shore, could be related, in part, to other ongoing study efforts that may disturb the near-shore areas periodically.

Given these observations, I propose to conduct replicate benthic macroinvertebrate and periphyton sampling both near-shore and off-shore in each of the seep areas and two reference areas. The thought being that if the seeps are not having an effect on the benthic or periphyton communities, there should be no significant differences between the two, regardless of near-shore or off-shore. A replicated sampling design will facilitate the use of statistics in making the various comparisons. In addition, I propose that sampling be conducted using a passive sampling gear, such as artificial substrate samplers, for both communities. Active sampling methods for sampling macroinvertebrates are of limited use in this area due to lack of unidirectional flow associated with wave action. Given the dominant substrate in the study area, I suggest that rock basket samplers be used with manufactured material (e.g., ceramic eggs) as the substrate. Finally, in order to detect potential synergistic effects associated with the leachate chemical constituents and physical effects associated with the CKD coating the substrate, I suggest that replicate periphyton samples be collected from the native substrate at each location.

Please contact me if you have any questions or comments on these observations and suggestions.

Sincerely,

MARTY SNEEN

Marty Sneen
Aquatic Biologist

Substrate Characteristics and Benthic Sampling Reconnaissance Locations in Little Traverse Bay – January 2006

		West CKD		**Seep 2**		**Seep 1**		**East CKD**		
Qualitative Substrate (%)	**West Ref**	**Middle**	**East**	**Middle**	**East**	**West**	**East**	**West**	**East**	**East Ref**
Bedrock			20			60	70		5	
Boulder	70	40	40	70	70	20	10	5	20	70
Cobble	25	40	30	30	25	20	20	80	65	30
Large Gravel	5	20	10	<1	5	<1		10	10	<1
Small Gravel						<1		<5		
Sand						<1		<5		
Depth (m)	0.75	0.75	1	1-0.75	0.75	1	0.75	0.75	0.5	.5
Distance from Shore (m)	20	20	25	25	20	25	25	30	25	15
Macroinvertebrates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Benthic Macroinvertebrate Taxa Collected during Reconnaissance Sampling on Little Traverse Bay – January 2006

	West Ref	**West CKD**		**Seep 2**		**Seep 1**		**East CKD**		**East Ref**
Taxa		**Middle**	**East**	**Middle**	**East**	**West**	**East**	**West**	**East**	
Oligochaeta		X				X				
Isopoda				X		X	X			
Amphipoda	X	X	X	X	X	X	X	X	X	X
Decapoda										X
Ephemeroptera						X	X		X	
Plecoptera									X	
Trichoptera		X	X				X	X	X	X
Chironomidae	X	X				X	X	X		
Dreissena polymorpha								X	X	X
Gastropoda										X

Appendix D

Preliminary Dreissenid Mussel Survey

Summary of Observations from the Survey on Presence and Abundance of Zebra Mussels in the Little Traverse Bay near the Bay Harbor CKD Site

Prepared by
Ish Inc.
And
EA Engineering & Science, Inc.
September 4, 2006

Introduction:

Due to concerns raised by the USEPA regarding the presence and abundance of zebra mussels in the Little Traverse Bay in the six areas proposed for the collection of the mussels to assess bioaccumulation of mercury, CMS asked Ish Inc. team to conduct a field survey of the Bay for the six areas and to determine if sufficient quantity of zebra mussel biomass can be collected to perform the mercury bioaccumulation study during September-October, 2006 time frame. Marty Sneen from EA Engineering, Dan Staub from Pescador, and Ish Murarka from Ish Inc. carried out a qualitative zebra mussel survey on 9 & 10 August, 2006 for the six areas of the Little Traverse Bay. Observations from this survey are reported in this paper.

Literature Information on Zebra Mussels:

Mackie (1993) reported that zebra mussels in Lake St. Clair were relatively short-lived (approximately 2-yrs.). He reported that growth rates averaged approximately 20-mm/yr with most individuals achieving a total shell length of <30-mm during their life-span. Mackie (1993) observed two distinct major periods of recruitment in Lake St. Clair: June through early-July and October through early-November. However, he further noted the presence of small individuals throughout the summer, suggesting that zebra mussel recruitment may be continuous throughout the warm summer months.

Observations on Presence and Abundance of Zebra Mussels in the Six Study Areas:

During the field survey on August 9 and 10, we entered the water, traversed each of the six areas and examined several different natural substrate materials varying in size and in the near- shore and off-shore locations. The substrate material we examined generally consisted of various size rocks. In the following subsections, the field observations on the presence and abundance of zebra mussels by each of the six areas are described.

West Reference Area

Zebra mussels were very abundant throughout the West Reference area except in the "surf-zone" within approximately 10-feet from shore. It appeared that there were at least three and possibly four cohorts (age-classes) observed in the West Reference area with a length range of approximately 5 to 30-mm. The mussels we observed at the West Reference area seem to prefer the under sides of medium to large rocks (generally >1-ft in diameter). In addition, zebra mussels were abundant on the lower edges of the rocks where they appeared to form the grout in between rocks. Relatively very few mussels were observed on the higher edges or on top of rocks.

West CKD Area

Zebra mussels were still numerous in the West CKD area. The mussels were found in habitats similar to those at the West Reference area. In addition, where the bedrock was fractured and puzzel-like, zebra mussels were fairly abundant on the under sides of large fractured pieces. It appeared that two cohorts (approximately 5 to 15-mm) were present with those in the 5-mm size range being the most abundant.

Seep 2 Area

Zebra mussel size and abundance were indistinguishable compared to West CKD area and were found in similar habitats, especially in areas of fractured bedrock. It was observed that rock located beneath, adjacent to, or behind a large boulder seemed to produce high densities of zebra mussels. From this observation as well as those from the other study locations, it seems clear that the zebra mussels along the Bay Harbor shore of Little Traverse Bay require a fair amount of shelter to become established.

Seep 1 Area

Although zebra mussels at Seep 1 were observed in abundance similar to Seep 2 and West CKD area, the mussels at Seep 1 area seemed to be dominated by the smaller cohort (<10-mm) though larger individuals were also observed.

East CKD Area

Very few zebra mussels were found at the East CKD area. This observation supports the USEPA observation for this area that zebra mussels are sparingly present in the East CKD area.

East Reference Area

Zebra mussels were very abundant throughout the East Reference area. Abundance and size distribution in the East CKD area were similar to the West Reference area.

Transplanting of Zebra Mussels in the East CKD Area:

Given the paucity of zebra mussels in the East CKD area, we transplanted rocks with an abundance of zebra mussels from the East Reference area into the East CKD area. In the East CKD area, the rocks were placed in mesh laundry bags in habitats similar to where they were found in the East Reference. Two locations in the East CKD area were established for the transplant. At each location, two medium sized rocks (8 to 12-in) were placed in one bag and one large sized rock (>12-in) was placed in a separate bag. These transplanted rocks will be checked during the week of September 4, 2006 when the deployment of the artificial substrate baskets takes place, to determine the survival of the transplanted zebra mussels and any recruitment that may have occurred.

Summary and Conclusions:

Based on these qualitative observations on the presence and abundance of zebra mussels, it is concluded that we will be able to collect replicate samples of more than 10-g of zebra mussels biomass for tissue analysis to measure mercury concentrations at five of the six study areas. The collection of zebra mussels at East CKD area will be dependent upon the success of the zebra mussel transplant from the East Reference area.

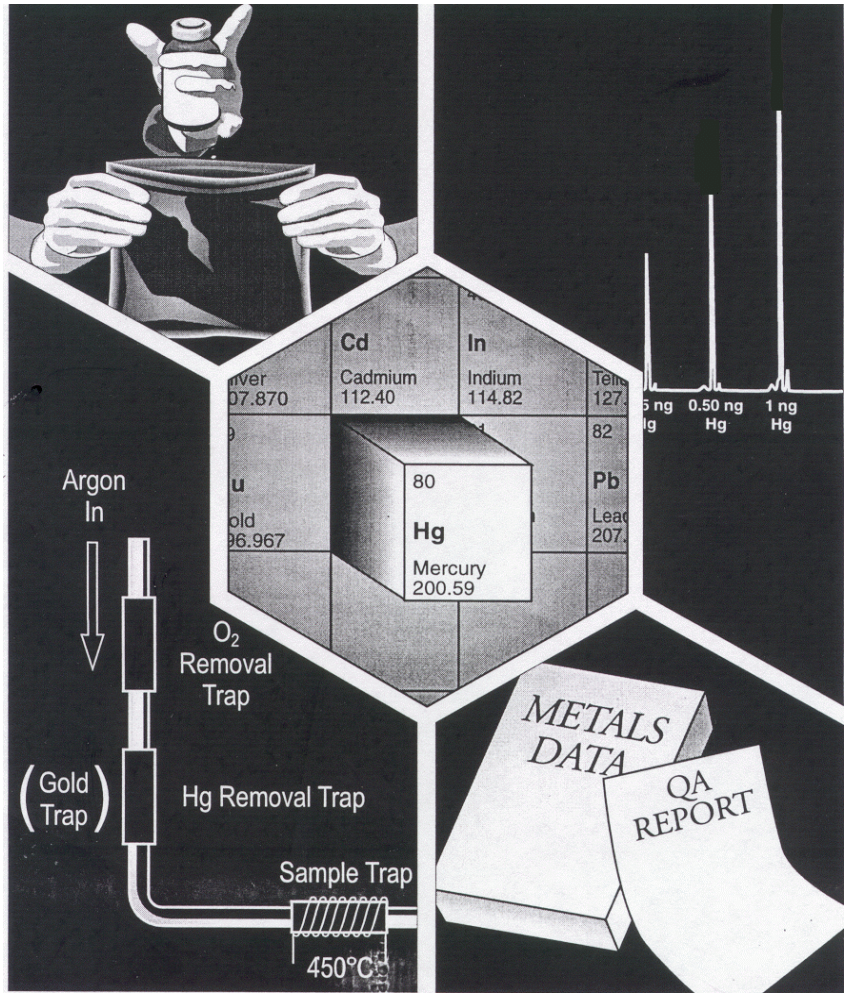
Appendix E

U.S. EPA Method 1631

United States
Environmental Protection
Agency

Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry

August 2002



United States Environmental Protection Agency
Office of Water 4303
EPA-821-R-02-019
August 2002

Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry

Acknowledgments

This Method was developed under the direction of William A. Telliard and Maria Gomez-Taylor of the Engineering and Analysis Division (EAD) within the U.S. Environmental Protection Agency's (EPA's) Office of Science and Technology (OST). EPA acknowledges contributions to this method by Frontier Geosciences, Inc., Albion Environmental, Battelle Marine Sciences Laboratory, STL-Canton, and Tekran Inc. Additional assistance in preparing the Method was provided by DynCorp Environmental and Interface, Inc.

Disclaimer

This Method has been reviewed and approved for publication by the Statistics and Analytical Support Branch within EPA's Engineering and Analysis Division. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Questions concerning this Method or its application should be addressed to:

W.A. Telliard
Statistics and Analytical Support Branch (4303T)
U.S. Environmental Protection Agency
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Washington, DC 20460
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Introduction

Method 1631 (the "Method") supports technology-based and water quality-based monitoring programs authorized under the Clean Water Act (CWA; the "Act").

CWA Sections 301 and 306 require EPA to publish effluent standards that restrict the direct discharge of pollutants to the nations waters, and CWA Sections 307(b) and (c) require EPA to promulgate nationally applicable pretreatement standards which restrict pollutant discharges into sewers flowing to publicly owned treatment works (POTWs). The effluent limitations guidelines are published at CFR parts 401-503.

CWA Section 303 requires each State to set a water quality standard for each body of water within its boundaries. A State water quality standard consists of a designated use or uses of a water body or a segment of a water body, the water quality criteria that are necessary to protect the designated use or uses, and an antidegradation policy. CWA Section 304(a) requires EPA to publish water quality criteria that reflect the latest scientific knowledge concerning the physical fate of pollutants, the effects of pollutants on ecological and human health, and the effect of pollutants on biological community diversity, productivity, and stability. These water quality standards serve two purposes: (1) they establish the water quality goals for a specific water body, and (2) they are the basis for establishing water quality-based treatment controls and strategies beyond the technology-based controls required by CWA Sections 301(b) and 306.

In 1987, amendments to the CWA required States to adopt numeric criteria for toxic pollutants (designated in Section 307(a) of the Act) based on EPA Section 304(a) criteria or other scientific data, when the discharge or presence of those toxic pollutants could reasonably be expected to interfere with designated uses. Method 1631 was specifically developed to provide reliable measurements of mercury at EPA WQC levels.

In developing methods for determination of trace metals, EPA found that one of the greatest difficulties was precluding sample contamination during collection, transport, and analysis. The degree of difficulty, however, is highly dependent on the metal and site-specific conditions. Method 1631 is designed to preclude contamination in nearly all situations. It also contains procedures necessary to produce reliable results at the lowest WQC levels published by EPA. In recognition of the variety of situations to which this Method may be applied, and in recognition of continuing technological advances, Method 1631 is performance based. Alternative procedures may be used so long as those procedures are demonstrated to yield reliable results.

Requests for additional copies of this draft Method should be directed to:

U.S. EPA Sample Control Center
6101 Stevenson Avenue
Alexandria, VA 22304-3540
703/461–2100

Note: This Method is performance based. The laboratory is permitted to omit steps or modify procedures provided that all performance requirements in this Method are met. The laboratory must not omit or modify any procedure defined by the term “shall” or “must” and must perform all quality control tests.

Method 1631, Revision E

Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry

1.0 Scope and Application

1.1 Method 1631, Revision E (the "Method") is for determination of mercury (Hg) in filtered and unfiltered water by oxidation, purge and trap, desorption, and cold-vapor atomic fluorescence spectrometry (CVAFS). This Method is for use in EPA's data gathering and monitoring programs associated with the Clean Water Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation and Liability Act, and the Safe Drinking Water Act. The Method is based on a contractor-developed procedure (Reference 16.1) and on peer-reviewed, published procedures for the determination of mercury in aqueous samples, ranging from sea water to sewage effluent (References 16.2–16.5).

1.2 This Method is accompanied by Method 1669: *Sampling Ambient Water for Determination of Trace Metals at EPA Water Quality Criteria Levels* (Sampling Method). The Sampling Method guidance document is recommended to preclude contamination during the sampling process.

1.3 This Method is for determination of Hg in the range of 0.5–100 ng/L. Application may be extended to higher levels by selection of a smaller sample size or by calibration of the analytical system across a higher range. For measurement of blank samples, the Method may be extended to a lower level by calibration to a lower calibration point. Section 10.4 gives requirements for extension of the calibration range.

1.4 The ease of contaminating ambient water samples with mercury and interfering substances cannot be overemphasized. This Method includes suggestions for improvements in facilities and analytical techniques that should minimize contamination and maximize the ability of the laboratory to make reliable trace metals determinations. Certain sections of this Method contain suggestions and other sections contain requirements to minimize contamination.

1.5 The detection limit and minimum level of quantitation in this Method usually are dependent on the level of interferences rather than instrument limitations. The method detection limit (MDL; 40 CFR 136, Appendix B) for Hg has been determined to be 0.2 ng/L when no interferences are present. The minimum level of quantitation (ML) has been established as 0.5 ng/L. An MDL as low as 0.05 ng/L can be achieved for low Hg samples by using a larger sample volume, a lower BrCl level (0.2%), and extra caution in sample handling.

1.6 Clean and ultraclean—The terms "clean" and "ultraclean" have been applied to the techniques needed to reduce or eliminate contamination in trace metals determinations. These terms are not used in this Method because they lack an exact definition. However, the information provided in this Method is consistent with the summary guidance on clean and ultraclean techniques (References 16.6-16.7).

1.7 This Method follows the EPA Environmental Methods Management Council's "Guidelines and Format for Methods to Be Proposed at 40 CFR, part 136 or part 141."

1.8 This Method is "performance based." The laboratory is permitted to modify the Method to overcome interferences or lower the cost of measurements if all performance criteria are met. Section 9.1.2.1 gives the requirements for establishing method equivalency.

1.9 Any modification of this Method, beyond those expressly permitted, shall be considered a major modification subject to application and approval of alternate test procedures under 40 CFR 136.4 and 136.5.

1.10 This Method should be used only by analysts experienced in the use of CVAFS techniques and who are trained thoroughly in the sample handling and instrument techniques described in this Method. Each laboratory that uses this Method must demonstrate the ability to generate acceptable results using the procedures in Section 9.2.

1.11 This Method is accompanied by a data verification and validation guidance document, *Guidance on the Documentation and Evaluation of Trace Metals Data Collected for CWA Compliance Monitoring* (Reference 16.8), that can be used for verification and validation of the data obtained.

1.12 This Method uses either a bubbler or flow-injection system for determination of mercury in water. Separate calibration, analysis, and calculation procedures are provided for a bubbler system (Sections 10.2, 11.2.1, and 12.2) and for a flow-injection system (Sections 10.3, 11.2.2, and 12.3).

2.0 Summary of Method

2.1 A 100- to 2000-mL sample is collected directly into a cleaned, pretested, fluoropolymer or glass bottle using sample handling techniques designed for collection of mercury at trace levels (Reference 16.9).

2.2 For dissolved Hg, the sample is filtered through a 0.45-µm capsule filter prior to preservation.

2.3 The sample is preserved by adding either pretested 12N hydrochloric acid (HCl) or bromine monochloride (BrCl) solution. If a sample will also be used for the determination of methyl mercury, it should be preserved according to procedures in the method that will be used for determination of methylmercury.

2.4 Prior to analysis, all Hg in a 100-mL sample aliquot is oxidized to Hg(II) with BrCl.

2.5 After oxidation, the sample is sequentially reduced with $NH_2OH{\cdot}HCl$ to destroy the free halogens, then reduced with stannous chloride ($SnCl_2$) to convert Hg(II) to volatile Hg(0).

2.6 The Hg(0) is separated from solution either by purging with nitrogen, helium, or argon, or by vapor/liquid separation. The Hg(0) is collected onto a gold trap (Figures 1, 2, and 3).

2.7 The Hg is thermally desorbed from the gold trap into an inert gas stream that carries the released Hg(0) to a second gold (analytical) trap. The Hg is desorbed from the analytical trap into a gas stream that carries the Hg into the cell of a cold-vapor atomic fluorescence spectrometer (CVAFS) for detection (Figures 2 and 3).

2.8 Quality is assured through calibration and testing of the oxidation, purging, and detection systems.

3.0 Definitions

3.1 Total mercury—all BrCl-oxidizable mercury forms and species found in an unfiltered aqueous solution. This includes, but is not limited to, Hg(II), Hg(0), strongly organo-complexed Hg(II) compounds, adsorbed particulate Hg, and several tested covalently bound organo-mercurials (e.g., CH_3HgCl, $(CH_3)_2Hg$, and $C_6H_5HgOOCCH_3$). The recovery of Hg bound within microbial cells may require the additional step of UV photo-oxidation. In this Method, total mercury and total recoverable mercury are synonymous.

3.2 Dissolved mercury—all BrCl-oxidizable mercury forms and species found in the filtrate of an aqueous solution that has been filtered through a 0.45-µm filter.

3.3 Apparatus—Throughout this Method, the sample containers, sampling devices, instrumentation, and all other materials and devices used in sample collection, sample processing, and sample analysis that come in contact with the sample and therefore require careful cleaning will be referred to collectively as the Apparatus.

3.4 Definitions of other terms used in this Method are given in the glossary (Section 17.0).

4.0 Contamination and Interferences

4.1 Preventing samples from becoming contaminated during the sampling and analysis process constitutes one of the greatest difficulties encountered in trace metals determinations. Over the last two decades, marine chemists have come to recognize that much of the historical data on the concentrations of dissolved trace metals in seawater are erroneously high because the concentrations reflect contamination from sampling and analysis rather than ambient levels. Therefore, it is imperative that extreme care be taken to avoid contamination when collecting and analyzing samples for trace metals.

4.2 Samples may become contaminated by numerous routes. Potential sources of trace metals contamination during sampling include: metallic or metal-containing labware (e.g., talc gloves that contain high levels of zinc), containers, sampling equipment, reagents, and reagent water; improperly cleaned or stored equipment, labware, and reagents; and atmospheric inputs such as dirt and dust. Even human contact can be a source of trace metals contamination. For example, it has been demonstrated that dental work (e.g., mercury amalgam fillings) in the mouths of laboratory personnel can contaminate samples directly exposed to exhalation (Reference 16.9).

4.3 Contamination Control

4.3.1 Philosophy—The philosophy behind contamination control is to ensure that any object or substance that contacts the sample is metal free and free from any material that may contain mercury.

4.3.1.1 The integrity of the results produced cannot be compromised by contamination of samples. This Method and the Sampling Method give requirements and suggestions for control of sample contamination.

4.3.1.2 Substances in a sample cannot be allowed to contaminate the laboratory work area or instrumentation used for trace metals measurements. This Method gives requirements and suggestions for protecting the laboratory.

4.3.1.3 Although contamination control is essential, personnel health and safety remain the highest priority. The Sampling Method and Section 5 of this Method give suggestions and requirements for personnel safety.

4.3.2 Avoiding contamination—The best way to control contamination is to completely avoid exposure of the sample to contamination in the first place. Avoiding exposure means performing operations in an area known to be free from contamination. Two of the most important factors in avoiding/reducing sample contamination are (1) an awareness of potential sources of contamination and (2) strict attention to work being done. Therefore, it is imperative that the procedures described in this Method be carried out by well-trained, experienced personnel.

4.3.3 Use a clean environment—The ideal environment for processing samples is a class-100 clean room. If a clean room is not available, all sample preparation should be performed in a class-100 clean bench or a nonmetal glove box fed by mercury-and particle-free air or nitrogen. Digestion should be performed in a nonmetal fume hood equipped with HEPA filtration and ideally situated in a clean room.

4.3.4 Minimize exposure—The Apparatus that will contact samples, blanks, or standard solutions should be opened or exposed only in a clean room, clean bench, or glove box so that exposure to an uncontrolled atmosphere is minimized. When not being used, the Apparatus should be covered with clean plastic wrap, stored in the clean bench or in a plastic box or glove box, or bagged in clean zip-type bags. Minimizing the time between cleaning and use will also minimize contamination.

4.3.5 Clean work surfaces—Before a given batch of samples is processed, all work surfaces in the hood, clean bench, or glove box in which the samples will be processed should be cleaned by wiping with a lint-free cloth or wipe soaked with reagent water.

4.3.6 Wear gloves—Sampling personnel must wear clean, non-talc gloves during all operations involving handling of the Apparatus, samples, and blanks. Only clean gloves may touch the Apparatus. If another object or substance is touched, the glove(s) must be changed before again handling the Apparatus. If it is even suspected that gloves have become contaminated, work must be halted, the contaminated gloves removed, and a new pair of clean gloves put on. Wearing multiple layers of clean gloves will allow the old pair to be quickly stripped with minimal disruption to the work activity.

4.3.7 Use metal-free Apparatus—All Apparatus used for determination of mercury at ambient water quality criteria levels must be nonmetallic, free of material that may contain metals, or both.

4.3.7.1 Construction materials—Only fluoropolymer or glass containers must be used for collection of samples that will be analyzed for mercury because mercury vapors can diffuse in or out of other materials, leading to results that are biased low or high. Polyethylene and/or polypropylene labware may be used for digestion and other purposes because the time of sample exposure to these materials is relatively short. All materials, regardless of construction, that will directly or

indirectly contact the sample, must be known to be clean and free of Hg at the levels specified in this Method before proceeding.

4.3.7.2 Serialization—It is recommended that serial numbers be indelibly marked or etched on each piece of reusable Apparatus so that contamination can be traced, and logbooks should be maintained to track the sample from the container through the labware to introduction into the instrument. It may be useful to dedicate separate sets of labware to different sample types; e.g., receiving waters vs. effluents. However, the Apparatus used for processing blanks and standards must be mixed with the Apparatus used to process samples so that contamination of all labware can be detected.

4.3.7.3 The laboratory or cleaning facility is responsible for cleaning the Apparatus used by the sampling team. If there are any indications that the Apparatus is not clean when received by the sampling team (e.g., ripped storage bags), an assessment of the likelihood of contamination must be made. Sampling must not proceed if it is possible that the Apparatus is contaminated. If the Apparatus is contaminated, it must be returned to the laboratory or cleaning facility for proper cleaning before any sampling activity resumes.

4.3.8 Avoid sources of contamination—Avoid contamination by being aware of potential sources and routes of contamination.

4.3.8.1 Contamination by carryover—Contamination may occur when a sample containing a low concentration of mercury is processed immediately after a sample containing a relatively high concentration of mercury. The Hg concentration at which the analytical system (purge, traps, detector) will carry greater than 0.5 ng/L of Hg into a succeeding bubbler or system blank must be determined by analyzing calibration solutions containing successively larger concentrations of Hg. This test must be run prior to first use of the analytical system and whenever a change is made that would increase the amount of carryover. When a sample contains ½ or greater of this determined Hg concentration, a bubbler blank (bubbler system) or system blank (flow injection system) must be analyzed to demonstrate no carryover at the blank criteria level. For the bubbler system, the blank must be run using the same bubbler and sample trap used to run the high concentration sample. Samples analyzed following a sample that has been determined to result in carryover must be reanalyzed. Samples that are known or suspected to contain the lowest concentration of mercury should be analyzed first followed by samples containing higher levels.

4.3.8.2 Contamination by samples—Significant laboratory or instrument contamination may result when untreated effluents, in-process waters, landfill leachates, and other undiluted samples containing concentrations of mercury greater than 100 ng/L are processed and analyzed. Samples known or suspected to contain Hg concentrations greater than 100 ng/L should be diluted prior to bringing them into the clean room or laboratory dedicated for processing trace metals samples.

4.3.8.3 Contamination by indirect contact—Apparatus that may not directly come in contact with the samples may still be a source of contamination. For example, clean tubing placed in a dirty plastic bag may pick up contamination from the bag and subsequently transfer the contamination to the sample. It is imperative that every piece of the Apparatus that is directly or indirectly used in the collection, processing, and analysis of water samples be thoroughly cleaned (Section 6.1.2).

4.3.8.4 Contamination by airborne particulate matter—Less obvious substances capable of contaminating samples include airborne particles. Samples may be contaminated by airborne dust, dirt, particles, or vapors from unfiltered air supplies; nearby corroded or rusted pipes, wires, or other fixtures; or metal-containing paint. Whenever possible, sample processing and analysis should occur as far as possible from sources of airborne contamination.

4.3.8.5 Contamination from reagents— Contamination can be introduced into samples from method reagents used during processing and analysis. Reagent blanks must be analyzed for contamination prior to use (see Section 9.4.3). If reagent blanks are contaminated, a new batch of reagents must be prepared (see Section 9.4.3.2).

4.4 Interferences

4.4.1 At the time of promulgation of this Method, gold and iodide were known interferences. At a mercury concentration of 2.5 ng/L and at increasing iodide concentrations from 30 to 100 mg/L, test data have shown that mercury recovery will be reduced from 100 to 0 percent. At iodide concentrations greater than 3 mg/L, the sample should be pre-reduced with $SnCl_2$ (to remove the brown color) and additional or more concentrated $SnCl_2$ should be added. To preclude loss of Hg, the additional $SnCl_2$ should be added in a closed vessel or analysis should proceed immediately. If samples containing iodide concentrations greater than 30 mg/L are analyzed, it may be necessary to clean the analytical system with 4N HCl after the analysis (Reference 16.10).

4.4.2 The potential exists for destruction of the gold traps if free halogens are purged onto them, or if they are overheated (>500 °C). When the instructions in this Method are followed, neither of these outcomes is likely.

4.4.3 Water vapor may collect in the gold traps and subsequently condense in the fluorescence cell upon desorption, giving a false peak due to scattering of the excitation radiation. Condensation can be avoided by predrying the gold trap. Traps that tend to absorb large quantities of water vapor should not be used.

4.4.4 The fluorescent intensity is strongly dependent upon the presence of molecular species in the carrier gas that can cause "quenching" of the excited atoms. The dual amalgamation technique eliminates quenching due to trace gases, but it remains the laboratory's responsibility to ensure high purity inert carrier gas and a leak-free analytical train.

5.0 Safety

5.1 The toxicity or carcinogenicity of each chemical used in this Method has not been precisely determined; however, each compound should be treated as a potential health hazard. Exposure to these compounds should be reduced to the lowest possible level.

5.1.1 Chronic mercury exposure may cause kidney damage, muscle tremors, spasms, personality changes, depression, irritability and nervousness. Organo-mercurials may cause permanent brain damage. Because of the toxicological and physical properties of Hg, pure standards should be handled only by highly trained personnel thoroughly familiar with handling and cautionary procedures and the associated risks.

5.1.2 It is recommended that the laboratory purchase a dilute standard solution of the Hg in this Method. If primary solutions are prepared, they shall be prepared in a hood, and a NIOSH/MESA-approved toxic gas respirator shall be worn.

5.2 This Method does not address all safety issues associated with its use. The laboratory is responsible for maintaining a current file of OSHA regulations for safe handling of the chemicals specified in this Method. OSHA rules require that a reference file of material safety data sheets (MSDSs) must be made available to all personnel involved in these analyses (29 CFR 1917.28, Appendix E). It also is suggested that the laboratory perform personal hygiene monitoring of each analyst who uses this Method and that the results of this monitoring be made available to the analyst. Personal hygiene monitoring should be performed using OSHA or NIOSH approved personal hygiene monitoring methods. Additional information on laboratory safety can be found in References 16.11-16.14. The references and bibliography included in Reference 16.14 are particularly comprehensive in dealing with the general subject of laboratory safety.

5.3 Samples suspected to contain concentrations of Hg at µg/L or higher levels are handled using essentially the same techniques employed in handling radioactive or infectious materials. Well-ventilated, controlled access laboratories are required. Assistance in evaluating the health hazards of particular laboratory conditions may be obtained from certain consulting laboratories and from State Departments of Health or Labor, many of which have an industrial health service. Each laboratory must develop a safety program for handling Hg.

5.3.1 Facility—When samples known or suspected of containing high concentrations of mercury are handled, all operations (including removal of samples from sample containers, weighing, transferring, and mixing) should be performed in a glove box demonstrated to be leak-tight or in a fume hood demonstrated to have adequate airflow. Gross losses to the laboratory ventilation system must not be allowed. Handling of the dilute solutions normally used in analytical and animal work presents no inhalation hazards except in an accident.

5.3.2 Protective equipment—Disposable plastic gloves, apron or lab coat, safety glasses or mask, and a glove box or fume hood adequate for radioactive work should be used. During analytical operations that may give rise to aerosols or dusts, personnel should wear respirators equipped with activated carbon filters.

5.3.3 Training—Workers must be trained in the proper method of removing contaminated gloves and clothing without contacting the exterior surfaces.

5.3.4 Personal hygiene—Hands and forearms should be washed thoroughly after each manipulation and before breaks (coffee, lunch, and shift).

5.3.5 Confinement—Isolated work areas posted with signs, segregated glassware and tools, and plastic absorbent paper on bench tops will aid in confining contamination.

5.3.6 Effluent vapors—The effluent from the CVAFS should pass through either a column of activated charcoal or a trap containing gold or sulfur to amalgamate or react mercury vapors.

5.3.7 Waste handling—Good technique includes minimizing contaminated waste. Plastic bag liners should be used in waste cans. Janitors and other personnel must be trained in the safe handling of waste.

5.3.8 Decontamination

5.3.8.1 Decontamination of personnel—Use any mild soap with plenty of scrubbing action.

5.3.8.2 Glassware, tools, and surfaces—Sulfur powder will react with Hg to produce mercuric sulfide, thereby eliminating the possible volatilization of Hg. Satisfactory cleaning may be accomplished by dusting a surface lightly with sulfur powder, then washing with any detergent and water.

5.3.9 Laundry—Clothing known to be contaminated should be collected in plastic bags. Persons that convey the bags and launder the clothing should be advised of the hazard and trained in proper handling. If the launderer knows of the potential problem, the clothing may be put into a washer without contact. The washer should be run through a cycle before being used again for other clothing.

5.3.10 Wipe tests—A useful method of determining cleanliness of work surfaces and tools is to wipe the surface with a piece of filter paper. Extraction and analysis by this Method can achieve a limit of detection of less than 1 ng per wipe. Less than 0.1 µg per wipe indicates acceptable cleanliness; anything higher warrants further cleaning. More than 10 µg on a wipe constitutes an acute hazard and requires prompt cleaning before further use of the equipment or work space, and indicates that unacceptable work practices have been employed.

6.0 Apparatus and Materials

Disclaimer: The mention of trade names or commercial products in this Method is for illustrative purposes only and does not constitute endorsement or recommendation for use by the Environmental Protection Agency. Equivalent performance may be achievable using apparatus, materials, or cleaning procedures other than those suggested here. The laboratory is responsible for demonstrating equivalent performance.

6.1 Sampling equipment

6.1.1 Sample collection bottles-fluoropolymer or glass, 125- to 1000-mL, with fluoropolymer or fluoropolymer-lined cap.

6.1.2 Cleaning

6.1.2.1 New bottles are cleaned by heating to 65–75 °C in 4 N HCl or concentrated HNO_3 for at least 48 h. The bottles are cooled, rinsed three times with reagent water, and filled with reagent water containing 1% HCl. These bottles are capped and placed in a clean oven at 60-70°C overnight. After cooling, they are rinsed three more times with reagent water, filled with reagent water containing 0.4% (v/v) HCl, and placed in a mercury-free Class-100 clean bench until the outside surfaces are dry. The bottles are tightly capped (with a wrench), double-bagged in new polyethylene zip-type bags until needed, and stored in wooden or plastic boxes until use. The bottles may be shipped to the sampling site containing dilute HCl solution (e.g., 0.04%), containing reagent water, or empty.

6.1.2.2 Used bottles known not to have contained mercury at high (>100 ng/L) levels are cleaned as above, except for only 6–12 h in hot 4 N HCl.

6.1.2.3 Bottle blanks must be analyzed as described in Section 9.4.7. To verify the effectiveness of the cleaning procedures, bottle blanks must be demonstrated to be free of mercury at the ML of this Method.

6.1.2.4 As an alternative to cleaning by the laboratory, bottles may be purchased from a commercial supplier and each lot certified to be clean. Bottles from the lot must be tested as bottle blanks (Section 9.4.7) and demonstrated to be free of mercury at the ML of this Method. If mercury is present above this level in any bottle, either the lot must be rejected or the bottles must be re-cleaned.

6.1.3 Filtration Apparatus

6.1.3.1 Filter—0.45-µm, 15-mm diameter capsule filter (Gelman Supor 12175, or equivalent)

6.1.3.2 Peristaltic pump—115-V a.c., 12-V d.c., internal battery, variable-speed, single-head (Cole-Parmer, portable, "Masterflex L/S," Catalog No. 07570-10 drive with Quick Load pump head, Catalog No. 07021-24, or equivalent).

6.1.3.3 Tubing—styrene/ethylene/butylene/silicone (SEBS) resin for use with peristaltic pump, approx 3/8-in ID by approximately 3 ft (Cole-Parmer size 18, Catalog No. 06424-18, or approximately 1/4-in OD, Cole-Parmer size 17, Catalog No. 06424-17, or equivalent). Tubing is cleaned by soaking in 5–10% HCl solution for 8–24 h, rinsing with reagent water in a clean bench in a clean room, and drying in the clean bench by purging with metal-free air or nitrogen. After drying, the tubing is double-bagged in clear polyethylene bags, serialized with a unique number, and stored until use.

6.2 Equipment for bottle and glassware cleaning

6.2.1 Vat, 100–200 L, high-density polyethylene (HDPE), half filled with 4 N HCl in reagent water.

6.2.2 Panel immersion heater, 500-W, all-fluoropolymer coated, 120 vac (Cole-Parmer H-03053-04, or equivalent)

WARNING: *Read instructions carefully!! The heater will maintain steady state, without temperature feedback control, of 60–75°C in a vat of the size described. However, the equilibrium temperature will be higher (up to boiling) in a smaller vat. Also, the heater plate MUST be maintained in a vertical position, completely submerged and away from the vat walls to avoid melting the vat or burning out!*

6.2.3 Laboratory sink—in Class-100 clean area, with high-flow reagent water (Section 7.1) for rinsing.

6.2.4 Clean bench—Class-100, for drying rinsed bottles.

6.2.5 Oven—stainless steel, in Class-100 clean area, capable of maintaining ± 5°C in the 60–70°C temperature range.

6.3 Cold vapor atomic fluorescence spectrometer (CVAFS): The CVAFS system used may either be purchased from a supplier, or built in the laboratory from commercially available components.

6.3.1 Commercially available CVAFS—Tekran (Toronto, ON) Series 2600 CVAFS, Brooks-Rand (Seattle, WA) Model III CVAFS, Leeman Labs Hydra AF Gold*plus* CVAFS, or equivalent

6.3.2 Custom-built CVAFS (Reference 16.15). Figure 2 shows the schematic diagram. The system consists of the following:

6.3.2.1 Low-pressure 4-W mercury vapor lamp

6.3.2.2 Far UV quartz flow-through fluorescence cell—12 mm x 12 mm x 45 mm, with a 10-mm path length (NSG Cells, or equivalent).

6.3.2.3 UV-visible photomultiplier (PMT)—sensitive to < 230 nm. This PMT is isolated from outside light with a 253.7-nm interference filter (Oriel Corp., Stamford, CT, or equivalent).

6.3.2.4 Photometer and PMT power supply (Oriel Corp. or equivalent), to convert PMT output (nanoamp) to millivolts

6.3.2.5 Black anodized aluminum optical block—holds fluorescence cell, PMT, and light source at perpendicular angles, and provides collimation of incident and fluorescent beams (Frontier Geosciences Inc., Seattle, WA, or equivalent).

6.3.2.6 Flowmeter—with needle valve capable of reproducibly keeping the carrier gas flow rate at 30 mL/min

6.4 Hg purging system—Figure 2 shows the schematic diagram for the purging system. The system consists of the following:

6.4.1 Flow meter/needle valve—capable of controlling and measuring gas flow rate to the purge vessel at 350 ± 50 mL/min.

6.4.2 Fluoropolymer fittings—connections between components and columns are made using 6.4-mm OD fluoropolymer tubing and fluoropolymer friction-fit or threaded tubing connectors. Connections between components requiring mobility are made with 3.2-mm OD fluoropolymer tubing because of its greater flexibility.

6.4.3 Acid fume pretrap—10-cm long x 0.9-cm ID fluoropolymer tube containing 2–3 g of reagent grade, nonindicating, 8–14 mesh soda lime chunks, packed between wads of silanized glass wool. This trap is cleaned of Hg by placing on the output of a clean cold vapor generator (bubbler) and purging for 1 h with N_2 at 350 mL/min.

6.4.4 Cold vapor generator (bubbler)—200-mL borosilicate glass (15 cm high x 5.0 cm diameter) with standard taper 24/40 neck, fitted with a sparging stopper having a coarse glass frit that extends to within 0.2 cm of the bubbler bottom (Frontier Geosciences, Inc. or equivalent).

6.5 The dual-trap Hg(0) preconcentrating system

6.5.1 Figures 2 and 3 show the dual-trap amalgamation system (Reference 16.5).

6.5.2 Gold-coated sand traps—10-cm long x 6.5-mm OD x 4-mm ID quartz tubing. The tube is filled with 3.4 cm of gold-coated 45/60 mesh quartz sand (Frontier Geosciences Inc., Seattle, WA, or equivalent). The ends are plugged with quartz wool.

6.5.2.1 Traps are fitted with 6.5-mm ID fluoropolymer friction-fit sleeves for making connection to the system. When traps are not in use, fluoropolymer end plugs are inserted in trap ends to eliminate contamination.

6.5.2.2 At least six traps are needed for efficient operation, one as the "analytical" trap, and the others to sequentially collect samples.

6.5.3 Heating of gold-coated sand traps—To desorb Hg collected on a trap, heat for 3.0 min to 450–500 °C (a barely visible red glow when the room is darkened) with a coil consisting of 75 cm of 24-gauge Nichrome wire at a potential of 10-14 vac. Potential is applied and finely adjusted with an autotransformer.

6.5.4 Timers—The heating interval is controlled by a timer-activated 120-V outlet (Gralab, or equivalent), into which the heating coil autotransformer is plugged. Two timers are required, one each for the "sample" trap and the "analytical" trap.

6.5.5 Air blowers—After heating, traps are cooled by blowing air from a small squirrel-cage blower positioned immediately above the trap. Two blowers are required, one each for the "sample" trap and the "analytical" trap.

6.6 Recorder—Any multi-range millivolt chart recorder or integrator with a range compatible with the CVAFS is acceptable. By using a two-pen recorder with pen sensitivity offset by a factor of 10, the dynamic range of the system is extended to 10^3.

6.7 Pipettors—All-plastic pneumatic fixed-volume and variable pipettors in the range of 10 µL to 5.0 mL.

6.8 Analytical balance capable of weighing to the nearest 0.01 g

7.0 Reagents and Standards

Note: The quantities of reagents and the preparation procedures in this section are for illustrative purposes. Equivalent performance may be achievable using quantities of reagents and procedures other than those suggested here. The laboratory is responsible for demonstrating equivalent performance.

7.1 Reagent water—18-MΩ minimum, ultrapure deionized water starting from a prepurified (distilled, reverse osmosis, etc.) source. Water should be monitored for Hg, especially after ion exchange beds are changed.

7.2 Air—It is very important that the laboratory air be low in both particulate and gaseous mercury. Ideally, mercury work should be conducted in a new laboratory with mercury-free paint on the walls. A source of air that is very low in Hg should be brought directly into the Class-100 clean bench air intake. If this is not possible, air coming into the clean bench can be cleaned for mercury by placing a gold-coated cloth prefilter over the intake. Gold-coated cloth filter: Soak 2 m^2 of cotton gauze in 500 mL of 2% gold chloride solution at pH 7. In a hood, add 100 mL of 30% $NH_2OH{\cdot}HCl$ solution, and homogenize into the cloth with gloved hands. The material will turn black as colloidal gold is precipitated. Allow the mixture to set for several hours, then rinse

with copious amounts of deionized water. Squeeze-dry the rinsed cloth, and spread flat on newspapers to air-dry. When dry, fold and place over the intake prefilter of the laminar flow hood.

CAUTION: Great care should be taken to avoid contaminating the laboratory with gold dust. This could cause interferences with the analysis if gold becomes incorporated into the samples or equipment. The gilding procedure should be done in a remote laboratory if at all possible.

7.3 Hydrochloric acid—trace-metal purified reagent-grade HCl containing less than 5 pg/mL Hg. The HCl should be analyzed for Hg before use.

7.4 Hydroxylamine hydrochloride—Dissolve 300 g of $NH_2OH{\cdot}HCl$ in reagent water and bring to 1.0 L. This solution may be purified by the addition of 1.0 mL of $SnCl_2$ solution and purging overnight at 500 mL/min with Hg-free N_2. Flow injection systems may require the use of less $SnCl_2$ for purification of this solution.

7.5 Stannous chloride—Bring 200 g of $SnCl_2{\cdot}2H_2O$ and 100 mL concentrated HCl to 1.0 L with reagent water. Purge overnight with mercury-free N_2 at 500 mL/min to remove all traces of Hg. Store tightly capped.

7.6 Bromine monochloride (BrCl)—In a fume hood, dissolve 27 g of reagent grade KBr in 2.5 L of low-Hg HCl. Place a clean magnetic stir bar in the bottle and stir for approximately 1 h in the fume hood. Slowly add 38 g reagent grade $KBrO_3$ to the acid while stirring. When all of the $KBrO_3$ has been added, the solution color should change from yellow to red to orange. Loosely cap the bottle, and allow to stir another hour before tightening the lid.

WARNING: *This process generates copious quantities of free halogens (Cl_2, Br_2, BrCl), which are released from the bottle. Add the $KBrO_3$ slowly in a fume hood!*

7.7 Stock mercury standard—NIST-certified 10,000-ppm aqueous Hg solution (NIST-3133). This solution is stable at least until the NIST expiration date.

7.8 Secondary Hg standard—Add approx 0.5 L of reagent water and 5 mL of BrCl solution (Section 7.6) to a 1.00-L Class A volumetric flask. Add 0.100 mL of the stock mercury standard (Section 7.7) to the flask and dilute to 1.00 L with reagent water. This solution contains 1.00 µg/mL (1.00 ppm) Hg. Transfer the solution to a fluoropolymer bottle and cap tightly. This solution is considered stable until the NIST expiration date.

7.9 Working Hg Standard A—Dilute 1.00 mL of the secondary Hg standard (Section 7.8) to 100 mL in a Class A volumetric flask with reagent water containing 0.5% by volume BrCl solution (Section 7.6). This solution contains 10.0 ng/mL and should be replaced monthly, or longer if extended stability is demonstrated.

7.10 Working Hg Standard B—Dilute 0.10 mL of the secondary Hg standard (Section 7.8) to 1000 mL in a Class A volumetric flask with reagent water containing 0.5% by volume BrCl solution (Section 7.6). This solution contains 0.10 ng/mL and should be replaced monthly, or longer if extended stability is demonstrated.

7.11 Initial Precision and Recovery (IPR) and Ongoing Precision and Recovery (OPR) solutions—Using the working Hg standard A (Section 7.9), prepare IPR and OPR solutions at a

concentration of 5 ng/L Hg in reagent water. IPR/OPR solutions are prepared using the same amounts of reagents used for preparation of the calibration standards.

7.12 Nitrogen—Grade 4.5 (standard laboratory grade) nitrogen that has been further purified by the removal of Hg using a gold-coated sand trap.

7.13 Argon—Grade 5.0 (ultra high-purity, GC grade) argon that has been further purified by the removal of Hg using a gold-coated sand trap.

8.0 Sample Collection, Preservation, and Storage

8.1 Before samples are collected, consideration should be given to the type of data required (i.e., dissolved or total), so that appropriate preservation and pretreatment steps can be taken. An excess of BrCl should be confirmed either visually (presence of a yellow color) or with starch iodide indicating paper, using a separate sample aliquot, prior to sample processing or direct analysis to ensure the sample has been properly preserved.

8.2 Samples are collected into rigorously cleaned fluoropolymer bottles with fluoropolymer or fluoropolymer-lined caps. Glass bottles may be used if Hg is the only target analyte. It is critical that the bottles have tightly sealing caps to avoid diffusion of atmospheric Hg through the threads (Reference 16.4). Polyethylene sample bottles must not be used (Reference 16.15).

8.3 Collect samples using guidance provided in the Sampling Method (Reference 16.9). Procedures in the Sampling Method are based on rigorous protocols for collection of samples for mercury (References 16.4 and 16.15).

NOTE: *Discrete samplers have been found to contaminate samples with Hg at the ng/L level. Therefore, great care should be exercised if this type of sampler is used. It may be necessary for the sampling team to use other means of sample collection if samples are found to be contaminated using the discrete sampler.*

8.4 Sample filtration—For dissolved Hg, a sample is filtered through a 0.45-µm capsule filter (Section 6.1.3.1) in a mercury-free clean area prior to preservation. If the sample is filtered, it must be accompanied by a blank that has been filtered under the same conditions. The Sampling Method describes sample filtration procedures.

8.5 Preservation—Samples are preserved by adding either 5 mL/L of pretested 12N HCl or 5 mL/L BrCl solution to the sample bottle. If a sample will be used also for the determination of methyl mercury, it should be collected and preserved according to procedures in the method that will be used for determination of methyl mercury (e.g., HCl or H_2SO_4 solution). Preserved samples are stable for up to 90 days of the date of collection.

8.5.1 Samples to be analyzed for total or dissolved Hg only may be shipped to the laboratory unpreserved and unrefrigerated if they are collected in fluoropolymer or glass bottles and capped tightly. Samples must be either preserved or analyzed within 48 hours of collection. If a sample is oxidized in the sample bottle, the time to preservation can be extended to 28 days.

8.5.2 Samples that are acid-preserved may lose Hg to coagulated organic materials in the water or condensed on the walls (Reference 16.16). The best approach is to add BrCl directly to the sample bottle at least 24 hours before analysis. If other Hg species are to be analyzed, these aliquots must be removed prior to the addition of BrCl. If BrCl

cannot be added directly to the sample bottle, the bottle must be shaken vigorously prior to sub-sampling.

8.5.3 Handling of the samples in the laboratory should be undertaken in a mercury-free clean bench, after rinsing the outside of the bottles with reagent water and drying in the clean air hood.

NOTE: *Because of the potential for contamination, it is recommended that filtration and preservation of samples be performed in the clean room in the laboratory. However, if circumstances prevent overnight shipment of samples, samples should be filtered and preserved in a designated clean area in the field in accordance with the procedures given in Method 1669 (Reference 16.9). If filtered in the field, samples ideally should be filtered into the sample bottle.*

8.6 Storage—Sample bottles should be stored in clean (new) polyethylene bags until sample analysis.

8.7 Sample preservation, storage, and holding time requirements also are given at 40 CFR part 136.3(e) Table II.

9.0 Quality Control

9.1 Each laboratory that uses this Method is required to operate a formal quality assurance program (Reference 16.17). The minimum requirements of this program consist of an initial demonstration of laboratory capability, ongoing analysis of standards and blanks as a test of continued performance, and the analysis of matrix spikes (MS) and matrix spike duplicates (MSD) to assess precision and recovery. Laboratory performance is compared to established performance criteria to determine that the results of analyses meet the performance characteristics of the Method.

9.1.1 The laboratory shall make an initial demonstration of the ability to generate acceptable accuracy and precision. This ability is established as described in Section 9.2.

9.1.2 In recognition of advances that are occurring in analytical technology, the laboratory is permitted certain options to improve results or lower the cost of measurements. These options include automation of the dual-amalgamation system, single-trap amalgamation (Reference 16.18), direct electronic data acquisition, calibration using gas-phase elemental Hg standards, use of the bubbler or flow-injection systems, or changes in the detector (i.e., CVAAS) when less sensitivity is acceptable or desired. Changes in the determinative technique, such as the use of colorimetry, are not allowed. If an analytical technique other than the CVAFS technique specified in this Method is used, that technique must have a specificity for mercury equal to or better than the specificity of the technique in this Method.

9.1.2.1 Each time this Method is modified, the laboratory is required to repeat the procedure in Section 9.2 to demonstrate that an MDL (40 CFR part 136, Appendix B) less than or equal to one-third the regulatory compliance limit or less than or equal to the MDL of this Method (Table 1), whichever is greater, can be achieved. If the change will affect calibration, the instrument must be recalibrated according to Section 10.

Note: If the compliance limit is greater than the concentration of Hg in the OPR/OPR (5 ng/L), the acceptance criteria for blanks and the concentrations of mercury spiked into quality control samples may be increased to support measurements at the compliance limit. For example, if the compliance limit is 12

ng/L (National Toxics Rule, 40 CFR 131.36), the MDL must be less than or equal to 4 ng/L; concentrations of the calibration standards may be 5, 10, 20, 50 , and 100 ng/L; concentrations of the IPR/OPR samples may be 10 ng/L; spike concentrations and acceptance criteria for MS/MSD samples would remain as specified in Section 9.3; and an appropriate blank acceptance criterion would be 5 ng/L.

9.1.2.2 The laboratory is required to maintain records of modifications made to this Method. These records include the following, at a minimum:

9.1.2.2.1 The names, titles, addresses, and telephone numbers of the analyst(s) who performed the analyses and modification, and the quality control officer who witnessed and will verify the analyses and modification

9.1.2.2.2 A narrative stating the reason(s) for the modification(s)

9.1.2.2.3 Results from all quality control (QC) tests demonstrating the performance of the modified method, including the following:

(a) Calibration (Section 10)
(b) Initial precision and recovery (Section 9.2.2)
(c) Analysis of blanks (Section 9.4)
(d) Matrix spike/matrix spike duplicate analysis (Section 9.3)
(e) Ongoing precision and recovery (Section 9.5)
(f) Quality control sample (Section 9.6)
(g) Method detection limit (Section 9.2.1)

9.1.2.2.4 Data that will allow an independent reviewer to validate each determination by tracking the instrument output to the final result. These data are to include the following:

(a) Sample numbers and other identifiers
(b) Processing dates
(c) Analysis dates
(d) Analysis sequence/run chronology
(e) Sample weight or volume
(f) Copies of logbooks, chart recorder, or other raw data output
(g) Calculations linking raw data to the results reported

9.1.3 Analyses of MS and MSD samples are required to demonstrate the accuracy and precision and to monitor matrix interferences. Section 9.3 describes the procedure and QC criteria for spiking.

9.1.4 Analyses of blanks are required to demonstrate acceptable levels of contamination. Section 9.4 describes the procedures and criteria for analyzing blanks.

9.1.5 The laboratory shall, on an ongoing basis, demonstrate through analysis of the ongoing precision and recovery (OPR) sample and the quality control sample (QCS) that the system is in control. Sections 9.5 and 9.6 describe these procedures, respectively.

9.1.6 The laboratory shall maintain records to define the quality of the data that are generated. Sections 9.3.7 and 9.5.3 describe the development of accuracy statements.

9.1.7 Quality of the analyses is controlled by an analytical batch. An analytical batch is a set of samples oxidized with the same batch of reagents, and analyzed during the same 12-hour shift. A batch may be from 1 to as many as 20 samples. Each batch must be accompanied by 3 system blanks (Section 9.4.2 for the flow-injection system), a

minimum of 3 bubbler blanks (Section 9.4.1 for the bubbler system), 1 OPR sample at the beginning and end of the batch (Section 9.5), a QCS (Section 9.6), and at least 3 method blanks (Section 9.4.4). In addition, there must be 1 MS and 1 MSD sample for every 10 samples (a frequency of 10%). A typical analytical sequence would be:

(a) Three system blanks (Section 9.4.2) or a minimum of 3 bubbler blanks (Section 9.4.1)
(b) A minimum of five, non-zero calibration standards (Section 10.2.2.1)
(c) On-going precision and recovery (Section 9.5)
(d) Quality control sample (Section 9.6)
(e) Method blank (Section 9.4.4)
(f) Seven samples
(g) Method blank (Section 9.4.4)
(h) Three samples
(i) Matrix spike (Section 9.3)
(j) Matrix spike duplicate (Section 9.3)
(k) Four samples
(l) Method blank (Section 9.4.4)
(m) Six samples
(n) Matrix spike (Section 9.3)
(o) Matrix spike duplicate (Section 9.3)
(p) Ongoing precision and recovery (Section 9.5)

The above sequence includes calibration. If system performance is verified at the end of the sequence using the OPR, analysis of samples and blanks may proceed without recalibration (i.e., the analytical sequence would be entered at Step (d) above), unless more than 12 hours has elapsed since verification of system performance. If more than 12 hours has elapsed, the sequence would be initiated at Step (c) above.

9.2 Initial demonstration of laboratory capability

9.2.1 Method detection limit—To establish the ability to detect Hg, the laboratory shall achieve an MDL that is less than or equal to the MDL listed in Section 1.5 or one-third the regulatory compliance limit, whichever is greater. The MDL shall be determined according to the procedure at 40 CFR 136, Appendix B using the apparatus, reagents, and standards that will be used in the practice of this Method. This MDL shall be used for determination of laboratory capability only, and should be determined when a new operator begins work or whenever, in the judgment of the laboratory, a change in instrument hardware or operating conditions would dictate reevaluation of capability.

9.2.2 Initial precision and recovery (IPR)—To establish the ability to generate acceptable precision and recovery, the laboratory shall perform the following operations:

9.2.2.1 Analyze four replicates of the IPR solution (5 ng/L, Section 7.11) according to the procedure beginning in Section 11.

9.2.2.2 Using the results of the set of four analyses, compute the average percent recovery (X), and the standard deviation of the percent recovery (s) for Hg.

9.2.2.3 Compare s and X with the corresponding limits for initial precision and recovery in Table 2. If s and X meet the acceptance criteria, system performance is acceptable and analysis of samples may begin. If, however, s exceeds the

precision limit or X falls outside the acceptance range, system performance is unacceptable. Correct the problem and repeat the test (Section 9.2.2.1).

9.3 Matrix spike (MS) and matrix spike duplicate (MSD)—To assess the performance of the Method on a given sample matrix, the laboratory must spike, in duplicate, a minimum of 10% (1 sample in 10) from a given sampling site or, if for compliance monitoring, from a given discharge. Therefore, an analytical batch of 20 samples would require two pairs of MS/MSD samples (four spiked samples total).

9.3.1 The concentration of the spike in the sample shall be determined as follows:

9.3.1.1 If, as in compliance monitoring, the concentration of Hg in the sample is being checked against a regulatory compliance limit, the spiking level shall be at that limit or at 1–5 times the background concentration of the sample (as determined in Section 9.3.2), whichever is greater.

9.3.1.2 If the concentration of Hg in a sample is not being checked against a limit, the spike shall be at 1–5 times the background concentration or at 1-5 times the ML in Table 1, whichever is greater.

9.3.2 To determine the background concentration (B), analyze one sample aliquot from each set of 10 samples from each site or discharge according to the procedure in Section 11. If the expected background concentration is known from previous experience or other knowledge, the spiking level may be established *a priori*.

9.3.2.1 If necessary, prepare a standard solution to produce an appropriate level in the sample (Section 9.3.1).

9.3.2.2 Spike two additional sample aliquots with identical amounts of the spiking solution and analyze these aliquots as described in Section 11.1.2 to determine the concentration after spiking (A).

9.3.3 Calculate the percent recovery (R) in each aliquot using the following equation:

$$\% R = 100 \frac{(A-B)}{T}$$

where:

A = *Measured concentration of analyte after spiking*
B = *Measured concentration of analyte before spiking*
T = *True concentration of the spike*

9.3.4 Compare percent recovery (R) with the QC acceptance criteria in Table 2.

9.3.4.1 If results of the MS/MSD are similar and fail the acceptance criteria, and recovery for the OPR standard (Section 9.5) for the analytical batch is within the acceptance criteria in Table 2, an interference is present and the results may not be reported or otherwise used for permitting or regulatory compliance purposes. If the interference can be attributed to sampling, the site or discharge should be resampled. If the interference can be attributed to a method deficiency, the laboratory must modify the method, repeat the test required in Section 9.1.2, and repeat analysis of the sample and MS/MSD. However, during the development

of Method 1631, very few interferences have been noted in the determination of Hg using this Method. (See Section 4.4 for information on interferences.)

9.3.4.2 If the results of both the spike and the OPR test fall outside the acceptance criteria, the analytical system is judged to be not in control, and the results may not be reported or used for permitting or regulatory compliance purposes. The laboratory must identify and correct the problem and reanalyze all samples in the sample batch.

9.3.5 Relative percent difference (RPD)—Compute the RPD between the MS and MSD results according to the following equation using the concentrations found in the MS and MSD. Do not use the recoveries calculated in Section 9.3.3 for this calculation because the RPD is inflated when the background concentration is near the spike concentration.

$$RPD = 200 \times \frac{(|D1-D2|)}{(D1+D2)}$$

Where:
D1 = concentration of Hg in the MS sample
D2 = concentration of Hg in the MSD sample

9.3.6 The RPD for the MS/MSD pair must not exceed the acceptance criterion in Table 2. If the criterion is not met, the system is judged to be out of control. The problem must be identified and corrected, and the MS/MSD and corresponding samples reanalyzed.

9.3.7 As part of the QC program for the laboratory, method precision and recovery for samples should be assessed and records maintained. After analyzing five samples in which the recovery passes the test in Section 9.3.4, compute the average percent recovery (R_a) and the standard deviation of the percent recovery (s_r). Express the accuracy assessment as a percent recovery interval from R_a - $2s_r$ to R_a + $2s_r$. For example, if R_a = 90% and s_r = 10% for five analyses, the accuracy interval is expressed as 70–110%. Update the accuracy assessment regularly (e.g., after every five to ten new accuracy measurements).

9.4 Blanks—Blanks are critical to the reliable determination of Hg at low levels. The sections below give the minimum requirements for analysis of blanks. Analysis of additional blanks is recommended as necessary to pinpoint sources of contamination in, and external to, the laboratory.

9.4.1 Bubbler blanks—Bubbler blanks are analyzed to demonstrate that bubbler systems are free from contamination at levels that could affect data quality. At least three bubbler blanks must be run during calibration and with each analytical batch.

9.4.1.1 To analyze a bubbler blank, place a clean gold trap on the bubbler. Purge and analyze previously purged water using the procedure in Section 11, and determine the amount of Hg remaining in the system.

9.4.1.2 If the bubbler blank is found to contain more than 50 pg Hg, the system is out of control. The problem must be investigated and remedied, and the samples run on that bubbler must be reanalyzed. If the blanks from other bubblers contain less than 50 pg Hg, the data associated with those bubblers remain valid, provided that all other criteria in Section 9 also are met.

9.4.1.3 The mean result for all bubbler blanks (from bubblers passing the specification in Section 9.4.1.2) must be < 25 pg (0.25 ng/L) Hg with a standard deviation (n-1) of <10 pg (0.10 ng/L). If the mean is < 25 pg, the average peak area or height is subtracted from all raw data before results are calculated (Section 12.2).

9.4.1.4 If Hg in the bubbler blank exceeds the acceptance criteria in Section 9.4.1.3, the system is out of control. The problem must be resolved and the system recalibrated. Usually, the bubbler blank is too high for one of the following reasons:

(a) Bubblers need rigorous cleaning;
(b) Soda-lime is contaminated; or
(c) Carrier gas is contaminated.

9.4.2 System blanks— System blanks are analyzed to demonstrate that flow injection systems are free from contamination at levels that could affect data quality. Three system blanks must be run during calibration and with each analytical batch.

9.4.2.1 To analyze a system blank, analyze reagent water containing the same amount of reagents used to prepare the calibration standards.

9.4.2.2 If a system blank is found to contain ≥ 0.50 ng/L Hg, the system is out of control. The problem must be investigated and remedied, and the system recalibrated. If the blanks contain < 0.50 ng/L Hg, the data associated with the blanks remain valid, provided that all other criteria in Section 9 also are met.

9.4.2.3 The mean result for the three system blanks must be <0.5 ng/L Hg with a standard deviation (n-1) <0.1 ng/L. If the mean exceeds these criteria, the system is out of control, and the problem must be resolved and the system recalibrated. If the mean is <0.5 ng/L, the average peak height or area is subtracted from all raw data before results are calculated (Section 12.3).

9.4.3 Reagent blanks—Reagent blanks are used to demonstrate that the reagents used to prepare samples for Hg analyses are free from contamination. The Hg concentration in reagent blanks is determined by analyzing the reagent solutions using either the bubbler or flow-injection system. For the bubbler system, reagent may be added directly to previously purged water in the bubbler.

9.4.3.1 Reagent blanks are required when the batch of reagents (bromine monochloride plus hydroxylamine hydrochloride) are prepared. The amount of Hg in a reagent blank containing 0.5% (v/v) BrCl solution (Section 7.6) and 0.2% (v/v) hydroxylamine hydrochloride solution (Section 7.4) must be < 20 pg (0.2 ng/L).

9.4.3.2 The presence of more than 20 pg (0.2 ng/L) of Hg indicates a problem with the reagent solution. The purging of certain reagent solutions, such as $SnCl_2$ or NH_2OH, with mercury-free nitrogen or argon can reduce Hg to acceptable levels. Because BrCl cannot be purified, a new batch must be prepared and tested if the BrCl is contaminated.

9.4.4 Method blanks— Method blanks are used to demonstrate that the analytical system is free from contamination that could otherwise compromise sample results. Method blanks are prepared and analyzed using sample containers, labware, reagents, and analytical procedures identical to those used to prepare and analyze the samples.

9.4.4.1 A minimum of three method blanks per analytical batch are required for both the bubbler and flow-injection systems.

9.4.4.2 If the result for any method blank containing the nominal amount of reagent used to prepare a sample (Section 11.1.1) is found to contain ≥ 0.50 ng/L (50 pg) Hg, the system is out of control. Mercury in the analytical system must be reduced until a method blank is free from contamination at the 0.50 ng/L level. Samples associated with a contaminated method blank must be reanalyzed.

9.4.4.3 Because method blanks are analyzed using procedures identical to those used to analyze samples, any sample requiring an increased amount of reagent must be accompanied by at least one method blank that includes an identical amount of reagent.

9.4.5 Field blanks–Field blanks are used to demonstrate that samples have not been contaminated by the sample collection and transport activities.

9.4.5.1 Analyze the field blank(s) shipped with each set of samples (samples collected from the same site at the same time, to a maximum of 10 samples). Analyze the blank immediately before analyzing the samples in the batch.

9.4.5.2 If Hg or any potentially interfering substance is found in the field blank at a concentration equal to or greater than the ML (Table 1), or greater than one-fifth the level in the associated sample, whichever is greater, results for associated samples may be the result of contamination and may not be reported or otherwise used for regulatory compliance purposes.

9.4.5.3 Alternatively, if sufficient multiple field blanks (a minimum of three) are collected, and the average concentration (of the multiple field blanks) plus two standard deviations is equal to or greater than the regulatory compliance limit or equal to or greater than one-half of the level in the associated sample, results for associated samples may be the result of contamination and may not be reported or otherwise used for regulatory compliance purposes.

9.4.5.4 If contamination of the field blanks and associated samples is known or suspected, the laboratory should communicate this to the sampling team so that the source of contamination can be identified and corrective measures taken before the next sampling event.

9.4.6 Equipment blanks—Before any sampling equipment is used at a given site, the laboratory or cleaning facility is required to generate equipment blanks on all sampling equipment that will be used to demonstrate that the sampling equipment is free from contamination.

9.4.6.1 Equipment blanks are generated in the laboratory or at the equipment cleaning facility by processing reagent water through the sampling devices using the same procedures that are used in the field (see Sampling Method). Therefore, the "clean hands/dirty hands" technique used during field sampling should be followed when preparing equipment blanks at the laboratory or cleaning facility for low level mercury measurements. If grab samples are to be collected using any ancillary equipment, e.g., an extension pole or a dipper, an equipment blank

is generated by submersing this equipment into the reagent water and analyzing the resulting reagent water collected.

9.4.6.2 The equipment blank must be analyzed using the procedures in this Method. If mercury or any potentially interfering substance is detected in the blank at or above the level specified for the field blank (Section 9.4.5), the source of contamination or interference must be identified, and the problem corrected. The equipment must be demonstrated to be free from mercury and interferences before the equipment may be used in the field.

9.4.7 Bottle blanks— Bottles must be subjected to conditions of use to verify the effectiveness of the cleaning procedures. A representative set of sample bottles (Section 6.1.2) should be filled with reagent water acidified to pH <2 and allowed to stand for a minimum of 24 h. At least 5% of the bottles from a given lot should be tested, and the time that the bottles are allowed to stand should be as close as possible to the actual time that the sample will be in contact with the bottle. After standing, the water must be analyzed for any signs of contamination. If a bottle shows contamination at or above the level specified for the field blank (Section 9.4.5), the problem must be identified, the cleaning procedures corrected or cleaning solutions changed, and all affected bottles re-cleaned.

9.5 Ongoing precision and recovery (OPR)—To demonstrate that the analytical system is within the performance criteria of this Method and that acceptable precision and recovery is being maintained within each analytical batch, the laboratory shall perform the following operations:

9.5.1 Analyze the OPR solution (5 ng/L, Section 7.11) prior to the analysis of each analytical batch according to the procedure beginning in Section 11. An OPR also must be analyzed at the end of an analytical sequence or at the end of each 12-hour shift.

9.5.2 Compare the recovery with the limits for ongoing precision and recovery in Table 2. If the recovery is in the range specified, the analytical system is in control and analysis of samples and blanks may proceed. If, however, the concentration is not in the specified range, the analytical process is not in control. Correct the problem and repeat the ongoing precision and recovery test. All reported results must be associated with an OPR that meets the Table 2 performance criteria at the beginning and end of each batch.

9.5.3 The laboratory should add results that pass the specification in Section 9.5.2 to IPR and previous OPR data and update QC charts to form a graphic representation of continued laboratory performance. The laboratory also should develop a statement of laboratory data quality by calculating the average percent recovery (R_a) and the standard deviation of the percent recovery (s_r). Express the accuracy as a recovery interval from $R_a - 2s_r$ to $R_a + 2s_r$. For example, if $R_a = 95\%$ and $s_r = 5\%$, the accuracy is 85–105%.

9.6 Quality control sample (QCS) – The laboratory must obtain a QCS from a source different from the Hg used to produce the standards used routinely in this Method (Sections 7.7–7.10). The QCS should be analyzed as an independent check of system performance.

9.7 Depending on specific program requirements, the laboratory may be required to analyze field duplicates and field spikes collected to assess the precision and accuracy of the sampling, sample transportation, and storage techniques. The relative percent difference (RPD) between field duplicates should be less than 20%. If the RPD of the field duplicates exceeds 20%, the laboratory should communicate this to the sampling team so that the source of error can be identified and corrective measures taken before the next sampling event.

10.0 Calibration and Standardization

10.1 Calibration and standardization— Separate calibration procedures are provided for a bubbler system (Section 10.2) and flow-injection system (Section 10.3). Both systems are calibrated using standards traceable to NIST Standard Reference Materials. If system performance is verified at the end of an analytical batch using the OPR, analysis of samples and blanks may proceed without recalibration, unless more than 12 hours has elapsed since verification of system performance.

10.2 Bubbler system calibration

10.2.1 Establish the operating conditions necessary to purge Hg from the bubbler and to desorb Hg from the traps in a sharp peak. Further details for operation of the purge-and-trap, desorption, and analysis systems are given in Sections 11.2.1 and 11.2.2.

10.2.2 The calibration must contain a minimum of five non-zero points and the results of analysis of three bubbler blanks. The lowest calibration point must be at the Minimum Level (ML).

NOTE: *The purge efficiency of the bubbler system is 100% and is independent of volume at the volumes used in this Method. Calibration of this system is typically performed using units of mass. For purposes of working in concentration, the volume is assumed to be 100 mL.*

10.2.2.1 Standards are analyzed by the addition of aliquots of Hg working standard A (Section 7.9) and Hg working standard B (Section 7.10) directly into the bubblers. Add 0.50 mL of working standard B and 0.5 mL $SnCl_2$ to the bubbler. Swirl to produce a standard containing 50 pg of Hg (0.5 ng/L). Purge under the optimum operating conditions (Section 10.2.1). Sequentially follow with the addition of aliquots of 0.05, 0.25, 0.50 and 1.0 mL of working standard A to produce standards of 500, 2500, 5000, and 10,000 pg Hg (5.0, 25.0, 50.0 and 100.0 ng/L).

NOTE: *If calibration to the higher levels results in carryover (Section 4.3.8.1), calibrate the system across a narrower range (Section 10.4)*

10.2.2.2 Analyze the standards beginning with the lowest concentration and proceeding to the highest. Tabulate the height or area for each peak.

10.2.2.3 Prepare and analyze a minimum of 3 bubbler blanks. If multiple bubblers are used, there must be 1 bubbler blank per bubbler (to a maximum of 4 bubblers). Calculate the mean peak area or height for the bubbler blanks.

10.2.2.4 For each calibration point, subtract the mean peak height or area of the bubbler blanks from the peak height or area for each standard. Calculate the calibration factor (CF_x) for Hg in each of the five standards using the mean bubbler-blank-subtracted peak height or area and the following equation:

$$CF_x = \frac{(A_x) - (\overline{A}_{BB})}{(C_x)}$$

Where:

A_x = *peak height or area for Hg in standard*

$\overline{A}_{BB}$ = *mean peak height or area for Hg in bubbler blank*

C_x = *mass in standard analyzed (ng)*

10.2.2.5 Calculate the mean calibration factor (CF_m), the standard deviation of the calibration factor (SD; n-1), and the relative standard deviation (RSD) of the calibration factor, where RSD = 100 x SD/CF_m.

10.2.2.6 If RSD ≤ 15%, calculate the recovery for the lowest standard using CF_m. If the RSD ≤ 15% and the recovery of the lowest standard is in the range of 75-125%, the calibration is acceptable and CF_m may be used to calculate the concentration of Hg in samples. If RSD > 15% or if the recovery of the lowest standard is not in the range of 75-125%, recalibrate the analytical system and repeat the test.

10.2.2.7 Calculate the concentration of Hg in the bubbler blanks (Section 10.2.2.1) using CF_m. The bubbler blanks must meet the criteria in Section 9.4.1; otherwise, mercury in the system must be reduced and the calibration repeated until the bubbler blanks meet the criteria.

10.3 Flow-injection system calibration

10.3.1 Establish the operating conditions necessary to purge Hg from the gas-liquid separator and dryer tube and desorb Hg from the traps in a sharp peak. Further details for operating the analytical system are given in Section 11.2.1.

10.3.2 The calibration must contain a minimum of 5 non-zero points and the results of analysis of 3 system blanks. The lowest calibration point must be at the minimum level (ML).

10.3.2.1 Place 25-30 mL of reagent water and 250 µL of concentrated BrCl solution (Section 7.6) in each of 5 calibrated 50-mL autosampler vials. Prepare the 0.5 ng/L calibration standard by adding 250 µL of working standard B (Section 7.10) to the vial. Dilute to the mark with reagent water. Sequentially follow with the addition of aliquots of 25, 125, 250 and 500 µL of working standard A (Section 7.9) to produce standards of 5.0, 25.0, 50.0 and 100.0 ng/L, respectively. Cap the vials and invert once to mix.

10.3.2.2 Immediately prior to analysis, remove the caps and add 125 µL of NH_2OH solution (Section 7.4). Re-cap, invert once to mix, and allow to stand until the yellow color disappears. Remove all caps and place vials into the analysis rack.

10.3.2.3 Analyze the standards beginning with the lowest concentration and proceeding to the highest. Tabulate the height or area for the Hg peak.

10.3.2.4 Prepare and analyze a minimum of 3 system blanks and tabulate the peak heights or areas. Calculate the mean peak area or height for the system blanks.

10.3.2.5 For each calibration point, subtract the mean peak height or area of the system blanks (Section 9.4.2) from the peak height or area for each standard. Calculate

the calibration factor (CF_x) for Hg in each of the five standards using the mean reagent-blank-subtracted peak height or area and the following equation:

$$CF_x = \frac{(A_x) - (\overline{A}_{SB})}{(C_x)}$$

Where:

A_x = *peak height or area for Hg in standard*

$\overline{A}_{SB}$ = *mean peak height or area for Hg in calibration blanks*

C_x = *concentration of standard analyzed (ng/L)*

10.3.2.6 Calculate the mean calibration factor (CF_m), the standard deviation of the calibration factor (SD; n-1), and the relative standard deviation (RSD) of the calibration factor, where RSD = 100 x SD/CF_m.

10.3.2.7 If RSD ≤ 15%, calculate the recovery for the lowest standard (0.5 ng/L) using CF_m. If the RSD ≤ 15% and the recovery of the lowest standard is in the range of 75-125%, the calibration is acceptable and CF_m may be used to calculate the concentration of Hg in samples, blanks, and OPRs. If RSD > 15% or if the recovery of the lowest standard is not in the range of 75-125%, recalibrate the analytical system and repeat the test.

10.3.2.8 Calculate the concentration of Hg in the system blanks (Section 9.4.2) using CF_m. The system blanks must meet the criteria in Section 9.4.2; otherwise, mercury in the system must be reduced and the calibration repeated until the system blanks meet the criteria.

10.4 Calibration to a range other than 0.5 to 100 ng/L—This Method may be calibrated to a range other than 0.5 to 100 ng/L, provided that the following requirements are met:

(a) There must be a minimum of five non-zero calibration points.
(b) The difference between successive calibration points must be no greater than a factor of 10 and no less than a factor of 2 and should be approximately evenly spaced on a logarithmic scale over the calibration range.
(c) The relative standard deviation (RSD) of the calibration factors for all calibration points must be less than 15%.
(d) The calibration factor for any calibration point at a concentration greater than 100 ng/L must be within ±15% of the average calibration factor for the points at or below 100 ng/L.
(e) The calibration factor for any point <0.5 ng/L must be within 25% of the average calibration factor for all points.
(f) If calibration is to a higher range and this Method is used for regulatory compliance, the ML must be less than one-third the regulatory compliance limit

11.0 Procedure

NOTE: *The following procedures for analysis of samples are provided as guidelines. Laboratories may find it necessary to optimize the procedures, such as drying time or potential applied to the Nichrome wires, for the laboratory's specific instrument set-up.*

11.1 Sample Preparation

11.1.1 Pour a 100-mL aliquot from a thoroughly shaken, acidified sample, into a 125-mL fluoropolymer bottle. If BrCl was not added as a preservative (Section 8.5), add the amount of BrCl solution (Section 7.6) given below, cap the bottle, and digest at room temperature for a 12 h minimum.

11.1.1.1 For clear water and filtered samples, add 0.5 mL of BrCl; for brown water and turbid samples, add 1.0 mL of BrCl. If the yellow color disappears because of consumption by organic matter or sulfides, more BrCl should be added until a permanent (12-h) yellow color is obtained.

11.1.1.2 Some highly organic matrices, such as sewage effluent, will require high levels of BrCl (e.g., 5 mL/100 mL of sample) and longer oxidation times, or elevated temperatures (e.g., place sealed bottles in oven at 50 °C for 6 h). The oxidation must be continued until it is complete. Complete oxidation can be determined by either observation of a permanent yellow color remaining in the sample or the use of starch iodide indicating paper to test for residual free oxidizer. The sample also may be diluted to reduce the amount of BrCl required, provided that the resulting level of mercury is sufficient for reliable determination.

11.1.2 Matrix spikes and matrix spike duplicates—For every 10 or fewer samples, pour 2 additional 100-mL aliquots from a selected sample (see Section 9.3), spike at the level specified in Section 9.3, and process in the same manner as the samples. There must be a minimum of 2 MS/MSD pairs for each analytical batch of 20 samples.

11.2 Hg reduction and purging—Separate procedures are provided for the bubbler system (Section 11.2.1) and flow-injection (Section 11.2.2).

11.2.1 Hg reduction and purging for the bubbler system

11.2.1.1 Add 0.2-0.25 mL of NH_2OH solution to the BrCl-oxidized sample in the 125-mL sample bottle. Cap the bottle and swirl the sample. The yellow color will disappear, indicating the destruction of the BrCl. Allow the sample to react for 5 min with periodic swirling to be sure that no traces of halogens remain.

NOTE: *Purging of free halogens onto the gold trap will result in damage to the trap and low or irreproducible results.*

11.2.1.2 Connect a fresh trap to the bubbler, pour the reduced sample into the bubbler, add 0.5 mL of $SnCl_2$ solution, and purge the sample onto a gold trap with N_2 at 350 ± 50 mL/min for 20 min.

11.2.1.3 When analyzing Hg samples, the recovery is quantitative, and organic interferents are destroyed. Thus, standards, bubbler blanks, and small amounts of high-level samples may be run directly in previously purged water. After very high samples (Section 4.3.8.1), a small degree of carryover (<0.01%) may occur. Bubblers that contain such samples must be demonstrated to be clean prior to proceeding with low level samples. Samples run immediately following a sample that has been determined to result in carryover must be reanalyzed using a bubbler that is demonstrated to be clean as per Section 4.3.8.1.

11.2.2 Hg reduction and purging for the flow-injection system

11.2.2.1 Add 0.2-0.25 mL of NH_2OH solution (Section 7.4) to the BrCl-oxidized sample in the 125-mL sample bottle or in the autosampler tube (the amount of NH_2OH required will be approximately 30 percent of the BrCl volume). Cap the bottle and swirl the sample. The yellow color will disappear, indicating the destruction of the BrCl. Allow the sample to react for 5 minutes with periodic swirling to be sure that no traces of halogens remain.

NOTE: *Purging of free halogens onto the gold trap will result in damage to the trap and low or irreproducible results.*

11.2.2.2 Pour the sample solution into an autosampler vial and place the vial in the rack.

11.2.2.3 Carryover may occur after analysis of a sample containing a high level of mercury. Samples run immediately following a sample that has been determined to result in carryover (Section 4.3.8.1) must be reanalyzed using a system demonstrated to be clean as per Section 4.3.8.1.

11.3 Desorption of Hg from the gold trap

11.3.1 Remove the sample trap from the bubbler, place the Nichrome wire coil around the trap and connect the trap into the analyzer train between the incoming Hg-free argon and the second gold-coated (analytical) sand trap (Figure 2).

11.3.2 Pass argon through the sample and analytical traps at a flow rate of approximately 30 mL/min for approximately 2 min to drive off condensed water vapor.

11.3.3 Apply power to the coil around the sample trap for 3 minutes to thermally desorb the Hg (as Hg(0)) from the sample trap onto the analytical trap.

11.3.4 After the 3-min desorption time, turn off the power to the Nichrome coil, and cool the sample trap using the cooling fan.

11.3.5 Turn on the chart recorder or other data acquisition device to start data collection, and apply power to the Nichrome wire coil around the analytical trap. Heat the analytical trap for 3 min (1 min beyond the point at which the peak returns to baseline).

11.3.6 Stop data collection, turn off the power to the Nichrome coil, and cool the analytical trap to room temperature using the cooling fan.

11.3.7 Place the next sample trap in line and proceed with analysis of the next sample.

NOTE: *Do not heat a sample trap while the analytical trap is still warm; otherwise, the analyte may be lost by passing through the analytical trap.*

11.4 Peaks generated using this technique should be very sharp and almost symmetrical. Mercury elutes at approximately 1 minute and has a width at half-height of about 5 seconds.

11.4.1 Broad or asymmetrical peaks indicate a problem with the desorption train, such as improper gas flow rate, water vapor on the trap(s), or an analytical trap damaged by chemical fumes or overheating.

11.4.2 Damage to an analytical trap is also indicated by a sharp peak, followed by a small, broad peak.

11.4.3 If the analytical trap has been damaged, the trap and the fluoropolymer tubing downstream from it should be discarded because of the possibility of gold migration onto downstream surfaces.

11.4.4 Gold-coated sand traps should be tracked by unique identifiers so that any trap producing poor results can be quickly recognized and discarded.

12.0 Data Analysis and Calculations

12.1 Separate procedures are provided for calculation of sample results using the bubbler system (Section 12.2) and the flow-injection system (Section 12.3), and for method blanks (Section 12.4).

12.2 Calculations for the bubbler system

12.2.1 Calculate the mean peak height or area for Hg in the bubbler blanks measured during system calibration or with the analytical batch (A_{BB}; n = 3 minimum).

12.2.2 Calculate the concentration of Hg in ng/L (parts-per-trillion; ppt) in each sample according to the following equation:

$$[Hg]\ (ng/L) = \frac{A_s - \overline{A}_{BB}}{CF_m \times V}$$

where:
A_s = *peak height (or area) for Hg in sample*
$\overline{A}_{BB}$ = *peak height (or area) for Hg in bubbler blank*
CF_m = *mean calibration factor (Section* 10.2.2.5)
V = *Volume of sample (L)*

12.3 Calculations for the flow-injection system

12.3.1 Calculate the mean peak height or area for Hg in the system blanks measured during system calibration or with each analytical batch (A_{SB}; n = 3)

12.3.2 Calculate the concentration of Hg in ng/L in each sample according to the following equation:

$$[Hg]\ (ng/L) = \frac{(A_s - \overline{A}_{SB})}{CF_m} \times \frac{V_{std}}{V_{sample}}$$

where:
A_s = *peak height (or area) for Hg in sample*
$\overline{A}_{SB}$ = *mean peak height (or area) for Hg in system blanks*
CF_m = *mean calibration factor (Section* 10.3.2.6)
V_{std} = *volume (mL) used for standards – volume (mL) reagent used in standards*
V_{sample} = *volume (mL) of sample – volume (mL) reagent used in sample*

12.4 Calculations for concentration of Hg in method blanks, field blanks, and reagent blanks.

12.4.1 Calculate the concentration of Hg in the method blanks (C_{MB}), field blanks (C_{FB}), or reagent blanks (C_{RB}) in ng/L, using the equation in Section 12.2.2 (if bubbler system is used) or Section 12.3.2 (if flow injection system is used) and substituting the peak height or area resulting from the method blank, field blank, or reagent blank for A_s.

12.4.2 Determine the mean concentration of Hg in the method blanks associated with the analytical batch (a minimum of three). If a sample requires additional reagent(s) (e.g., BrCl), a corresponding method blank containing an identical amount of reagent must be analyzed (Section 9.4.4.3). The concentration of Hg in the corresponding method blank may be subtracted from the concentration of Hg in the sample per Section 12.5.2.

12.5 Reporting

12.5.1 Report results for Hg at or above the ML, in ng/L, to three significant figures. Report results for Hg in samples below the ML as <0.5 ng/L, or as required by the regulatory authority or in the permit. Report results for Hg in reagent blanks and field blanks at or above the ML, in ng/L, to three significant figures. Report results for Hg in reagent blanks, method blanks, or field blanks below the ML but at or above the MDL to two significant figures. Report results for Hg not detected in reagent blanks, method blanks, or field blanks as <0.2 ng/L, or as required by the regulatory authority or in the permit.

12.5.2 Report results for Hg in samples, method blanks and field blanks separately. In addition to reporting results for the samples and blank(s) separately, the concentration of Hg in the method blanks or field blanks associated with the sample may be subtracted from the results for that sample, or must be subtracted if requested or required by a regulatory authority or in a permit.

12.5.3 Results from tests performed with an analytical system that is not in control must not be reported or otherwise used for permitting or regulatory compliance purposes, but do not relieve a discharger or permittee of reporting timely results.

13.0 Method Performance

13.1 This Method was tested in 12 laboratories using reagent water, freshwater, marine water and effluent (Reference 16.19). The quality control acceptance criteria listed in Table 2 were verified by data gathered in the interlaboratory study, and the method detection limit (MDL) given in Section 1.5 was verified in all 12 laboratories. In addition, the techniques in this Method have been compared with other techniques for low-level mercury determination in water in a variety of studies, including ICES-5 (Reference 16.20) and the International Mercury Speciation Intercomparison Exercise (Reference 16.21).

13.2 Precision and recovery data for reagent water, freshwater, marine water, and secondary effluent are given in Table 3.

14.0 Pollution Prevention

14.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Many opportunities for pollution prevention exist in laboratory operation. EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address waste generation. When it is not feasible to reduce wastes at the source, the Agency recommends recycling as the next best option. The acids used in this Method should be reused as practicable by purifying by electrochemical techniques. The only other chemicals used in this Method are the neat materials used in preparing standards. These standards are used in extremely small amounts and pose little threat to the environment when managed properly. Standards should be prepared in volumes consistent with laboratory use to minimize the disposal of excess volumes of expired standards.

14.2 For information about pollution prevention that may be applied to laboratories and research institutions, consult *Less is Better: Laboratory Chemical Management for Waste Reduction*, available from the American Chemical Society's Department of Governmental Relations and Science Policy, 1155 16th Street NW, Washington DC 20036, 202/872–4477.

15.0 Waste Management

15.1 The laboratory is responsible for complying with all Federal, State, and local regulations governing waste management, particularly hazardous waste identification rules and land disposal restrictions, and for protecting the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Compliance with all sewage discharge permits and regulations is also required. An overview of requirements can be found in *Environmental Management Guide for Small Laboratories* (EPA 233-B-98-001).

15.2 Acids, samples at pH <2, and BrCl solutions must be neutralized before being disposed of, or must be handled as hazardous waste.

15.3 For further information on waste management, consult *The Waste Management Manual for Laboratory Personnel* and *Less is Better: Laboratory Chemical Management for Waste Reduction*, both available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street NW, Washington, DC 20036.

16.0 References

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17.0 Glossary

The definitions and purposes below are specific to this Method, but have been conformed to common usage as much as possible.

17.1 **Ambient Water**—Waters in the natural environment (e.g., rivers, lakes, streams, and other receiving waters), as opposed to effluent discharges.

17.2 **Analytical Batch**—A batch of up to 20 samples that are oxidized with the same batch of reagents and analyzed during the same 12-hour shift. Each analytical batch must also include at least three bubbler blanks, an OPR, and a QCS. In addition, MS/MSD samples must be prepared at a frequency of 10% per analytical batch (one MS/MSD for every 10 samples).

17.3 **Bottle Blank**—The bottle blank is used to demonstrate that the bottle is free from contamination prior to use. Reagent water known to be free of mercury at the MDL of this Method is added to a bottle, acidified to pH <2 with BrCl or HCl, and allowed to stand for a minimum of 24 hours. The time that the bottle is allowed to stand should be as close as possible to the actual time that the sample will be in contact with the bottle. After standing, the water is analyzed.

17.4 **Bubbler Blank**—For this Method, the bubbler blank is specific to the bubbler system and is used to determine that the analytical system is free from contamination. After analysis of a standard, blank, or sample, the solution in the bubbler is purged and analyzed. A minimum of three bubbler blanks is required for system calibration.

17.5 **Equipment Blank**—Reagent water that has been processed through the sampling device at a laboratory or other equipment cleaning facility prior to shipment of the sampling equipment to the sampling site. The equipment blank is used to demonstrate that the sampling equipment is free from contamination prior to use. Where appropriate, the "clean hands/dirty hands" technique used during field sampling should be followed when preparing equipment blanks at the laboratory or cleaning facility.

17.6 **Field Blank**—Reagent water that has been transported to the sampling site and exposed to the same equipment and operations as a sample at the sampling site. The field blank is used to demonstrate that the sample has not been contaminated by the sampling and sample transport systems.

17.7 **Intercomparison Study**—An exercise in which samples are prepared and split by a reference laboratory, then analyzed by one or more testing laboratories and the reference laboratory. The intercomparison, with a reputable laboratory as the reference laboratory, serves as the best test of the precision and accuracy of the analyses at natural environmental levels.

17.8 **Matrix Spike (MS) and Matrix Spike Duplicate (MSD)**—Aliquots of an environmental sample to which known quantities of the analyte(s) of interest is added in the laboratory. The MS and MSD are analyzed exactly like a sample. Their purpose is to quantify the bias and precision caused by the sample matrix. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the MS and MSD corrected for these background concentrations.

17.9 **May**—This action, activity, or procedural step is allowed but not required.

17.10 **May not**—This action, activity, or procedural step is prohibited.

17.11 **Method blank**— Method blanks are used to determine the concentration of mercury in the analytical system during sample preparation and analysis, and consist of a volume of reagent water that is carried through the entire sample preparation and analysis. Method blanks are prepared by placing reagent water in a sample bottle and analyzing the water using reagents and procedures identical to those used to prepare and analyze the corresponding samples. A minimum of three method blanks is required with each analytical batch.

17.12 **Minimum Level (ML)**—The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed. The ML is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer (See Section 1.5).

17.13 **Must**—This action, activity, or procedural step is required.

17.14 **Quality Control Sample (QCS)**—A sample containing Hg at known concentrations. The QCS is obtained from a source external to the laboratory, or is prepared from a source of standards different from the source of calibration standards. It is used as an independent check of instrument calibration.

17.15 **Reagent blank**—Reagent blanks are used to determine the concentration of mercury in the reagents (BrCl, $NH_2OH{\cdot}HCl$, and $SnCl_2$) that are used to prepare and analyze the samples. In this Method, reagent blanks are required when each new batch of reagents is prepared.

17.16 **Reagent Water**—Water demonstrated to be free of mercury at the MDL of this Method. It is prepared from 18 MΩ ultrapure deionized water starting from a prepurified source. Reagent water is used to wash bottles, as trip and field blanks, and in the preparation of standards and reagents.

17.17 **Regulatory Compliance Limit**—A limit on the concentration or amount of a pollutant or contaminant specified in a nationwide standard, in a permit, or otherwise established by a regulatory authority.

17.18 **Shall**—This action, activity, or procedure is required.

17.19 **Should**—This action, activity, or procedure is suggested, but not required.

17.20 **Stock Solution**— A solution containing an analyte that is prepared from a reference material traceable to NIST, or a source that will attest to the purity and authenticity of the reference material.

17.21 **System Blank**— For this Method, the system blank is specific for the flow-injection system and is used to determine contamination in the analytical system and in the reagents used to prepare the calibration standards. A minimum of three system blanks is required during system calibration.

17.22 **Ultraclean Handling**— A series of established procedures designed to ensure that samples are not contaminated during sample collection, storage, or analysis.

18.0 Tables and Figures

Table 1

Lowest Ambient Water Quality Criterion for Mercury and the Method Detection Limit and Minimum Level of Quantitation for EPA Method 1631

Metal	Lowest Ambient Water Quality Criterion[1]	Method Detection Limit (MDL) and Minimum Level (ML)	
		MDL[2]	ML[3]
Mercury (Hg)	1.3 ng/L	0.2 ng/L	0.5 ng/L

1. Lowest water quality criterion for the Great Lakes System (Table 4, 40 CFR 132.6). The lowest Nationwide criterion is 12 ng/L (40 CFR 131.36).
2. Method detection limit (40 CFR 136, Appendix B)
3. Minimum level of quantitation (see Glossary)

Table 2

Quality Control Acceptance Criteria for Performance Tests in EPA Method 1631

Acceptance Criteria	Section	Limit (%)
Initial Precision and Recovery (IPR)	9.2.2	
Precision (RSD)	9.2.2.3	21
Recovery (X)	9.2.2.3	79-121
Ongoing Precision and Recovery (OPR)	9.5.2	77-123
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	9.3	
Recovery	9.3.4	71-125
Relative Percent Difference (RPD)	9.3.5	24

Table 3

Precision and Recovery for Reagent Water, Fresh Water, Marine Water, and Effluent Water Using Method 1631

Matrix	*Mean Recovery (%)	*Precision (% RSD)
Reagent Water	98.0	5.6
Fresh Water (Filtered)	90.4	8.3
Marine Water (Filtered)	92.3	4.7
Marine Water (Unfiltered)	88.9	5.0
Secondary Effluent (Filtered)	90.7	3.0
Secondary Effluent (Unfiltered)	92.8	4.5

*Mean percent recoveries and RSDs are based on expected Hg concentrations.

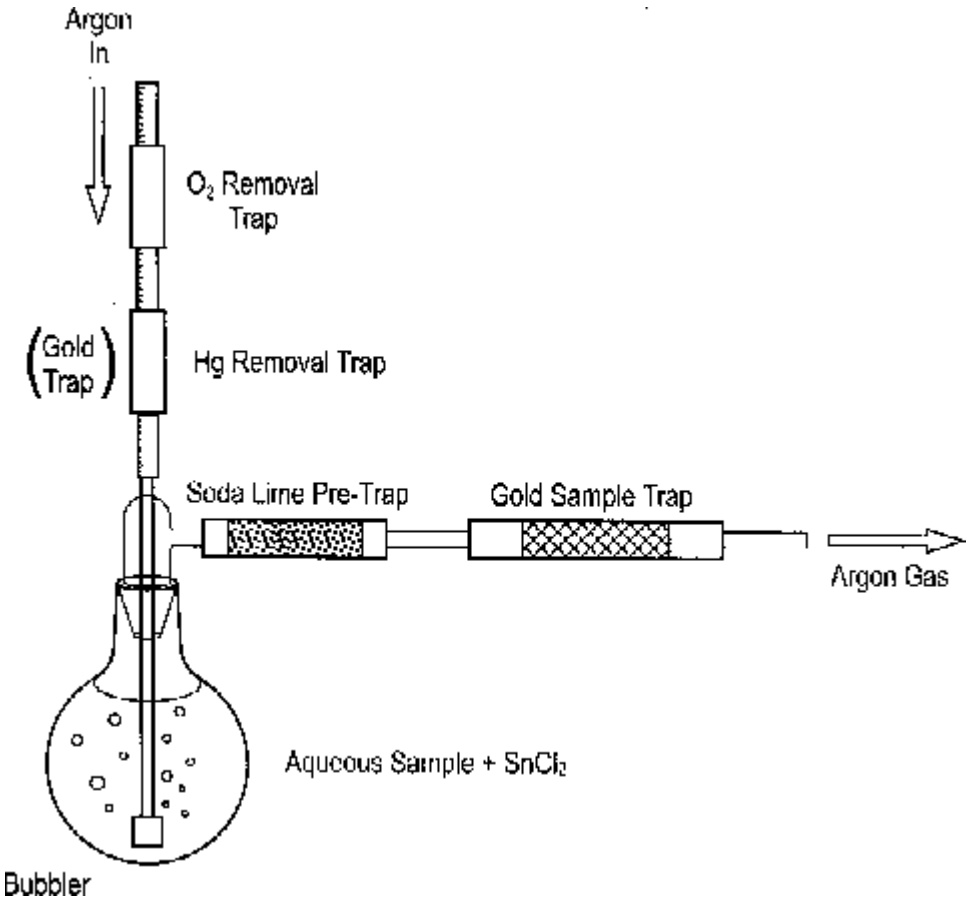


Figure 1. Schematic Diagram of Bubbler Setup

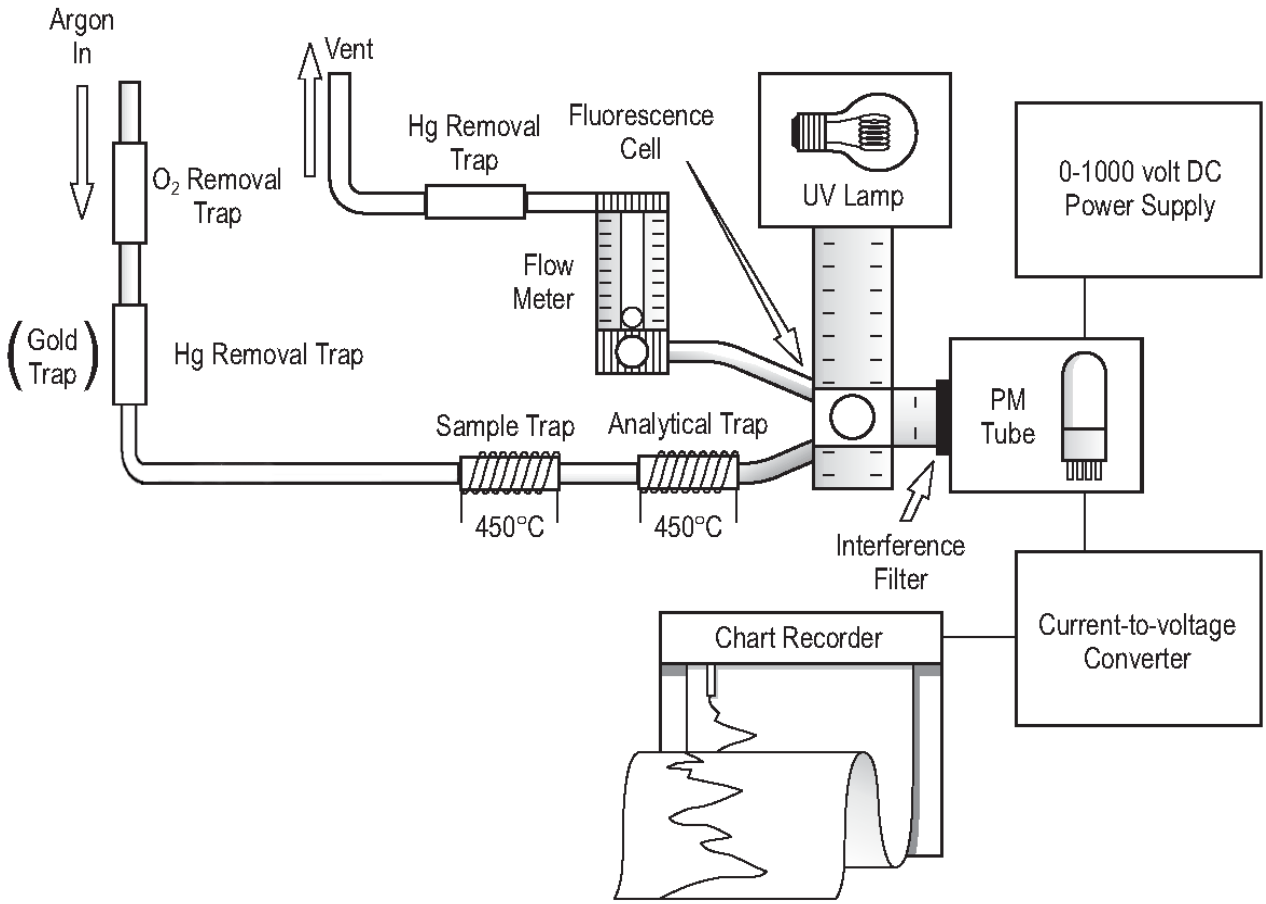


Figure 2. Schematic Diagram of the Bubbler, Purge and Trap, Cold Vapor Atomic Fluorescence Spectrometer (CVAFS) System

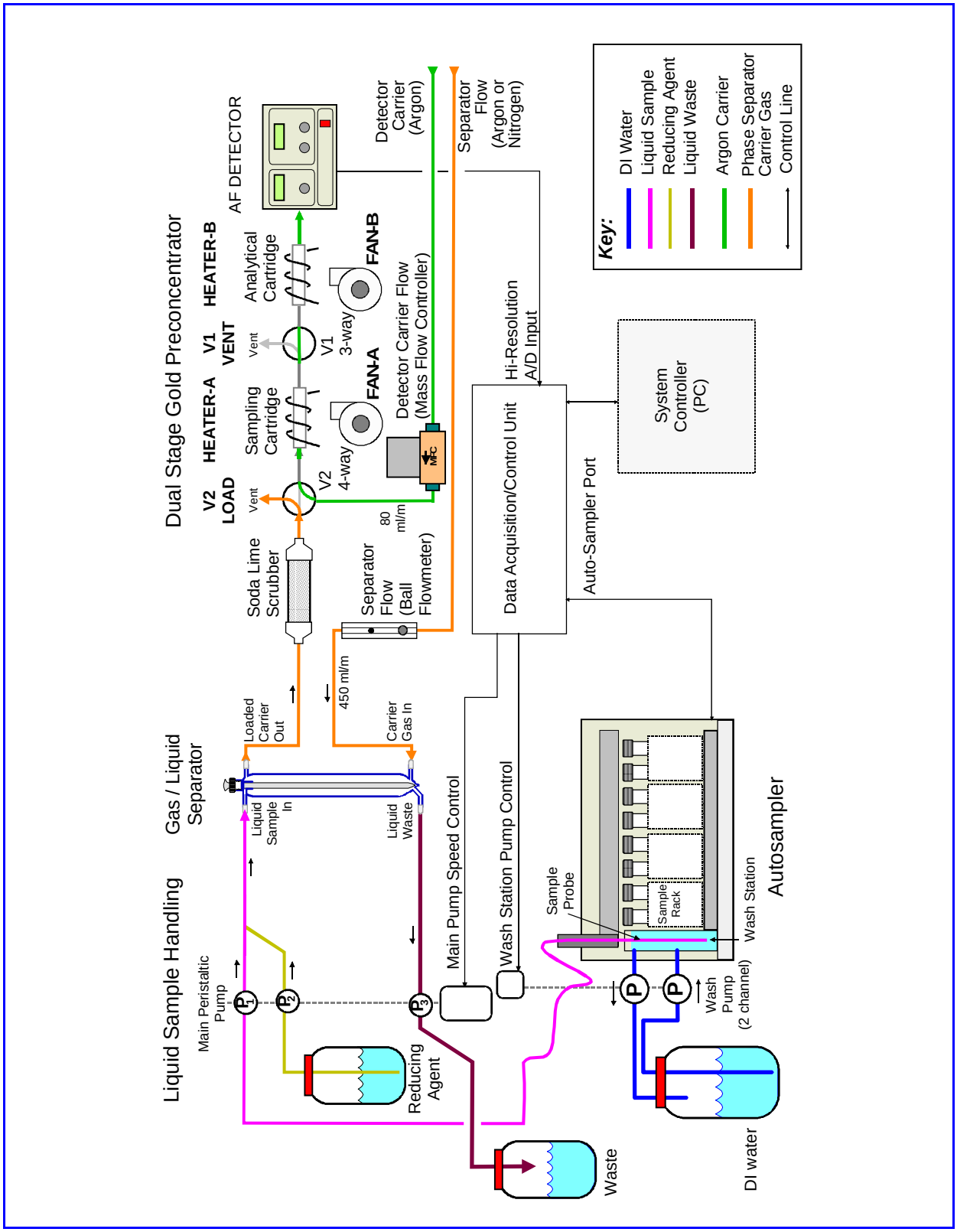


Figure 3. Schematic Diagram of the Flow-Injection, Cold Vapor Atomic Fluorescence Spectrometer (CVAFS) System

Appendix F

Raw Benthic Data

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from EREF, Little Traverse Bay, MI -- June 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naididae	12	3.66	16	18.39	--	--	28	5.61	17	18.48	24	20.00	14	17.07	55	18.71
Hyalella azteca	1	0.30	--	--	--	--	1	0.20	--	--	--	--	--	--	--	--
Gammarus	2	0.61	--	--	--	--	2	0.40	--	--	--	--	--	--	--	--
Acerpenna pygmaea	--	--	1	1.15	--	--	1	0.20	--	--	--	--	--	--	--	--
Pagastia	--	--	--	--	--	--	--	--	--	--	1	0.83	--	--	1	0.34
Corynoneura lobata	--	--	2	2.30	--	--	2	0.40	2	2.17	1	0.83	--	--	3	1.02
Thienemanniella xena	3	0.91	--	--	--	--	3	0.60	1	1.09	1	0.83	1	1.22	3	1.02
Cricotopus tremulus grp.	119	36.28	21	24.14	26	30.95	166	33.27	20	21.74	15	12.50	13	15.85	48	16.33
Cricotopus bicinctus grp.	56	17.07	11	12.64	12	14.29	79	15.83	24	26.09	28	23.33	25	30.49	77	26.19
Orthocladius	6	1.83	4	4.60	4	4.76	14	2.81	4	4.35	--	--	1	1.22	5	1.70
Psectrocladius	--	--	1	1.15	--	--	1	0.20	--	--	--	--	--	--	--	--
Dicrotendipes fumidus	--	--	6	6.90	3	3.57	9	1.80	5	5.43	17	14.17	8	9.76	30	10.20
Microtendipes	--	--	--	--	1	1.19	1	0.20	--	--	1	0.83	1	1.22	2	0.68
Polypedilum flavum	--	--	--	--	1	1.19	1	0.20	--	--	--	--	--	--	--	--
Paratanytarsus	49	14.94	9	10.34	9	10.71	67	13.43	6	6.52	3	2.50	9	10.98	18	6.12
Rheotanytarsus	80	24.39	16	18.39	28	33.33	124	24.85	13	14.13	29	24.17	10	12.20	52	17.69
TOTAL (Number/Sample)	328	100.00	87	100.00	84	100.00	499	100.00	92	100.00	120	100.00	82	100.00	294	100.00
Total Taxa Richness	9		10		8		15		9		10		9		11	
EPT Taxa Richness	0		1		0		1		0		0		0		0	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from EREF, Little Traverse Bay, MI -- October 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naididae	119	56.13	47	73.44	48	64.00	214	60.97	49	45.37	77	59.23	24	58.54	150	53.76
Caecidotea	5	2.36	--	--	--	--	5	1.42	1	0.93	--	--	--	--	1	0.36
Hyalella azteca	1	0.47	--	--	1	1.33	2	0.57	--	--	2	1.54	--	--	2	0.72
Gammarus	2	0.94	2	3.13	3	4.00	7	1.99	1	0.93	2	1.54	--	--	3	1.08
Hydracarina	--	--	1	1.56	--	--	1	0.28	--	--	--	--	--	--	--	--
Baetis flavistriga	1	0.47	--	--	--	--	1	0.28	--	--	--	--	--	--	--	--
Heptageniidae	--	--	--	--	--	--	--	--	--	--	1	0.77	--	--	1	0.36
Leucrocuta	1	0.47	--	--	--	--	1	0.28	--	--	--	--	--	--	--	--
Stenonema femoratum	--	--	--	--	--	--	--	--	1	0.93	--	--	--	--	1	0.36
Caenis	11	5.19	2	3.13	1	1.33	14	3.99	14	12.96	5	3.85	--	--	19	6.81
Ceratopsyche morosa grp.	1	0.47	2	3.13	--	--	3	0.85	5	4.63	2	1.54	2	4.88	9	3.23
Ceratopsyche morosa	--	--	--	--	5	6.67	5	1.42	--	--	--	--	--	--	--	--
Ceratopogonidae	--	--	--	--	--	--	--	--	1	0.93	--	--	--	--	1	0.36
Thienemannimyia grp.	1	0.47	--	--	--	--	1	0.28	1	0.93	1	0.77	1	2.44	3	1.08
Cricotopus tremulus grp.	13	6.13	1	1.56	3	4.00	17	4.84	--	--	7	5.38	3	7.32	10	3.58
Cricotopus bicinctus grp.	21	9.91	4	6.25	7	9.33	32	9.12	--	--	3	2.31	3	7.32	6	2.15
Eukiefferiella devonica grp.	1	0.47	--	--	--	--	1	0.28	--	--	--	--	--	--	--	--
Orthocladius	9	4.25	--	--	3	4.00	12	3.42	6	5.56	6	4.62	--	--	12	4.30
Dicrotendipes fumidus	2	0.94	1	1.56	1	1.33	4	1.14	3	2.78	3	2.31	1	2.44	7	2.51
Microtendipes	8	3.77	--	--	--	--	8	2.28	5	4.63	8	6.15	1	2.44	14	5.02
Polypedilum flavum	2	0.94	--	--	--	--	2	0.57	1	0.93	--	--	--	--	1	0.36
Paratanytarsus	8	3.77	1	1.56	1	1.33	10	2.85	10	9.26	9	6.92	3	7.32	22	7.89
Rheotanytarsus	6	2.83	1	1.56	1	1.33	8	2.28	9	8.33	4	3.08	3	7.32	16	5.73
Antocha	--	--	2	3.13	--	--	2	0.57	--	--	--	--	--	--	--	--
Hemerodromia	--	--	--	--	1	1.33	1	0.28	--	--	--	--	--	--	--	--
Dreissena rostriformis	--	--	--	--	--	--	--	--	1	0.93	--	--	--	--	1	0.36
TOTAL (Number/Sample)	212	100.00	64	100.00	75	100.00	351	100.00	108	100.00	130	100.00	41	100.00	279	100.00
Total Taxa Richness	18		11		12		22		15		14		9		18	
EPT Taxa Richness	4		2		2		5		3		3		1		3	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from ECKD, Little Traverse Bay, MI -- June 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naididae	10	6.80	6	19.35	3	6.67	19	8.52	7	15.91	5	8.93	2	7.69	14	11.11
Hyalella azteca	1	0.68	--	--	2	4.44	3	1.35	--	--	--	--	2	7.69	2	1.59
Hydracarina	--	--	--	--	1	2.22	1	0.45	--	--	--	--	--	--	--	--
Baetis flavistriga	--	--	--	--	1	2.22	1	0.45	--	--	1	1.79	--	--	1	0.79
Hydropsychidae	2	1.36	--	--	2	4.44	4	1.79	--	--	--	--	--	--	--	--
Hydropsyche	--	--	1	3.23	--	--	1	0.45	--	--	--	--	--	--	--	--
Thienemannimyia grp.	4	2.72	--	--	--	--	4	1.79	--	--	1	1.79	--	--	1	0.79
Corynoneura lobata	4	2.72	--	--	--	--	4	1.79	--	--	--	--	--	--	--	--
Cricotopus tremulus grp.	16	10.88	4	12.90	4	8.89	24	10.76	5	11.36	3	5.36	--	--	8	6.35
Cricotopus bicinctus grp.	88	59.86	11	35.48	22	48.89	121	54.26	15	34.09	29	51.79	7	26.92	51	40.48
Orthocladius	3	2.04	--	--	--	--	3	1.35	5	11.36	--	--	2	7.69	7	5.56
Nanocladius spiniplenus	--	--	--	--	--	--	--	--	--	--	--	--	1	3.85	1	0.79
Dicrotendipes fumidus	8	5.44	8	25.81	9	20.00	25	11.21	12	27.27	15	26.79	12	46.15	39	30.95
Microtendipes	1	0.68	--	--	--	--	1	0.45	--	--	--	--	--	--	--	--
Paratanytarsus	3	2.04	--	--	--	--	3	1.35	--	--	--	--	--	--	--	--
Rheotanytarsus	7	4.76	1	3.23	1	2.22	9	4.04	--	--	2	3.57	--	--	2	1.59
TOTAL (Number/Sample)	147	100.00	31	100.00	45	100.00	223	100.00	44	100.00	56	100.00	26	100.00	126	100.00
Total Taxa Richness	12		6		9		14		5		7		6		10	
EPT Taxa Richness	1		1		2		2		0		1		0		1	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from ECKD, Little Traverse Bay, MI -- October 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		8				2		4		8			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naididae	38	43.68	23	32.39	9	31.03	70	37.43	63	55.75	16	44.44	87	58.39	166	55.70
Caecidotea	--	--	--	--	--	--	--	--	--	--	1	2.78	--	--	1	0.34
Gammarus	--	--	--	--	1	3.45	1	0.53	--	--	--	--	--	--	--	--
Maccaffertium vicarium	--	--	--	--	--	--	--	--	--	--	--	--	1	0.67	1	0.34
Caenis	--	--	--	--	1	3.45	1	0.53	1	0.88	--	--	2	1.34	3	1.01
Hydropsychidae	8	9.20	3	4.23	--	--	11	5.88	4	3.54	2	5.56	7	4.70	13	4.36
Cheumatopsyche	1	1.15	1	1.41	--	--	2	1.07	6	5.31	--	--	1	0.67	7	2.35
Ceratopsyche morosa grp.	4	4.60	4	5.63	4	13.79	12	6.42	7	6.19	--	--	9	6.04	16	5.37
Ceratopsyche morosa	2	2.30	4	5.63	2	6.90	8	4.28	1	0.88	--	--	3	2.01	4	1.34
Thienemannimyia grp.	--	--	--	--	1	3.45	1	0.53	1	0.88	--	--	--	--	1	0.34
Thienemanniella xena	--	--	1	1.41	--	--	1	0.53	--	--	--	--	--	--	--	--
Cricotopus tremulus grp.	7	8.05	9	12.68	5	17.24	21	11.23	14	12.39	9	25.00	14	9.40	37	12.42
Cricotopus bicinctus grp.	--	--	5	7.04	--	--	5	2.67	2	1.77	--	--	1	0.67	3	1.01
Eukiefferiella devonica grp.	--	--	--	--	--	--	--	--	--	--	--	--	3	2.01	3	1.01
Eukiefferiella gracei grp.	--	--	--	--	--	--	--	--	1	0.88	3	8.33	8	5.37	12	4.03
Orthocladius	23	26.44	17	23.94	5	17.24	45	24.06	4	3.54	--	--	--	--	4	1.34
Dicrotendipes fumidus	--	--	1	1.41	--	--	1	0.53	4	3.54	--	--	2	1.34	6	2.01
Microtendipes	2	2.30	1	1.41	--	--	3	1.60	4	3.54	--	--	2	1.34	6	2.01
Polypedilum flavum	--	--	--	--	--	--	--	--	1	0.88	1	2.78	3	2.01	5	1.68
Paratanytarsus	--	--	--	--	--	--	--	--	--	--	1	2.78	2	1.34	3	1.01
Rheotanytarsus	2	2.30	2	2.82	--	--	4	2.14	--	--	3	8.33	3	2.01	6	2.01
Antocha	--	--	--	--	1	3.45	1	0.53	--	--	--	--	--	--	--	--
Dreissena rostriformis	--	--	--	--	--	--	--	--	--	--	--	--	1	0.67	1	0.34
TOTAL (Number/Sample)	87	100.00	71	100.00	29	100.00	187	100.00	113	100.00	36	100.00	149	100.00	298	100.00
Total Taxa Richness	8		11		9		15		13		8		16		19	
EPT Taxa Richness	3		3		3		4		4		0		5		5	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from SEEP1, Little Traverse Bay, MI -- June 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Nemertea	--	--	1	0.49	--	--	1	0.19	--	--	--	--	--	--	--	--
Naididae	30	28.30	58	28.16	55	25.11	143	26.93	31	42.47	138	57.98	70	31.25	239	44.67
Hyalella azteca	13	12.26	5	2.43	8	3.65	26	4.90	10	13.70	11	4.62	16	7.14	37	6.92
Hydracarina	--	--	--	--	1	0.46	1	0.19	--	--	--	--	--	--	--	--
Acerpenna pygmaea	--	--	2	0.97	--	--	2	0.38	--	--	1	0.42	--	--	1	0.19
Eurylophella bicolor grp.	--	--	2	0.97	--	--	2	0.38	--	--	--	--	--	--	--	--
Tricorythodes	--	--	1	0.49	--	--	1	0.19	--	--	--	--	--	--	--	--
Caenis	--	--	1	0.49	--	--	1	0.19	1	1.37	1	0.42	--	--	2	0.37
Hydroptila	1	0.94	6	2.91	3	1.37	10	1.88	--	--	1	0.42	1	0.45	2	0.37
Ablabesmyia mallochi	--	--	--	--	--	--	--	--	--	--	1	0.42	1	0.45	2	0.37
Thienemannimyia grp.	2	1.89	7	3.40	2	0.91	11	2.07	1	1.37	1	0.42	3	1.34	5	0.93
Pagastia	--	--	--	--	--	--	--	--	--	--	--	--	3	1.34	3	0.56
Potthastia	1	0.94	--	--	--	--	1	0.19	--	--	--	--	--	--	--	--
Corynoneura lobata	--	--	--	--	3	1.37	3	0.56	--	--	2	0.84	--	--	2	0.37
Thienemanniella xena	--	--	4	1.94	6	2.74	10	1.88	--	--	1	0.42	--	--	1	0.19
Cricotopus tremulus grp.	6	5.66	16	7.77	18	8.22	40	7.53	2	2.74	15	6.30	22	9.82	39	7.29
Cricotopus bicinctus grp.	19	17.92	51	24.76	71	32.42	141	26.55	4	5.48	29	12.18	50	22.32	83	15.51
Eukiefferiella	--	--	--	--	--	--	--	--	1	1.37	--	--	--	--	1	0.19
Orthocladius	--	--	3	1.46	10	4.57	13	2.45	2	2.74	4	1.68	4	1.79	10	1.87
Psectrocladius	1	0.94	1	0.49	3	1.37	5	0.94	--	--	3	1.26	3	1.34	6	1.12
Dicrotendipes fumidus	31	29.25	43	20.87	33	15.07	107	20.15	20	27.40	23	9.66	43	19.20	86	16.07
Microtendipes	--	--	3	1.46	2	0.91	5	0.94	--	--	--	--	--	--	--	--
Paratanytarsus	1	0.94	--	--	--	--	1	0.19	--	--	1	0.42	--	--	1	0.19
Rheotanytarsus	1	0.94	1	0.49	4	1.83	6	1.13	--	--	6	2.52	8	3.57	14	2.62
Dreissena rostriformis	--	--	1	0.49	--	--	1	0.19	1	1.37	--	--	--	--	1	0.19
TOTAL (Number/Sample)	106	100.00	206	100.00	219	100.00	531	100.00	73	100.00	238	100.00	224	100.00	535	100.00
Total Taxa Richness	11		18		14		22		10		16		12		19	
EPT Taxa Richness	1		5		1		5		1		3		1		3	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from SEEP1, Little Traverse Bay, MI -- October 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		8			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naididae	1	3.03	5	10.87	5	15.63	11	9.91	4	22.22	8	38.10	4	33.33	16	31.37
Caecidotea	--	--	--	--	--	--	--	--	--	--	1	4.76	--	--	1	1.96
Hyalella azteca	--	--	--	--	--	--	--	--	1	5.56	--	--	--	--	1	1.96
Gammarus	--	--	1	2.17	--	--	1	0.90	--	--	--	--	--	--	--	--
Eurylophella bicolor grp.	1	3.03	--	--	--	--	1	0.90	--	--	1	4.76	--	--	1	1.96
Caenis	1	3.03	2	4.35	--	--	3	2.70	1	5.56	1	4.76	2	16.67	4	7.84
Cheumatopsyche	--	--	--	--	2	6.25	2	1.80	--	--	1	4.76	1	8.33	2	3.92
Ceratopsyche morosa grp.	--	--	4	8.70	1	3.13	5	4.50	--	--	--	--	--	--	--	--
Ceratopsyche morosa	--	--	--	--	--	--	--	--	1	5.56	--	--	1	8.33	2	3.92
Thienemannimyia grp.	--	--	--	--	--	--	--	--	1	5.56	--	--	--	--	1	1.96
Cricotopus tremulus grp.	30	90.91	19	41.30	22	68.75	71	63.96	7	38.89	9	42.86	3	25.00	19	37.25
Cricotopus bicinctus grp.	--	--	2	4.35	2	6.25	4	3.60	--	--	--	--	--	--	--	--
Eukiefferiella gracei grp.	--	--	1	2.17	--	--	1	0.90	1	5.56	--	--	--	--	1	1.96
Orthocladius	--	--	9	19.57	--	--	9	8.11	--	--	--	--	--	--	--	--
Dicrotendipes fumidus	--	--	--	--	--	--	--	--	1	5.56	--	--	--	--	1	1.96
Microtendipes	--	--	2	4.35	--	--	2	1.80	--	--	--	--	--	--	--	--
Rheotanytarsus	--	--	1	2.17	--	--	1	0.90	1	5.56	--	--	1	8.33	2	3.92
TOTAL (Number/Sample)	33	100.00	46	100.00	32	100.00	111	100.00	18	100.00	21	100.00	12	100.00	51	100.00
Total Taxa Richness	4		10		5		12		9		6		6		12	
EPT Taxa Richness	2		2		2		4		2		3		3		4	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from SEEP2, Little Traverse Bay, MI -- June 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naididae	29	23.02	46	25.14	48	23.30	123	23.88	42	30.66	75	40.11	23	39.66	140	36.65
Caecidotea	--	--	--	--	1	0.49	1	0.19	--	--	2	1.07	--	--	2	0.52
Hyalella azteca	6	4.76	17	9.29	10	4.85	33	6.41	6	4.38	14	7.49	3	5.17	23	6.02
Hydracarina	1	0.79	5	2.73	1	0.49	7	1.36	--	--	--	--	--	--	--	--
Acerpenna pygmaea	--	--	--	--	--	--	--	--	--	--	1	0.53	--	--	1	0.26
Eurylophella bicolor grp.	--	--	2	1.09	1	0.49	3	0.58	--	--	--	--	--	--	--	--
Tricorythodes	--	--	--	--	1	0.49	1	0.19	--	--	--	--	--	--	--	--
Caenis	1	0.79	8	4.37	2	0.97	11	2.14	--	--	2	1.07	1	1.72	3	0.79
Plecoptera	--	--	--	--	--	--	--	--	1	0.73	--	--	--	--	1	0.26
Hydroptila	4	3.17	1	0.55	5	2.43	10	1.94	2	1.46	--	--	--	--	2	0.52
Tanypodinae	1	0.79	--	--	--	--	1	0.19	--	--	--	--	--	--	--	--
Ablabesmyia mallochi	--	--	1	0.55	1	0.49	2	0.39	1	0.73	1	0.53	--	--	2	0.52
Thienemannimyia grp.	3	2.38	4	2.19	4	1.94	11	2.14	--	--	--	--	--	--	--	--
Pagastia	--	--	--	--	--	--	--	--	--	--	--	--	1	1.72	1	0.26
Potthastia	--	--	--	--	1	0.49	1	0.19	3	2.19	2	1.07	--	--	5	1.31
Corynoneura lobata	--	--	--	--	3	1.46	3	0.58	1	0.73	1	0.53	--	--	2	0.52
Thienemanniella xena	2	1.59	2	1.09	1	0.49	5	0.97	--	--	3	1.60	--	--	3	0.79
Cricotopus tremulus grp.	12	9.52	22	12.02	24	11.65	58	11.26	9	6.57	6	3.21	2	3.45	17	4.45
Cricotopus bicinctus grp.	34	26.98	38	20.77	53	25.73	125	24.27	33	24.09	22	11.76	9	15.52	64	16.75
Cricotopus trifascia grp.	--	--	--	--	--	--	--	--	--	--	1	0.53	1	1.72	2	0.52
Cricotopus sylvestris grp.	2	1.59	--	--	--	--	2	0.39	--	--	--	--	--	--	--	--
Orthocladius	1	0.79	2	1.09	5	2.43	8	1.55	5	3.65	2	1.07	4	6.90	11	2.88
Nanocladius	--	--	--	--	--	--	--	--	--	--	--	--	1	1.72	1	0.26
Nanocladius spiniplenus	--	--	1	0.55	--	--	1	0.19	--	--	--	--	--	--	--	--
Psectrocladius	1	0.79	4	2.19	1	0.49	6	1.17	1	0.73	--	--	--	--	1	0.26
Psilometriocnemus	--	--	--	--	--	--	--	--	1	0.73	--	--	--	--	1	0.26
Dicrotendipes fumidus	18	14.29	23	12.57	31	15.05	72	13.98	29	21.17	43	22.99	12	20.69	84	21.99
Microtendipes	2	1.59	2	1.09	2	0.97	6	1.17	--	--	3	1.60	--	--	3	0.79
Nilothauma	--	--	--	--	1	0.49	1	0.19	--	--	--	--	--	--	--	--
Polypedilum flavum	--	--	--	--	--	--	--	--	--	--	1	0.53	--	--	1	0.26
Paratanytarsus	1	0.79	1	0.55	4	1.94	6	1.17	--	--	--	--	--	--	--	--
Rheotanytarsus	8	6.35	4	2.19	4	1.94	16	3.11	3	2.19	4	2.14	1	1.72	8	2.09

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from SEEP2, Little Traverse Bay, MI -- June 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Tanytarsus glabrescens grp.	--	--	--	--	2	0.97	2	0.39	--	--	--	--	--	--	--	--
Dreissena rostriformis	--	--	--	--	--	--	--	--	--	--	4	2.14	--	--	4	1.05
TOTAL (Number/Sample)	126	100.00	183	100.00	206	100.00	515	100.00	137	100.00	187	100.00	58	100.00	382	100.00
Total Taxa Richness	16		18		23		25		14		18		11		24	
EPT Taxa Richness	2		3		4		4		2		2		1		4	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from SEEP2, Little Traverse Bay, MI -- October 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Caecidotea	--	--	--	--	--	--	--	--	1	33.33	--	--	--	--	1	25.00
Gammarus	--	--	--	--	--	--	--	--	1	33.33	1	100.00	--	--	2	50.00
Baetis flavistriga	--	--	--	--	1	25.00	1	4.55	--	--	--	--	--	--	--	--
Caenis	--	--	1	7.14	--	--	1	4.55	1	33.33	--	--	--	--	1	25.00
Cheumatopsyche	--	--	3	21.43	--	--	3	13.64	--	--	--	--	--	--	--	--
Potthastia	--	--	1	7.14	--	--	1	4.55	--	--	--	--	--	--	--	--
Cricotopus tremulus grp.	4	100.00	9	64.29	3	75.00	16	72.73	--	--	--	--	--	--	--	--
TOTAL (Number/Sample)	4	100.00	14	100.00	4	100.00	22	100.00	3	100.00	1	100.00	0	--	4	100.00
Total Taxa Richness	1		4		2		5		3		1		0		3	
EPT Taxa Richness	0		2		1		3		1		0		0		1	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from WCKD, Little Traverse Bay, MI -- June 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naididae	9	10.23	56	21.62	15	20.55	80	19.05	17	16.50	12	17.65	--	--	29	14.01
Caecidotea	--	--	--	--	--	--	--	--	--	--	1	1.47	--	--	1	0.48
Hyalella azteca	4	4.55	3	1.16	4	5.48	11	2.62	10	9.71	--	--	2	5.56	12	5.80
Hydracarina	1	1.14	4	1.54	1	1.37	6	1.43	--	--	1	1.47	1	2.78	2	0.97
Baetis flavistriga	--	--	--	--	1	1.37	1	0.24	--	--	1	1.47	--	--	1	0.48
Eurylophella bicolor grp.	--	--	1	0.39	--	--	1	0.24	--	--	1	1.47	--	--	1	0.48
Tricorythodes	1	1.14	--	--	--	--	1	0.24	--	--	--	--	--	--	--	--
Caenis	--	--	1	0.39	--	--	1	0.24	--	--	--	--	--	--	--	--
Hydroptila	--	--	6	2.32	--	--	6	1.43	4	3.88	--	--	3	8.33	7	3.38
Ceratopogonidae	--	--	2	0.77	--	--	2	0.48	--	--	--	--	--	--	--	--
Thienemannimyia grp.	4	4.55	4	1.54	--	--	8	1.90	2	1.94	3	4.41	1	2.78	6	2.90
Pagastia	--	--	--	--	--	--	--	--	--	--	--	--	1	2.78	1	0.48
Corynoneura lobata	--	--	--	--	--	--	--	--	--	--	1	1.47	1	2.78	2	0.97
Thienemanniella xena	7	7.95	7	2.70	2	2.74	16	3.81	--	--	--	--	--	--	--	--
Cricotopus tremulus grp.	11	12.50	26	10.04	13	17.81	50	11.90	8	7.77	10	14.71	3	8.33	21	10.14
Cricotopus bicinctus grp.	31	35.23	90	34.75	20	27.40	141	33.57	33	32.04	13	19.12	6	16.67	52	25.12
Cricotopus trifascia grp.	1	1.14	--	--	1	1.37	2	0.48	--	--	--	--	--	--	--	--
Psectrocladius	--	--	--	--	--	--	--	--	--	--	1	1.47	1	2.78	2	0.97
Dicrotendipes fumidus	13	14.77	29	11.20	10	13.70	52	12.38	15	14.56	18	26.47	8	22.22	41	19.81
Microtendipes	--	--	4	1.54	1	1.37	5	1.19	--	--	--	--	--	--	--	--
Paratanytarsus	2	2.27	4	1.54	--	--	6	1.43	2	1.94	1	1.47	--	--	3	1.45
Rheotanytarsus	4	4.55	22	8.49	5	6.85	31	7.38	12	11.65	5	7.35	9	25.00	26	12.56
TOTAL (Number/Sample)	88	100.00	259	100.00	73	100.00	420	100.00	103	100.00	68	100.00	36	100.00	207	100.00
Total Taxa Richness	12		15		11		18		9		13		11		16	
EPT Taxa Richness	1		3		1		5		1		2		1		3	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from WCKD, Little Traverse Bay, MI -- October 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		6		8				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Caecidotea	1	2.00	--	--	--	--	1	1.23	--	--	--	--	--	--	--	--
Hyalella azteca	--	--	--	--	--	--	--	--	1	5.88	--	--	1	6.25	2	5.26
Gammarus	--	--	--	--	--	--	--	--	1	5.88	--	--	--	--	1	2.63
Leucrocuta	--	--	--	--	--	--	--	--	--	--	--	--	1	6.25	1	2.63
Heptagenia	1	2.00	--	--	--	--	1	1.23	--	--	--	--	--	--	--	--
Stenacron	--	--	--	--	--	--	--	--	1	5.88	--	--	--	--	1	2.63
Maccaffertium vicarium	--	--	--	--	--	--	--	--	--	--	--	--	1	6.25	1	2.63
Eurylophella bicolor grp.	--	--	2	7.69	--	--	2	2.47	1	5.88	1	20.00	2	12.50	4	10.53
Caenis	3	6.00	5	19.23	--	--	8	9.88	1	5.88	1	20.00	2	12.50	4	10.53
Cheumatopsyche	--	--	--	--	--	--	--	--	--	--	--	--	1	6.25	1	2.63
Ceratopsyche morosa grp.	2	4.00	--	--	2	40.00	4	4.94	1	5.88	--	--	--	--	1	2.63
Hydroptila	--	--	--	--	--	--	--	--	--	--	--	--	1	6.25	1	2.63
Thienemannimyia grp.	--	--	2	7.69	--	--	2	2.47	--	--	1	20.00	--	--	1	2.63
Cricotopus tremulus grp.	40	80.00	16	61.54	3	60.00	59	72.84	10	58.82	2	40.00	5	31.25	17	44.74
Cricotopus bicinctus grp.	1	2.00	--	--	--	--	1	1.23	--	--	--	--	--	--	--	--
Eukiefferiella gracei grp.	1	2.00	--	--	--	--	1	1.23	--	--	--	--	--	--	--	--
Microtendipes	1	2.00	--	--	--	--	1	1.23	1	5.88	--	--	1	6.25	2	5.26
Paratanytarsus	--	--	1	3.85	--	--	1	1.23	--	--	--	--	--	--	--	--
Hemerodromia	--	--	--	--	--	--	--	--	--	--	--	--	1	6.25	1	2.63
TOTAL (Number/Sample)	50	100.00	26	100.00	5	100.00	81	100.00	17	100.00	5	100.00	16	100.00	38	100.00
Total Taxa Richness	8		5		2		11		8		4		10		14	
EPT Taxa Richness	3		2		1		4		4		2		6		8	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from WREF, Little Traverse Bay, MI -- June 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	2		4		6				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Naididae	11	15.94	16	20.00	32	10.56	59	13.05	28	25.93	20	28.57	41	37.96	89	31.12
Caecidotea	--	--	--	--	--	--	--	--	--	--	--	--	1	0.93	1	0.35
Hyalella azteca	1	1.45	2	2.50	3	0.99	6	1.33	--	--	6	8.57	--	--	6	2.10
Hydracarina	1	1.45	1	1.25	2	0.66	4	0.88	--	--	1	1.43	--	--	1	0.35
Baetis flavistriga	--	--	--	--	--	--	--	--	--	--	1	1.43	--	--	1	0.35
Eurylophella bicolor grp.	1	1.45	--	--	--	--	1	0.22	--	--	--	--	--	--	--	--
Tricorythodes	--	--	--	--	1	0.33	1	0.22	--	--	1	1.43	--	--	1	0.35
Caenis	1	1.45	--	--	--	--	1	0.22	1	0.93	--	--	--	--	1	0.35
Hydroptila	--	--	1	1.25	1	0.33	2	0.44	1	0.93	--	--	--	--	1	0.35
Ceratopogonidae	--	--	--	--	--	--	--	--	1	0.93	--	--	--	--	1	0.35
Thienemannimyia grp.	2	2.90	1	1.25	--	--	3	0.66	--	--	1	1.43	--	--	1	0.35
Thienemanniella xena	5	7.25	3	3.75	10	3.30	18	3.98	2	1.85	2	2.86	--	--	4	1.40
Cricotopus tremulus grp.	7	10.14	10	12.50	28	9.24	45	9.96	13	12.04	6	8.57	9	8.33	28	9.79
Cricotopus bicinctus grp.	23	33.33	37	46.25	185	61.06	245	54.20	50	46.30	22	31.43	35	32.41	107	37.41
Nanocladius	--	--	--	--	2	0.66	2	0.44	--	--	2	2.86	1	0.93	3	1.05
Dicrotendipes fumidus	9	13.04	5	6.25	12	3.96	26	5.75	10	9.26	6	8.57	3	2.78	19	6.64
Glyptotendipes	1	1.45	--	--	--	--	1	0.22	--	--	--	--	--	--	--	--
Nilothauma	--	--	--	--	--	--	--	--	1	0.93	--	--	--	--	1	0.35
Pseudochironomus	--	--	--	--	--	--	--	--	--	--	--	--	1	0.93	1	0.35
Paratanytarsus	--	--	2	2.50	2	0.66	4	0.88	--	--	--	--	1	0.93	1	0.35
Rheotanytarsus	7	10.14	2	2.50	25	8.25	34	7.52	1	0.93	2	2.86	16	14.81	19	6.64
TOTAL (Number/Sample)	69	100.00	80	100.00	303	100.00	452	100.00	108	100.00	70	100.00	108	100.00	286	100.00
Total Taxa Richness	12		11		12		16		10		12		9		19	
EPT Taxa Richness	2		1		2		4		2		2		0		4	

The composition, number, and relative abundance of macroinvertebrates in rock basket samples from WREF, Little Traverse Bay, MI -- October 2006.

	Nearshore								Offshore							
	Replicates Processed						Replicates Combined		Replicates Processed						Replicates Combined	
	4		6		8				2		4		6			
Taxa	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Hydra	1	12.50	--	--	--	--	1	3.33	--	--	--	--	--	--	--	--
Caecidotea	1	12.50	--	--	--	--	1	3.33	--	--	--	--	--	--	--	--
Leucrocuta	--	--	--	--	1	4.76	1	3.33	--	--	--	--	1	5.88	1	3.70
Eurylophella bicolor grp.	1	12.50	--	--	1	4.76	2	6.67	--	--	--	--	--	--	--	--
Ceratopsyche morosa grp.	--	--	--	--	1	4.76	1	3.33	--	--	--	--	--	--	--	--
Ceratopsyche morosa	--	--	--	--	--	--	--	--	--	--	1	33.33	1	5.88	2	7.41
Lepidoptera	--	--	1	100.00	--	--	1	3.33	--	--	--	--	--	--	--	--
Thienemannimyia grp.	--	--	--	--	2	9.52	2	6.67	--	--	--	--	2	11.76	2	7.41
Cricotopus tremulus grp.	5	62.50	--	--	13	61.90	18	60.00	6	85.71	2	66.67	11	64.71	19	70.37
Cricotopus bicinctus grp.	--	--	--	--	--	--	--	--	1	14.29	--	--	--	--	1	3.70
Eukiefferiella devonica grp.	--	--	--	--	2	9.52	2	6.67	--	--	--	--	--	--	--	--
Orthocladius	--	--	--	--	--	--	--	--	--	--	--	--	1	5.88	1	3.70
Dicrotendipes fumidus	--	--	--	--	1	4.76	1	3.33	--	--	--	--	1	5.88	1	3.70
TOTAL (Number/Sample)	8	100.00	1	100.00	21	100.00	30	100.00	7	100.00	3	100.00	17	100.00	27	100.00
Total Taxa Richness	4		1		7		10		2		2		6		7	
EPT Taxa Richness	1		0		3		3		0		1		2		2	

Appendix G

Raw Periphyton Data

PhycoTech, Inc.
620 Broad Street - Suite 100 - St. Joseph - MI 49085 - Phone: 269-983-3654 - Fax: 269-983-3653
info@phycotech.com - www.phycotech.com

Algae Analysis with Biovolume Estimates

Report and Data Set

Customer ID: 222

Tracking Code:	060003-222	**Sample ID:**	EREF-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Near Shore Replicate 5 Jar# 1 & 2 mixed				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.32	576,585.999	39,937,690.490
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	8.80	9,609.767	1,368,741.166
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.00	5,848.368	15,782,570.460
9212	*Cocconeis*	*placentula*	.	lineata	.	.	Vegetative	17.00	1,595.010	655,296.565
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.00	12,813.022	18,085,564.179
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	39.00	5,316.698	5,778,187.671
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	88.00	1,595.010	26,724,702.813
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.52	115,317.200	5,889,283.989
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.93	22,422.789	9,671,782.959
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	14.00	6,406.511	1,469,303.210
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.60	28,829.300	17,945,884.619
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	52.00	3,203.256	1,339,629.660
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	40.40	9,609.767	7,100,681.563
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	100.00	531.670	19,229,837.012
1161	*Gomphonema*	*parvulum*	.	.	.	.	Vegetative	25.60	3,203.256	769,989.600
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	12.80	3,203.256	171,108.942
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	26.00	6,406.511	1,507,083.688

9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	13.80	16,016.278	1,048,196.509
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	48.00	531.670	1,443,130.602
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	33.60	6,406.511	865,606.778
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	20.80	3,203.256	830,064.736
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	33.36	64,065.111	22,588,313.878
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.44	35,235.811	8,186,885.660
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	240.00	531.670	8,166,448.530
Summary for Division ~ Bacillariophyta (24 detail records)							**Sum Total**	**Bacillariophyta**	938,487.694	216,555,985.278

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.40	19,219.533	472,412.285
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	520.00	5.417	269,539.620
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	615.00	21.666	3,239,376.158
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	4.80	3,203.256	82,438.665
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	70.00	531.670	1,289,402.526
8399	*Scenedesmus*	*acutus*	.	.	.	.	Vegetative	6.40	3,203.256	52,054.504
2884	*Scenedesmus*	*quadricauda*	.	.	.	.	Vegetative	20.00	531.670	167,029.020
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	724.00	27.082	5,441,841.564
☑ 103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	712.00	32.499	14,453,857.911
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total**	**Chlorophyta**	26,776.048	25,467,952.251

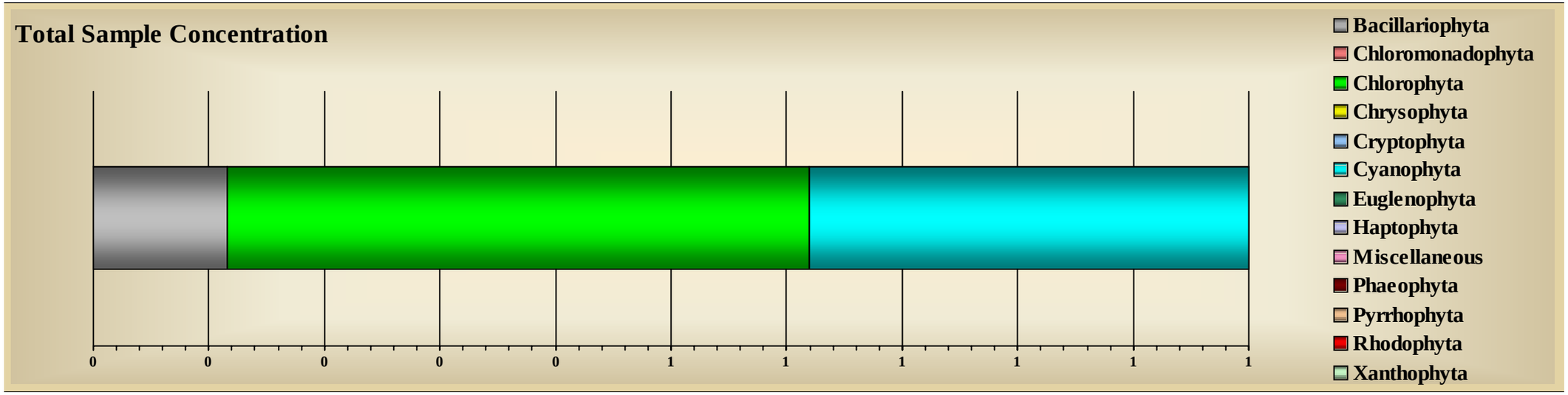
Division: Cyanophyta

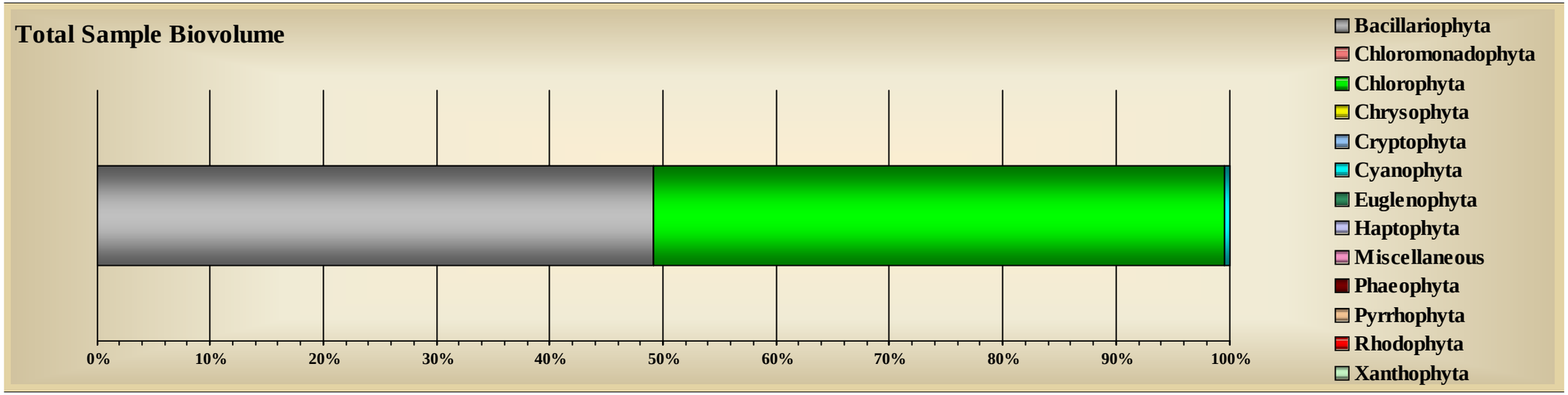
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	8.00	3,203.256	6,708.898
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	8.00	3,203.256	27,479.448
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	4.00	3,203.256	109,918.433

1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	12.57	115,317.200	158,987.823
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	48.00	3,203.256	69,557.733
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	12.00	6,406.511	38,643.434
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	67,268.367	101,440.697
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	1,441,464.998	579,613.076
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,345,367.331	360,692.981
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	96,097.667	402,533.905
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		3,084,735.095	1,855,576.430

Total Richness ~ 43 Taxa	Total Sample Concentration	Total Sample Biovolume
	4,049,998.836	243,879,513.958
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060005-222	**Sample ID:**	EREF-NS-7-1	**Replicate:**	7
Customer ID:	222	**Sample Date:**	6/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Near Shore Replicate 7 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.36	202,494.833	16,196,022.723
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	24.00	2,327.527	175,491.332
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	2,327.527	473,218.321
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	26.40	4,655.054	10,479,409.716
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	28.71	20,947.741	26,913,567.992
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	40.00	2,327.527	1,255,250.806
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	20.80	2,327.527	365,611.636
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	90.00	747.713	15,046,967.555
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.24	65,170.751	3,706,677.692
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.40	9,310.107	3,555,378.208
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	17.60	4,655.054	1,104,620.486
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	15.90	23,275.268	9,095,134.556
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	38.40	2,327.527	1,617,328.558
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	46.40	9,310.107	5,624,148.281
1155	*Fragilaria*	*leptostauron*	.	.	.	.	Vegetative	22.40	2,327.527	2,620,671.369
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	110.00	747.713	35,128,723.281
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	22.40	4,655.054	3,181,125.861

9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	18.00	2,327.527	267,658.601
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	24.20	9,310.107	2,533,627.452
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	14.40	13,965.161	1,130,866.609
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	40.00	2,327.527	3,369,434.651
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	44.00	373.856	2,583,909.099
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	22.40	6,982.580	1,168,070.496
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	19.20	2,327.527	404,332.140
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	28.00	6,982.580	2,358,603.953
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	35.00	1,121.569	1,144,928.091
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	33.67	27,930.322	9,121,006.878
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	32.00	2,327.527	762,683.987
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.20	16,292.688	3,395,135.435
Summary for Division ~ Bacillariophyta (29 detail records)							**Sum Total**	**Bacillariophyta**	452,203.525	164,779,605.764

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.47	9,310.107	255,411.621
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	700.00	35.421	4,008,713.175
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	444.80	23.614	1,805,152.415
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,160.00	7.871	4,130,674.911
Summary for Division ~ Chlorophyta (4 detail records)							**Sum Total**	**Chlorophyta**	9,377.014	10,199,952.121

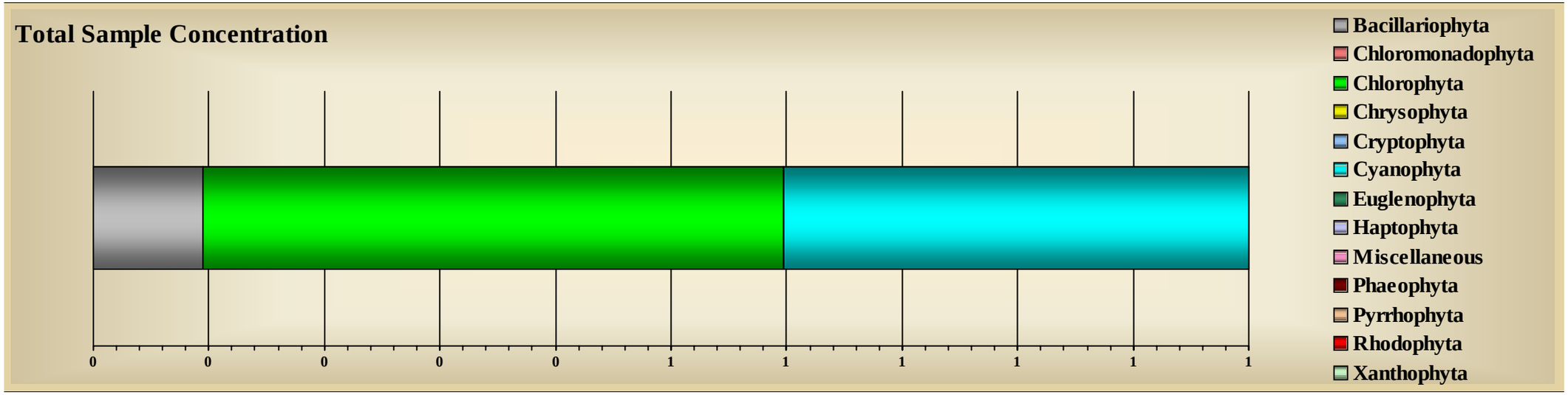
Division: Cyanophyta

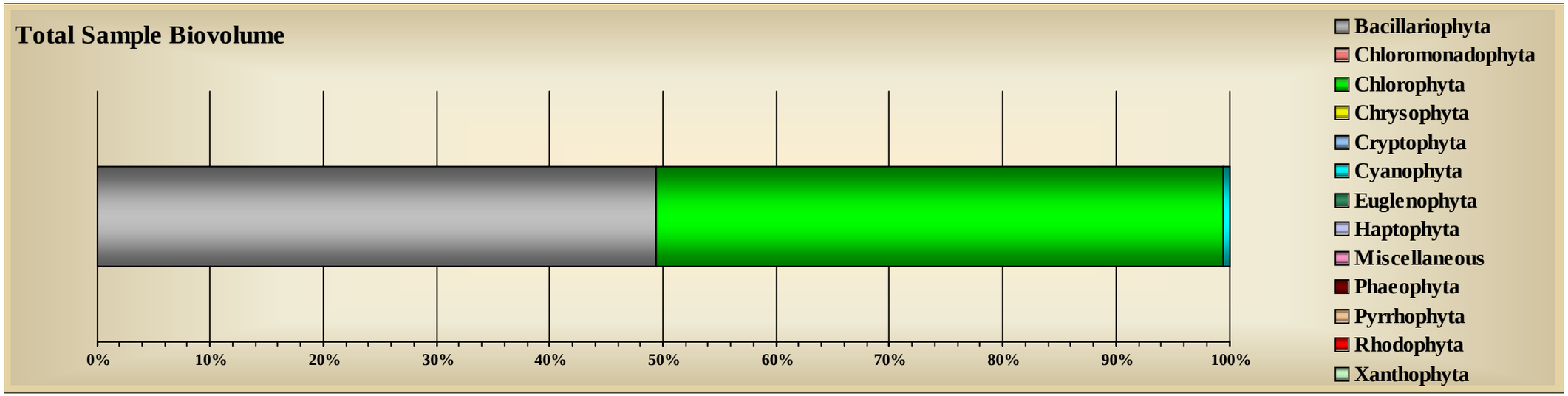
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	8.00	2,327.527	9,983.461
4052	*Aphanocapsa*	*koordersi*	.	.	.	.	Vegetative	9.60	2,327.527	134,777.302
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.00	2,327.527	22,462.961

4080	*Chroococcus*	*spp*	.	.	.	.	Vegetative	16.00	2,327.527	101,083.093
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	9.92	55,860.644	65,144.683
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	30.80	16,292.688	398,014.068
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	8.00	4,655.054	42,117.994
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.30	69,825.804	124,597.166
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	628,432.240	252,692.604
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,047,387.067	280,804.473
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	83,790.965	367,833.959
Summary for Division ~ Cyanophyta (11 detail records)							**Sum Total Cyanophyta**		1,915,554.569	1,799,511.763

Total Richness ~ 44 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,377,135.108	176,779,069.647
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060006-222	**Sample ID:**	EREF-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.40	1,883,204.271	151,456,326.850
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	8.53	34,874.153	3,829,412.187
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	22.00	2,981.867	4,309,192.812
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.93	69,748.306	79,956,033.737
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.00	34,874.153	45,436,463.523
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	105.00	1,863.667	32,214,100.118
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	12.53	139,496.613	4,690,057.463
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.00	46,498.871	8,699,627.201
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	15.47	92,997.742	34,928,435.948
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	38.93	34,874.153	9,938,150.201
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	28.00	23,249.435	8,180,509.156
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	66.00	186.367	4,486,653.448
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	25.33	34,874.153	19,550,087.574
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	18.80	23,249.435	2,542,876.777
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	15.84	58,123.589	7,455,948.638
9113	*Nitzschia*	*dissipata*	.	.	.	.	Vegetative	32.00	11,624.718	2,243,797.202
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	28.00	11,624.718	2,617,763.209

1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	24.00	11,624.718	1,752,965.584
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	20.00	11,624.718	2,337,287.832
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	24.00	11,624.718	4,713,728.876
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	44.00	11,624.718	5,237,632.817
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.06	511,487.580	118,904,341.247
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	204.00	1,304.567	17,032,422.730
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total**	**Bacillariophyta**	3,063,637.228	572,513,815.130

Division: Chlorophyta

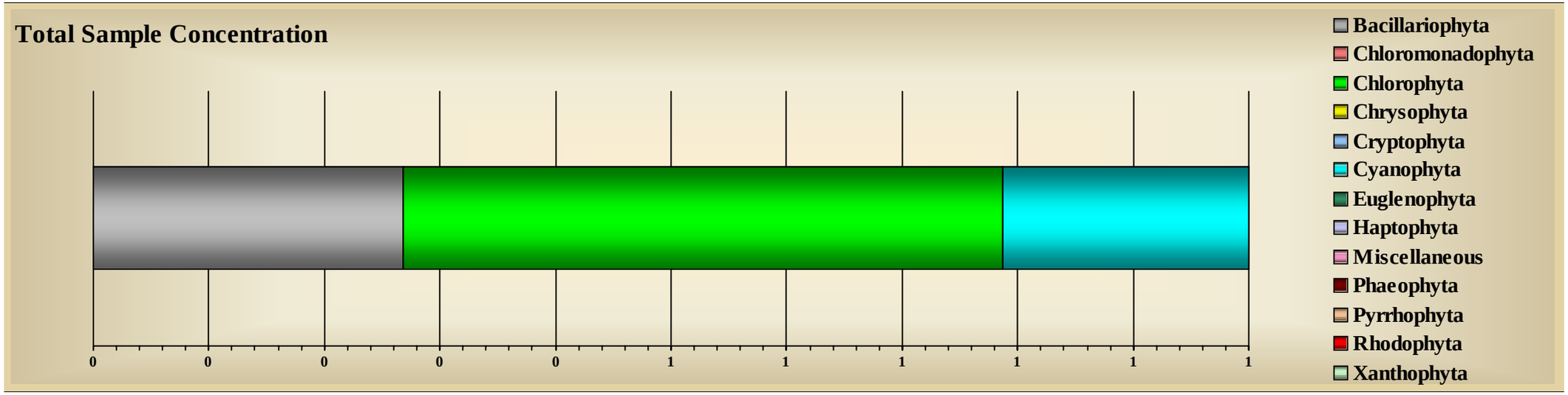
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2687	**Chlorococcaceae*	*spp*	.	.	.	> 1 um ovoid	Vegetative	12.00	372.733	234,195.253
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	216.00	7.863	349,373.935
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	2.88	209,244.919	2,894,505.889
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	24.00	186.367	281,034.323
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	96.00	3.931	42,683.693
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	556.00	51.107	10,325,541.142
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	34.67	559.100	623,428.437
8302	*Scenedesmus*	*quadricauda*	.	longispina	.	.	Vegetative	22.00	745.467	401,254.523
2884	*Scenedesmus*	*quadricauda*	.	.	.	.	Vegetative	16.00	186.367	15,613.017
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	80.00	3.931	252,940.405
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	686.55	102.214	17,184,713.674
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	896.00	7.863	4,574,269.148
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	640.00	3.931	505,880.811
Summary for Division ~ Chlorophyta (13 detail records)							**Sum Total**	**Chlorophyta**	211,475.793	37,685,434.250

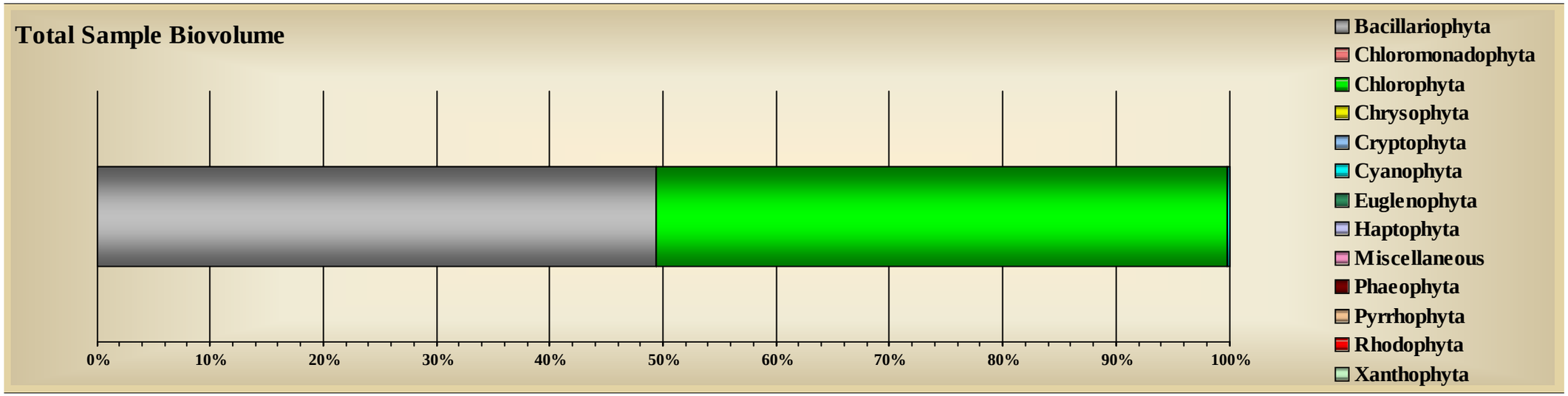
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	96.00	11,624.718	876,482.792
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	69,748.306	105,180.446
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	697,483.063	280,457.940
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,604,211.046	430,088.981
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	46,498.871	194,774.470
Summary for Division ~ Cyanophyta (5 detail records)							**Sum Total**	**Cyanophyta**	2,429,566.004	1,886,984.629

Total Richness ~ 41 Taxa	Total Sample Concentration	Total Sample Biovolume
	5,704,679.025	612,086,234.009
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060007-222	**Sample ID:**	EREF-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Off Shore Replicate 3 Jar# 1 & 2 mixed				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
☑ 10939	*Achnanthes*	*laevis*	.	.	.	.	Vegetative	16.00	5,724.528	828,708.957
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.28	832,918.775	64,307,826.165
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.50	1,900.291	6,125,158.320
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	5,724.528	8,734,255.323
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	34.20	22,898.111	21,920,342.999
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	16.00	5,724.528	390,794.612
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	110.00	475.073	9,949,922.956
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.50	85,867.915	3,688,610.847
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	19.91	62,969.804	20,728,998.381
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	20.48	40,071.694	19,568,578.806
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	46.00	22,898.111	10,543,018.299
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	36.00	11,449.055	3,314,835.828
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	28.00	475.073	200,236.831
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	48.00	475.073	1,289,507.022
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	36.00	475.073	3,438,685.345
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	5,724.528	405,146.576
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	24.00	5,724.528	932,297.720

9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	30.40	5,724.528	2,099,396.101
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	36.00	475.073	245,843.812
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	40.47	120,215.081	51,805,619.186
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	30.00	11,449.055	1,318,931.173
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	29.20	28,622.638	6,993,998.914
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	140.00	475.073	4,256,651.532
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total**	**Bacillariophyta**	1,278,458.132	243,087,365.704

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.47	17,173.583	388,265.516
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	16.00	475.073	159,198.387
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	448.00	19.360	2,475,125.503
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	48.00	950.145	573,114.232
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	24.00	475.073	89,549.117
8302	*Scenedesmus*	*quadricauda*	.	longispina	.	.	Vegetative	30.00	475.073	223,872.744
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	50.00	475.073	537,294.604
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	786.67	14.520	2,218,708.925
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,260.00	77.438	43,295,185.307
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	880.00	4.840	1,338,037.180
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total**	**Chlorophyta**	20,140.177	51,298,351.515

Division: Chrysophyta

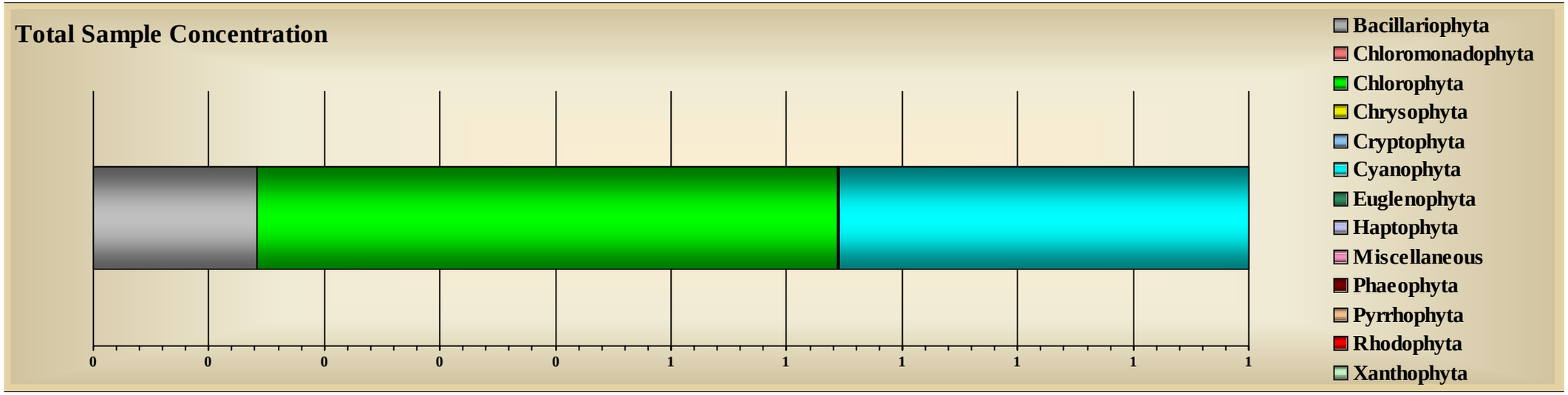
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	4.80	5,724.528	320,526.035
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	5,724.528	320,526.035

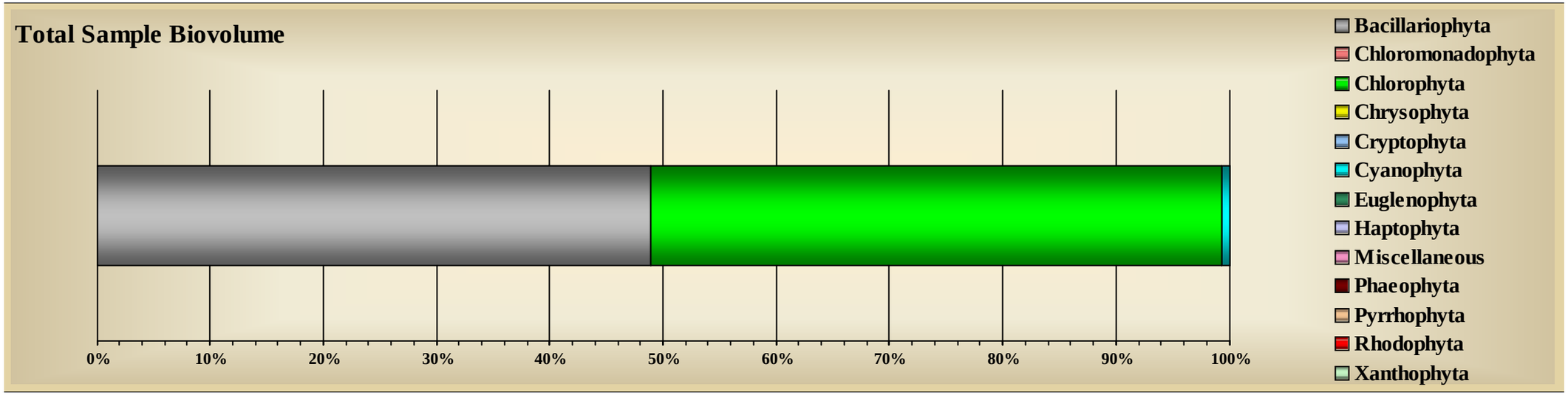
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
☑ 4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	6.40	11,449.055	46,038.941
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	18.00	80,143.387	161,136.294
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	4.80	5,724.528	31,076.743
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	85,867.915	215,811.831
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	772,811.234	310,747.397
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	2,060,829.958	552,508.512
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.53	188,909.413	1,679,669.153
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total Cyanophyta**		3,205,735.490	2,996,988.871

Total Richness ~ 41 Taxa	Total Sample Concentration	Total Sample Biovolume
	4,510,058.326	297,703,232.126
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060009-222	**Sample ID:**	EREF-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.08	942,377.117	63,474,470.356
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	18.40	4,133.233	344,048.659
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	8,266.466	1,179,538.718
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.00	343.013	1,086,227.318
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	28.00	4,133.233	4,804,514.227
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	42.80	8,266.466	10,186,190.626
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	88.00	343.013	5,747,247.917
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.16	103,330.824	5,481,524.561
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.71	33,065.864	11,072,537.637
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	12.00	686.026	89,128.444
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	15.47	12,399.699	5,857,140.374
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	45.33	12,399.699	4,520,834.743
109195	*Eucocconeis*	*flexella*	.	.	.	.	Vegetative	24.00	343.013	465,525.984
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	30.00	4,133.233	8,862,996.850
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	28.80	4,133.233	4,380,452.791
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	20.00	4,133.233	1,018,019.000
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	20.00	4,133.233	747,932.065

9305	*Navicula*	*decussis*	.	decussis	.	.	Vegetative	17.60	4,133.233	895,856.753
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	48.00	343.013	646,563.881
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	16,532.932	1,608,885.732
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	28.80	12,399.699	2,453,217.190
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.17	107,464.057	67,047,523.780
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	32.00	4,133.233	761,837.501
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.71	82,664.659	19,353,747.641
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	190.00	2,058.077	21,210,538.948
Summary for Division ~ Bacillariophyta (25 detail records)							**Sum Total**	**Bacillariophyta**	1,376,349.499	243,296,501.696

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.20	12,399.699	299,172.495
2246	*Euastrum*	*spp*	.	.	.	.	Vegetative	12.00	343.013	148,181.526
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	293.33	10.484	593,004.728
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	288.00	6.989	2,048,817.285
2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	240.00	3.495	74,828.203
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	130.00	343.013	1,396,577.985
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	798.00	13.978	2,056,897.326
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	776.00	17.473	11,688,657.187
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	240.00	3.495	94,852.652
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total**	**Chlorophyta**	13,141.637	18,400,989.388

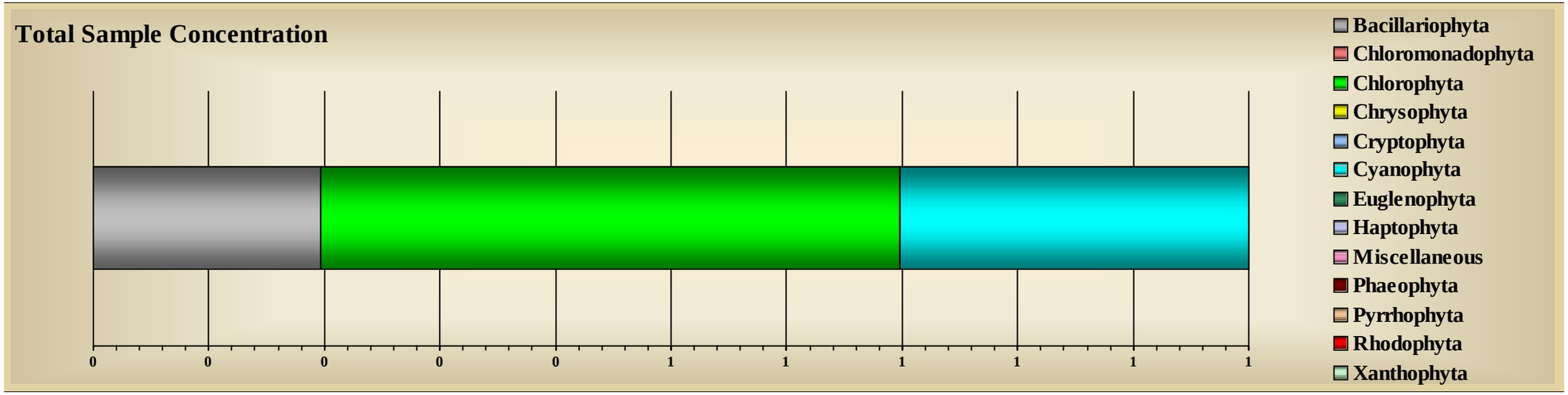
Division: Cyanophyta

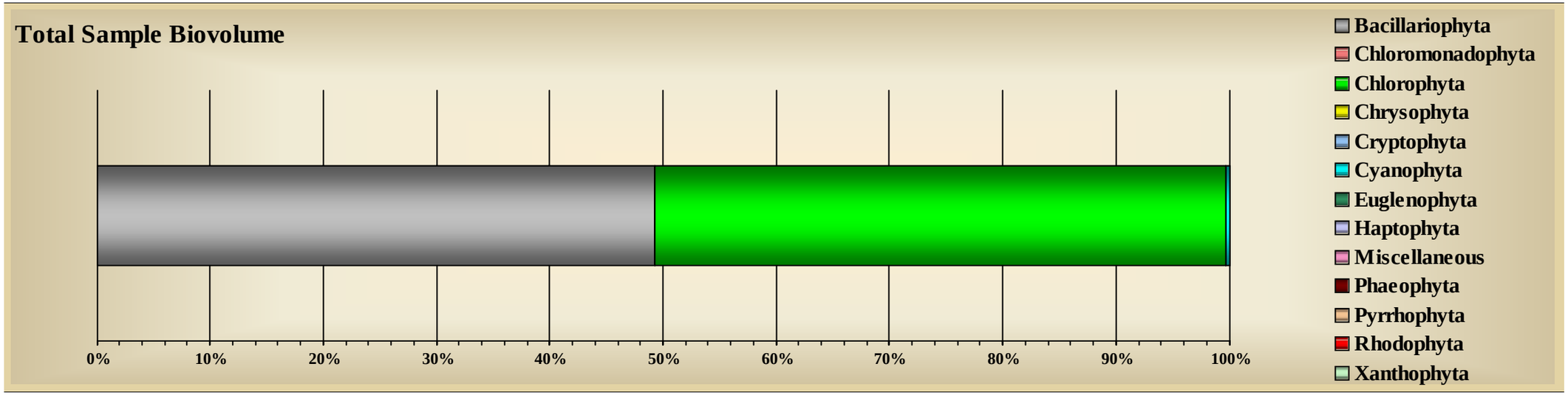
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	12.00	4,133.233	70,915.118
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	17.04	123,996.989	253,053.055

4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	7.20	16,532.932	134,627.664
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.10	86,797.892	198,515.460
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	867,978.923	349,014.325
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.80	86,797.892	274,862.886
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	929,977.418	249,326.946
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total Cyanophyta**		2,116,215.280	1,530,315.453

Total Richness ~ 41 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,505,706.415	263,227,806.537
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060058-222	**Sample ID:**	EREF-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Near Shore Replicate 1 Jar# 1 & 2 Mixed				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.36	420,427.291	30,638,975.169
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	10.40	4,004.069	493,988.453
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	25.60	4,004.069	8,707,592.948
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	24,024.417	33,953,811.322
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.00	4,004.069	5,367,118.739
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	90.00	265.835	4,555,347.070
1113	*Cymbella*	*hustedtii*	.	.	.	.	Vegetative	14.00	265.835	43,171.590
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	11.44	80,081.389	2,772,121.377
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	26.13	20,020.347	12,256,082.168
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	14.40	16,016.278	7,131,273.294
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	25.60	4,004.069	1,854,871.954
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	34.67	8,008.139	9,392,436.172
☑ 9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	2.40	8,008.139	86,946.766
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.00	8,008.139	1,159,295.021
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	44.00	531.670	1,111,578.002
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	28.00	4,004.069	1,127,092.293
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	38.76	68,069.180	32,467,263.305

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	37.33	16,016.278	5,166,210.551
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	240.00	265.835	4,083,224.265
Summary for Division ~ Bacillariophyta (19 detail records)							**Sum Total**	**Bacillariophyta**	690,029.118	162,368,400.459

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.20	16,016.278	217,904.662
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	644.57	37.915	8,724,915.812
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	200.00	5.417	217,809.794
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	539.20	32.499	3,292,794.009
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	660.00	10.833	5,064,077.704
Summary for Division ~ Chlorophyta (5 detail records)							**Sum Total**	**Chlorophyta**	16,102.942	17,517,501.981

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	4.00	4,004.069	128,864.168
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	4,004.069	128,864.168

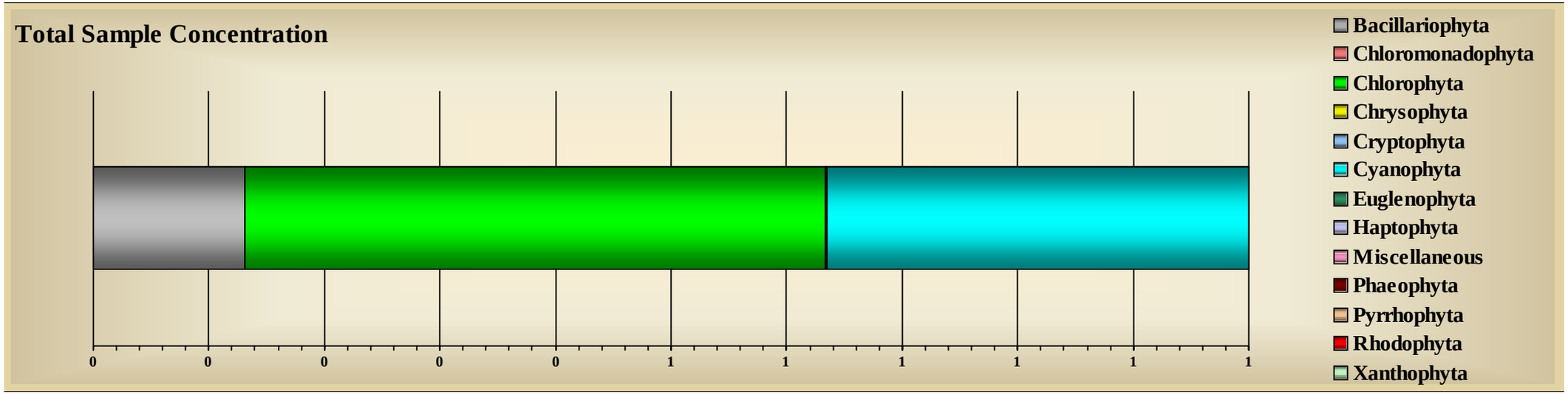
Division: Cyanophyta

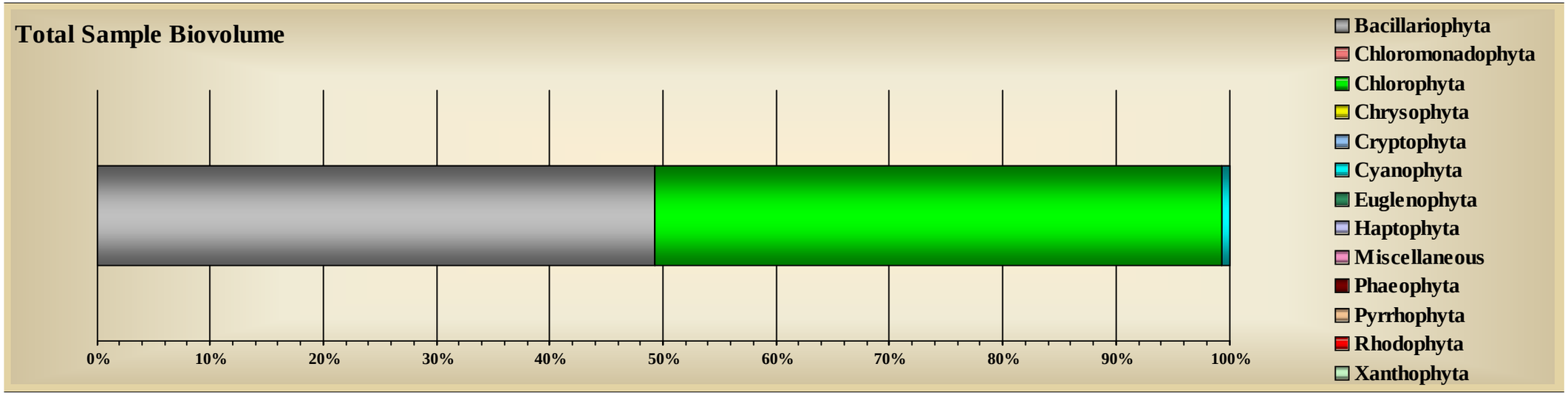
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	8.00	4,004.069	34,349.310
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	4.80	8,008.139	51,524.366
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	11.20	108,109.875	130,423.753
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	32.00	4,004.069	108,684.058
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	9.07	12,012.208	123,175.587

4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	72,073.250	130,423.753
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	720,732.499	289,806.538
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	912,927.832	244,755.952
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.60	84,085.458	918,583.179
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		1,925,957.400	2,031,726.495

Total Richness ~ 34 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,636,093.528	182,046,493.103
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060010-222	**Sample ID:**	ECKD-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
108169	*Achnanthes*	*lanceolata*	.	lanceolatoides	.	.	Vegetative	9.60	3,874.906	233,728.900
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.76	511,487.580	31,659,495.576
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	1,087.139	2,158,499.738
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	3,874.906	3,777,444.274
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	39.20	11,624.718	12,026,715.573
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	96.00	7,749.812	98,800,800.862
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.12	58,123.589	3,095,081.094
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.53	27,124.341	7,991,579.594
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	12.80	3,874.906	1,795,037.374
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	46.97	30,999.247	11,487,883.945
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	111.20	1,087.139	14,552,113.133
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	21.60	7,749.812	1,864,394.703
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	12.80	3,874.906	201,811.687
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	19.20	3,874.906	1,196,691.454
1216	*Navicula*	*halophila*	.	.	.	.	Vegetative	25.60	3,874.906	1,595,588.605
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.00	3,874.906	186,983.197
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	24.00	3,874.906	280,474.602

9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	20.00	3,874.906	233,728.900
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	40.27	23,249.435	8,923,814.532
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	33.84	267,368.508	67,139,012.892
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	186.40	931.833	13,719,568.799

Summary for Division ~ Bacillariophyta (21 detail records) **Sum Total Bacillariophyta** 983,457.306 282,920,449.432

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	2.60	42,623.965	414,219.692
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	10.40	3,874.906	486,155.770
☑ 2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	622.00	29.485	2,411,332.266
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	80.00	3,874.906	14,741,018.188
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	400.00	6.552	1,185,658.151
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	613.33	9.828	1,445,844.246
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	800.00	3.276	296,414.538

Summary for Division ~ Chlorophyta (7 detail records) **Sum Total Chlorophyta** 50,422.918 20,980,642.850

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1000035	**Chrysocapsaceae*	*spp*	.	.	.	>1 um spherical	Vegetative	3.20	3,874.906	66,482.923

Summary for Division ~ Chrysophyta (1 detail record) **Sum Total Chrysophyta** 3,874.906 66,482.923

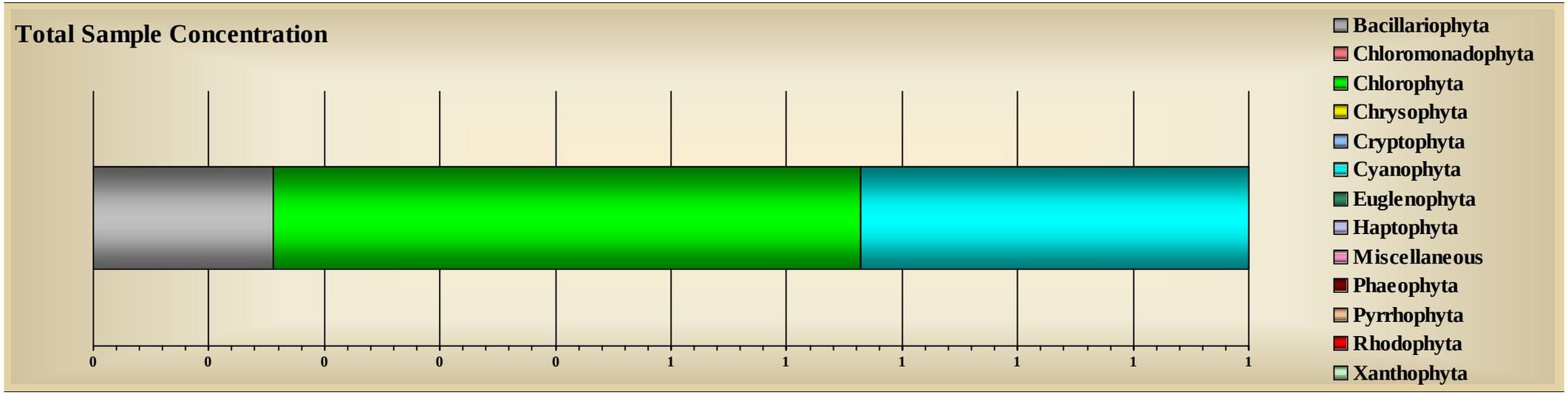
Division: Cyanophyta

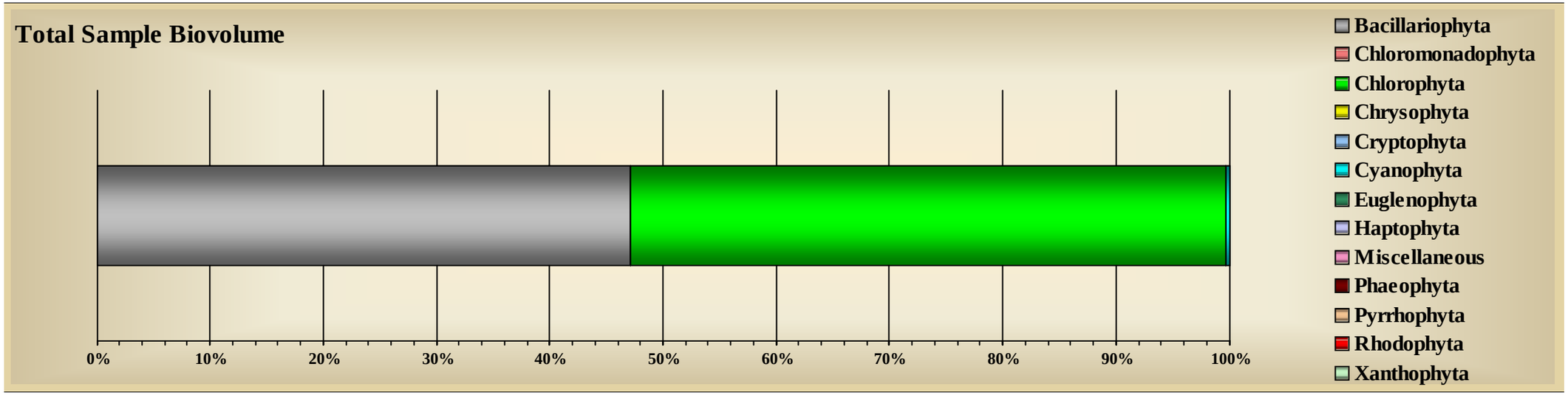
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4309	*Lyngbya*	*perelegans*	.	.	.	.	Vegetative	44.00	3,874.906	97,386.848

107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	112.00	3,874.906	490,830.456
4168	*Merismopedia*	*punctata*	.	.	.	.	Vegetative	20.00	155.306	3,903.248
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	22.40	3,874.906	68,170.832
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	23,249.435	42,072.178
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	1,278,718.949	514,172.890
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	813,730.241	218,161.078
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total Cyanophyta**		2,127,478.649	1,434,697.530

Total Richness ~ 36 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,165,233.779	305,402,272.734
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060011-222	**Sample ID:**	ECKD-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.53	612,235.133	58,818,041.497
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	32.00	163.589	411,142.795
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	33.60	10,203.919	13,772,580.340
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	36.40	10,203.919	9,654,703.159
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	88.00	654.354	13,257,853.625
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.12	85,032.657	4,887,736.671
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	23.31	23,809.144	11,340,211.991
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	17.60	3,401.306	807,112.638
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	15.20	6,802.613	3,887,135.283
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	51.71	37,414.369	40,285,259.867
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	212.00	327.177	16,922,637.565
1169	*Gomphonema*	*clavatum*	.	.	.	.	Vegetative	56.00	163.589	551,603.057
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	26.00	327.177	239,180.880
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	20.00	3,401.306	205,162.034
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	20.00	10,203.919	1,230,972.204
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	28.00	163.589	191,528.836
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	60.00	3,401.306	522,440.647

1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	35.78	190,473.153	58,648,550.322
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	39.20	3,401.306	767,987.751
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	36.24	132,650.946	38,753,602.323
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	183.00	17,006.532	107,709,846.750

Summary for Division ~ Bacillariophyta (21 detail records) **Sum Total Bacillariophyta** 1,151,441.002 382,865,290.232

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.80	6,802.613	393,910.724
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	419.20	17.254	886,714.210
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	56.00	163.589	482,047.066
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	24.00	3,401.306	437,678.734
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	320.00	6.902	2,331,267.405
2550	*Tetraedron*	*spp*	.	.	.	.	Vegetative	9.60	3,401.306	1,044,881.294
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	1,280.00	10.353	1,935,784.541
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	3,760.00	3.451	5,869,798.287

Summary for Division ~ Chlorophyta (8 detail records) **Sum Total Chlorophyta** 13,806.773 13,382,082.261

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	100.00	163.589	115,633.904
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	61.33	40,815.676	205,159.993
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	29.33	10,203.919	131,304.028
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	96,937.229	77,956.920
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	1,102,023.240	443,123.545
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.60	40,815.676	445,886.766
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	551,011.620	147,726.215

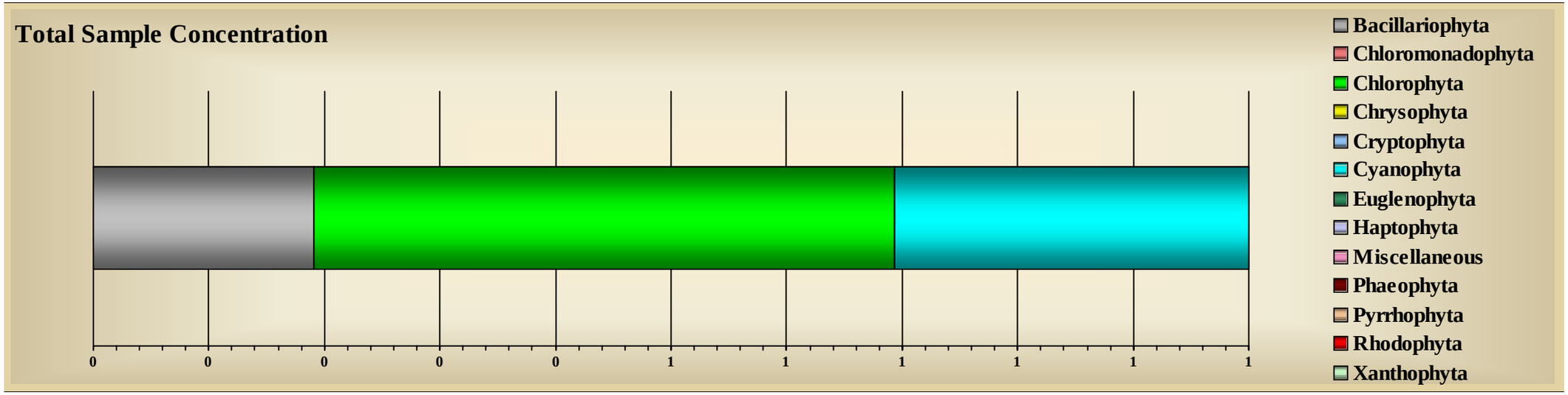
Summary for Division ~ Cyanophyta (7 detail records)	**Sum Total Cyanophyta**	1,841,970.948	1,566,791.372

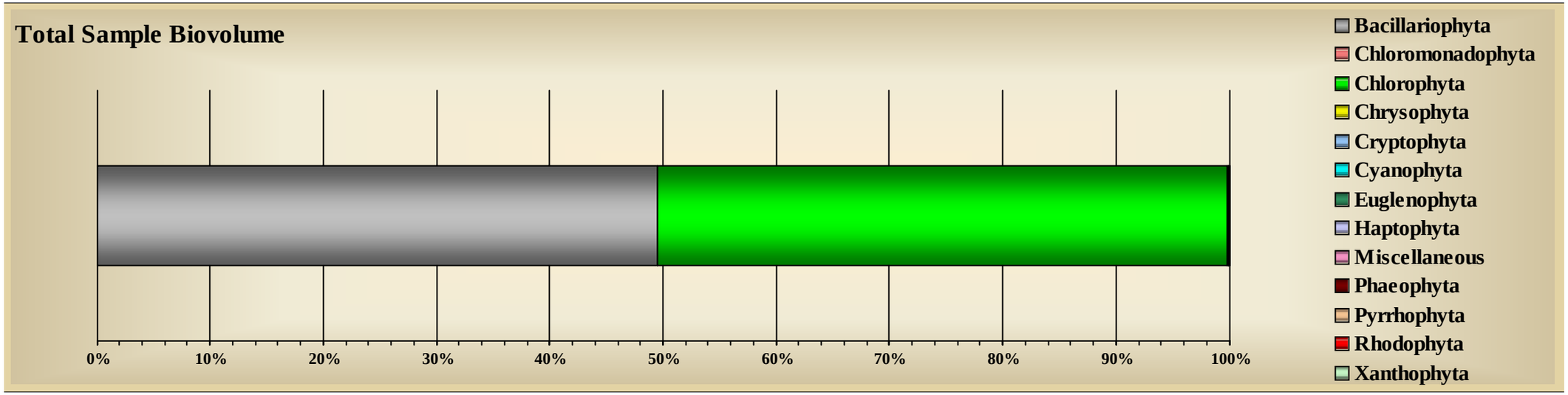
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
6034	*Gymnodinium*	*sp. 3*	.	.	.	.	Vegetative	6.40	3,401.306	131,303.688
Summary for Division ~ Pyrrhophyta (1 detail record)							**Sum Total Pyrrhophyta**		3,401.306	131,303.688

Total Richness ~ 37 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,010,620.029	397,945,467.553
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060012-222	**Sample ID:**	ECKD-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.80	606,035.284	54,566,932.134
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	19.20	4,040.235	350,929.983
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	26.40	4,040.235	965,057.051
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	33.60	8,080.471	9,713,320.206
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	35.20	8,080.471	5,920,609.991
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	36.00	335.295	197,153.462
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	88.00	2,347.065	33,020,388.393
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.40	32,321.882	1,548,968.006
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.80	36,362.117	25,951,242.944
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	20,201.176	8,816,568.988
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	51.47	36,362.117	19,452,234.494
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	46.40	4,040.235	1,507,698.216
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	22.40	4,040.235	1,499,601.988
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	26.00	670.590	177,142.587
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	28.00	4,040.235	1,393,158.759
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	18.80	8,080.471	1,177,889.370
9117	*Nitzschia*	*intermedia*	.	.	.	.	Vegetative	56.00	335.295	1,415,716.260

9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	20.40	12,120.706	1,323,297.436
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	26.40	8,080.471	1,315,987.034
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	112.00	4,040.235	2,606,436.549
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	36.88	76,764.469	23,377,667.244
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	30.32	68,683.999	18,892,165.774
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	150.00	670.590	2,447,653.524
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total**	**Bacillariophyta**	949,773.878	217,637,820.393

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	2.67	16,160.941	170,410.658
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	17.60	8,080.471	3,669,599.399
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	620.00	13.664	1,382,191.967
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	320.00	3.416	494,498.493
2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	240.00	3.416	42,495.964
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	681.78	30.743	3,419,251.037
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	400.00	3.416	154,530.779
Summary for Division ~ Chlorophyta (7 detail records)							**Sum Total**	**Chlorophyta**	24,296.066	9,332,978.297

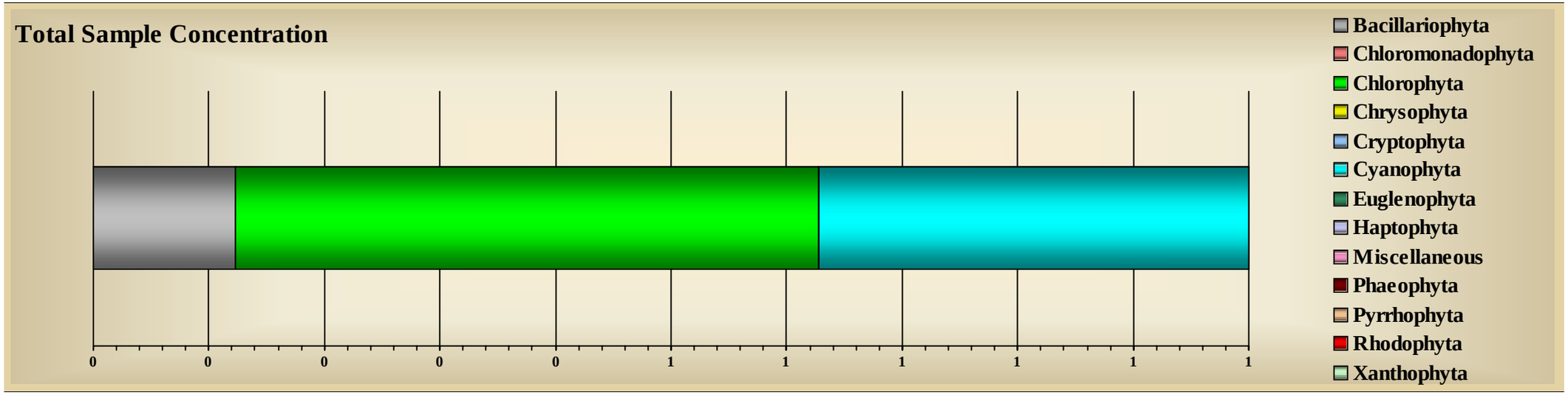
Division: Cyanophyta

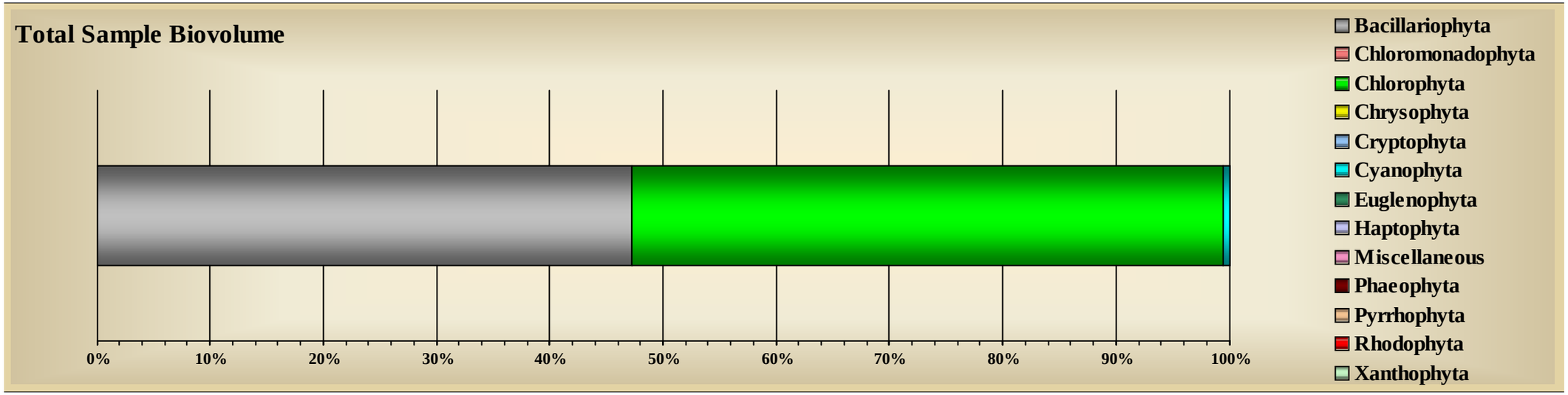
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	6.00	8,080.471	38,992.310
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	16.00	145,448.468	197,402.661
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	40.00	4,040.235	259,947.926
☑ 4169	*Merismopedia*	*elegans*	.	.	.	.	Vegetative	24.00	4,040.235	554,555.819
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	16.80	8,080.471	68,236.341
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	9.60	4,040.235	43,866.046

4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	84,844.940	177,699.242
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	1,393,881.153	560,479.612
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,090,863.511	292,460.507
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	121,207.057	259,952.775
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		2,864,526.775	2,453,593.238

Total Richness ~ 40 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,838,596.719	229,424,391.929
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060013-222	**Sample ID:**	ECKD-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.04	731,194.745	54,131,078.146
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	2,195.780	446,432.379
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	20.00	165.012	165,888.305
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	52.00	2,195.780	4,433,250.645
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	29.60	6,587.340	6,114,737.918
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	38.00	10,978.900	13,692,610.794
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	20.00	2,195.780	187,373.155
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	100.00	2,310.170	45,291,656.431
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.94	37,328.260	1,872,437.793
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	19.20	21,957.800	7,960,738.959
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	15.20	4,391.560	1,652,930.057
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	42.20	21,957.800	11,878,227.887
4272	*Diatoma*	*vulgaris*	.	.	.	distorta	Vegetative	20.00	2,195.780	397,338.910
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	39.02	26,349.360	25,098,874.870
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.00	2,195.780	317,871.215
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	20.00	4,391.560	529,785.505
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	28.00	4,391.560	741,699.356

9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	25.60	2,195.780	353,190.117
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	36.46	65,873.400	21,990,122.023
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	36.00	2,195.780	455,316.944
1000540	*Synedra*	*tenera*	.	.	.	.	Vegetative	28.00	2,195.780	245,927.362
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	33.12	199,815.981	56,595,558.834
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	204.00	4,391.560	48,432,231.941
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total**	**Bacillariophyta**	1,159,651.250	302,985,279.544

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	3.713	125,976.179
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	4.32	24,153.580	804,215.190
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	1,040.00	7.426	873,434.838
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	1,120.00	18.565	2,743,481.222
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	5.60	4,391.560	149,517.249
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	288.00	11.139	1,451,245.577
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	960.00	3.713	403,123.771
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	485.33	11.139	1,698,345.519
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total**	**Chlorophyta**	28,600.834	8,249,339.544

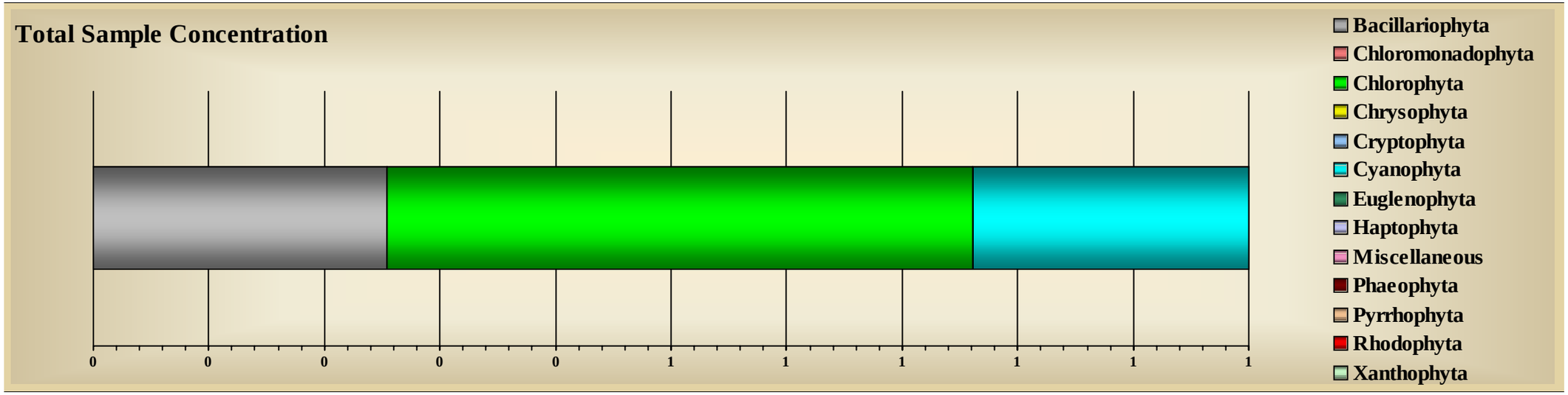
Division: Cyanophyta

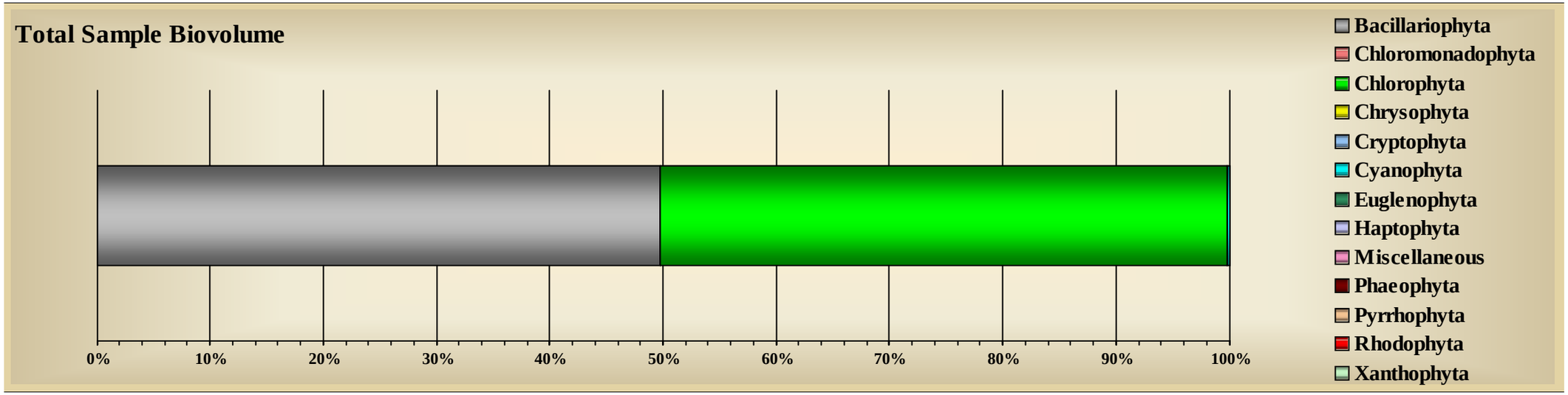
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	8.00	2,195.780	95,361.409
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	19.20	2,195.780	14,127.649
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	12.80	2,195.780	22,074.396
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	13,174.680	42,382.946
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.40	922,227.606	432,616.970

4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	131,746.801	35,321.317
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.40	17,566.240	127,147.959
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total**	**Cyanophyta**	1,091,302.667	769,032.645

Total Richness ~ 38 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,279,554.750	312,003,651.733
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060014-222	**Sample ID:**	ECKD-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
10939	*Achnanthes*	*laevis*	.	.	.	.	Vegetative	14.40	4,288.229	744,940.457
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.23	458,840.525	37,295,750.844
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	36.00	355.876	1,006,215.040
9854	*Cyclotella*	*sp. 1*	.	(small) Job 07	.	.	Vegetative	6.00	355.876	30,186.451
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	31.47	12,864.688	21,683,189.114
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	37.60	12,864.688	22,103,715.169
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	91.50	1,423.503	21,100,301.497
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.40	51,458.750	2,486,142.048
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	16.00	4,288.229	819,680.861
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	19.20	4,288.229	1,932,104.550
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	14.40	4,288.229	1,117,410.900
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	59.20	34,305.834	20,251,344.237
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	45.07	21,441.146	14,536,685.332
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	16.00	4,288.229	277,139.677
1220	*Nitzschia*	*spp*	.	.	.	.	Vegetative	36.00	355.876	965,966.452
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.00	8,576.458	551,807.619
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	28.00	355.876	149,996.904

1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	41.33	120,070.418	41,957,406.766
1000540	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.00	4,288.229	351,291.736
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	33.44	167,240.939	39,658,312.130
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	177.33	2,135.255	15,003,722.565
Summary for Division ~ Bacillariophyta (21 detail records)							**Sum Total**	**Bacillariophyta**	918,375.081	244,023,310.349

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	6.40	4,288.229	588,595.051
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	600.00	7.094	481,351.434
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	326.40	17.734	3,476,427.025
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	592.00	21.280	2,030,055.104
Summary for Division ~ Chlorophyta (4 detail records)							**Sum Total**	**Chlorophyta**	4,334.337	6,576,428.614

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	9.00	355.876	134,033.883
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	355.876	134,033.883

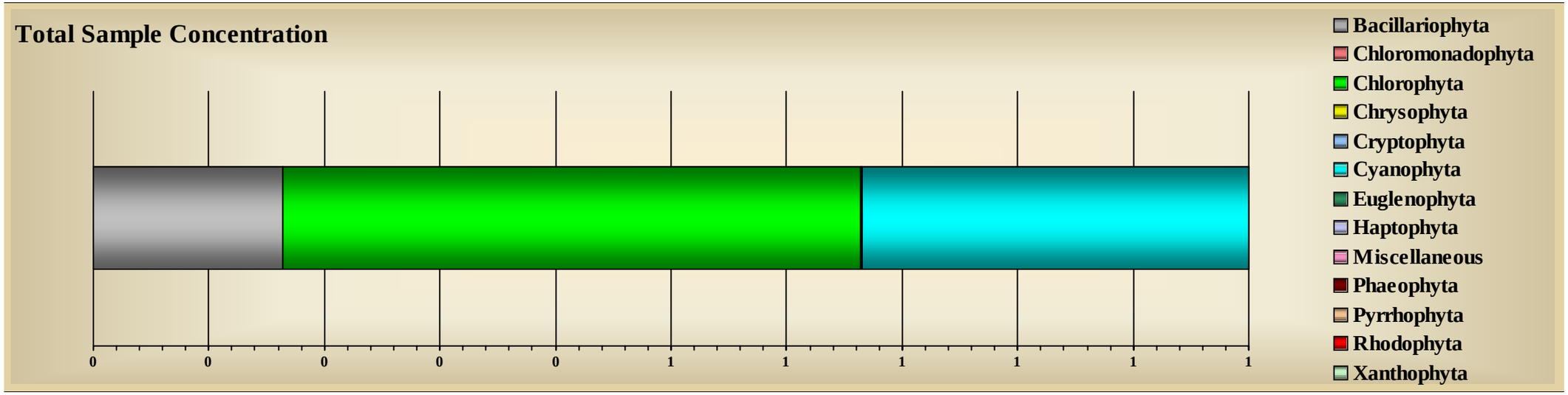
Division: Cyanophyta

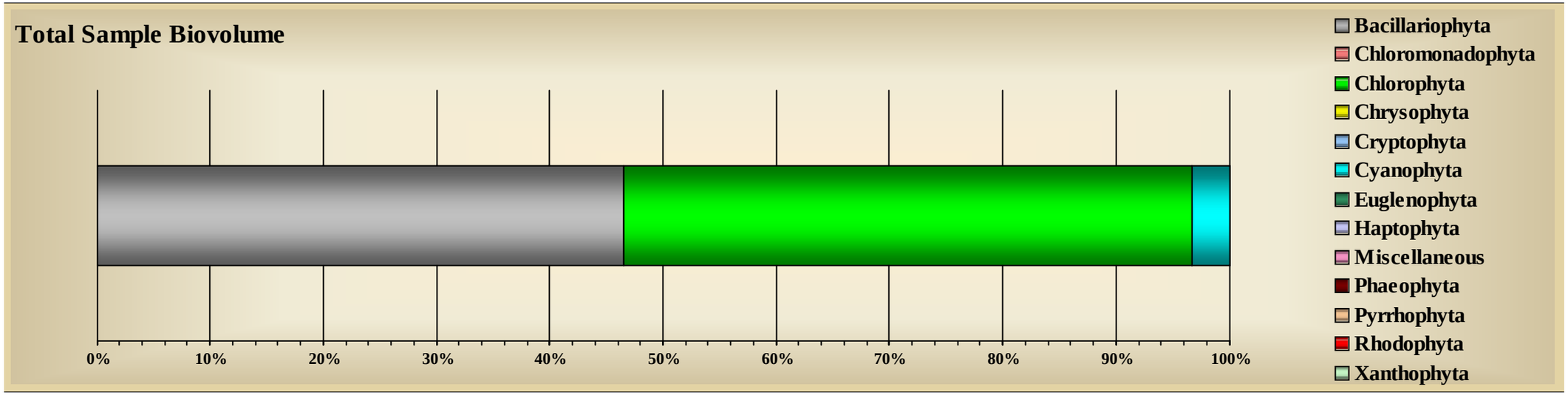
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	8.00	4,288.229	8,981.267
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	22.72	175,817.397	448,949.724
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	34.67	34,305.834	886,627.409
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	25.33	12,864.688	163,817.646

☑ 4174	*Oscillatoria*	*tenuis*	.	.	.	.	Vegetative	276.80	4,288.229	14,916,053.820
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.67	120,070.418	147,530.522
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	450,264.066	181,051.181
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	964,851.571	258,676.706
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.80	115,782.189	366,647.456
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		1,882,532.621	17,378,335.732

Total Richness ~ 35 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,805,597.914	268,112,108.578
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060015-222	**Sample ID:**	ECKD-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.92	441,687.608	32,272,302.599
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	19.20	4,288.229	258,659.982
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	8,576.458	4,689,744.681
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	38.00	2,847.006	1,988,349.106
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	25.60	4,288.229	829,048.498
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	90.00	711.752	8,370,198.127
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.31	47,170.521	2,557,085.654
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.36	68,611.667	24,198,539.149
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	12.00	4,288.229	388,616.483
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	14.67	1,779.379	939,134.095
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	45.20	47,170.521	16,801,252.862
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	36.00	355.876	724,474.812
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	50.00	17,152.917	8,604,752.145
1155	*Fragilaria*	*leptostauron*	.	.	.	.	Vegetative	16.00	355.876	1,001,742.963
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	36.00	4,288.229	8,729,771.179
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	32.00	8,576.458	2,207,231.332
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	33.24	171,529.168	56,877,322.566

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	30.00	85,764.584	18,025,657.224
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	223.33	711.752	5,200,531.287

Summary for Division ~ Bacillariophyta (19 detail records) **Sum Total Bacillariophyta** 920,154.460 194,664,414.744

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	2.67	30,017.604	316,523.632
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	18.00	355.876	143,106.153
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	240.00	7.251	273,360.073
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	28.00	355.876	161,687.922
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	18.00	1,067.627	226,398.379
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	773.33	7.251	3,761,434.615
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	720.00	32.630	3,112,790.211
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,280.00	3.626	2,857,523.971

Summary for Division ~ Chlorophyta (8 detail records) **Sum Total Chlorophyta** 31,847.741 10,852,824.955

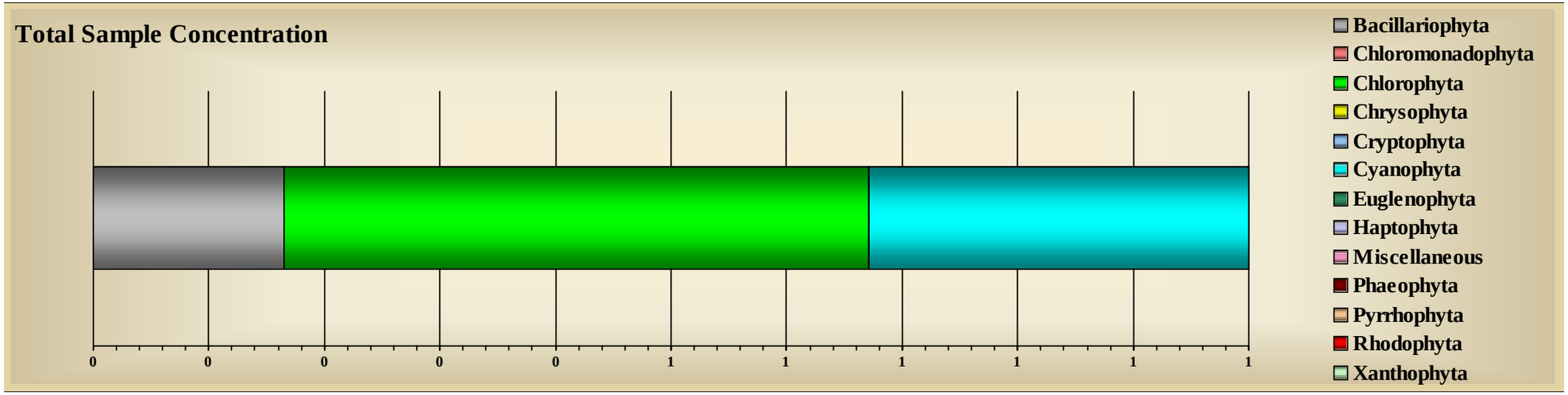
Division: Cyanophyta

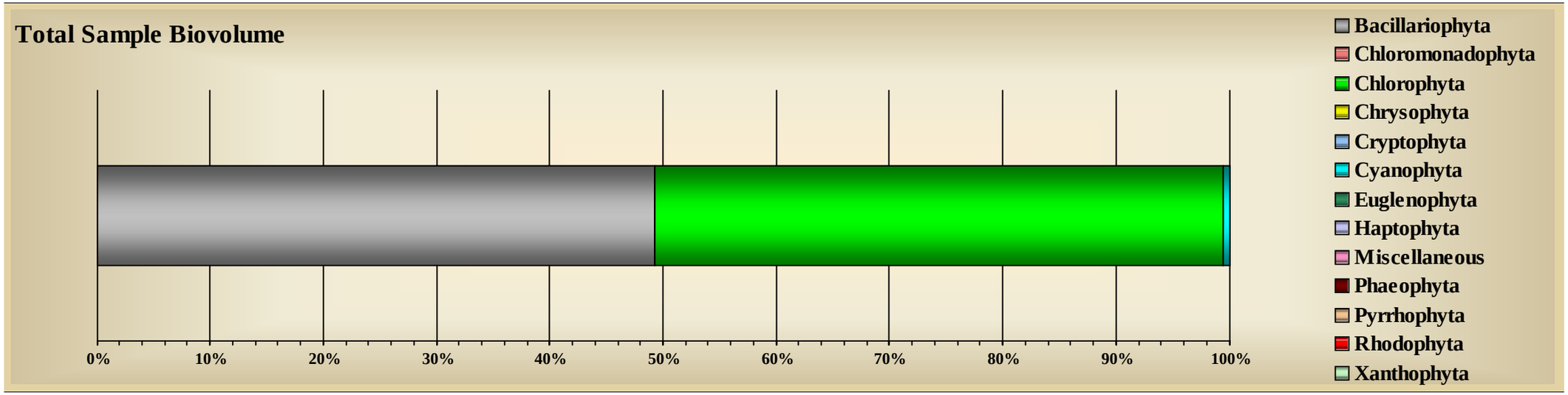
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4052	*Aphanocapsa*	*koordersi*	.	.	.	.	Vegetative	60.00	355.876	178,882.664
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	13.33	17,152.917	321,888.206
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	15.64	334,481.878	620,196.298
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	16.00	4,288.229	62,078.550
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.13	64,323.438	103,464.250
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	257,293.752	103,457.818
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	64,323.438	301,766.977
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,093,498.447	293,166.934

Summary for Division ~ Cyanophyta (8 detail records)	**Sum Total Cyanophyta**	1,835,717.975	1,984,901.698

Total Richness ~ 35 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,787,720.176	207,502,141.396
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060016-222	**Sample ID:**	SEEP1-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 1 Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.40	158,096.161	12,756,178.467
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	17.60	2,195.780	1,849,303.933
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	16.00	176.013	79,626.383
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	19,762.020	21,261,615.572
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	39.60	15,370.460	15,860,020.013
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	28.00	2,195.780	734,503.127
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	101.33	1,584.117	25,683,812.001
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.08	76,852.301	2,777,011.767
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	19.44	63,677.620	16,951,358.251
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	4,391.560	2,260,417.190
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	32.00	2,195.780	317,871.215
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	39.68	21,957.800	13,484,803.271
10379	*Fragilaria*	*capucina*	.	mesolepta	.	.	Vegetative	20.00	2,195.780	198,669.565
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	100.00	176.013	3,015,584.601
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	23.20	10,978.900	2,062,581.803
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	18.80	6,587.340	960,235.899
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	12.00	2,195.780	59,600.935

1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	28.00	2,195.780	370,849.678
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	24.80	13,174.680	1,691,074.269
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	28.00	2,195.780	354,135.401
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	34.24	63,677.620	15,545,082.579
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.76	39,524.040	8,541,745.864
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	219.00	1,936.143	21,599,607.182
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total**	**Bacillariophyta**	513,293.248	168,415,688.965

Division: Chlorophyta

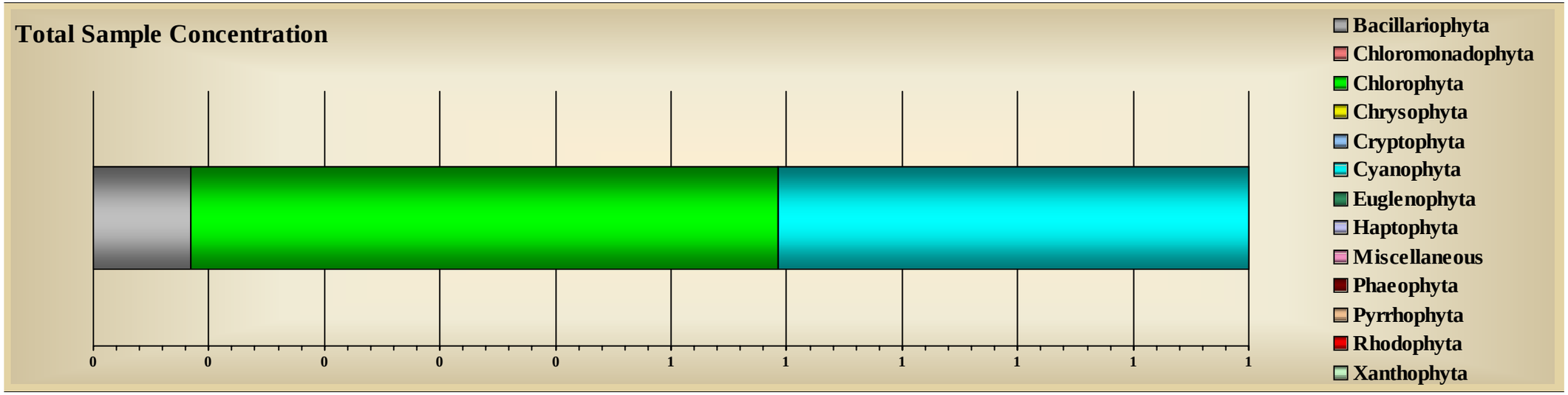
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	3.713	149,305.101
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	3.27	35,132.480	1,148,189.179
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	24.00	176.013	318,505.566
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	296.00	22.278	1,325,829.292
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	622.22	44.555	8,264,037.315
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	33.00	1,408.104	2,003,722.879
8302	*Scenedesmus*	*quadricauda*	.	longispina	.	.	Vegetative	11.73	6,587.340	563,927.030
2500	*Selenastrum*	*spp*	.	.	.	.	Vegetative	3.20	2,195.780	30,106.999
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	448.00	48.268	10,398,726.988
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	88.00	352.026	1,769,475.319
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	620.00	33.416	5,072,640.790
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,028.80	55.694	40,370,606.129
8211	*Uronema*	*elongatum*	.	.	.	.	Vegetative	160.00	3.713	29,861.020
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	960.00	3.713	716,664.482
Summary for Division ~ Chlorophyta (14 detail records)							**Sum Total**	**Chlorophyta**	46,067.092	72,161,598.087

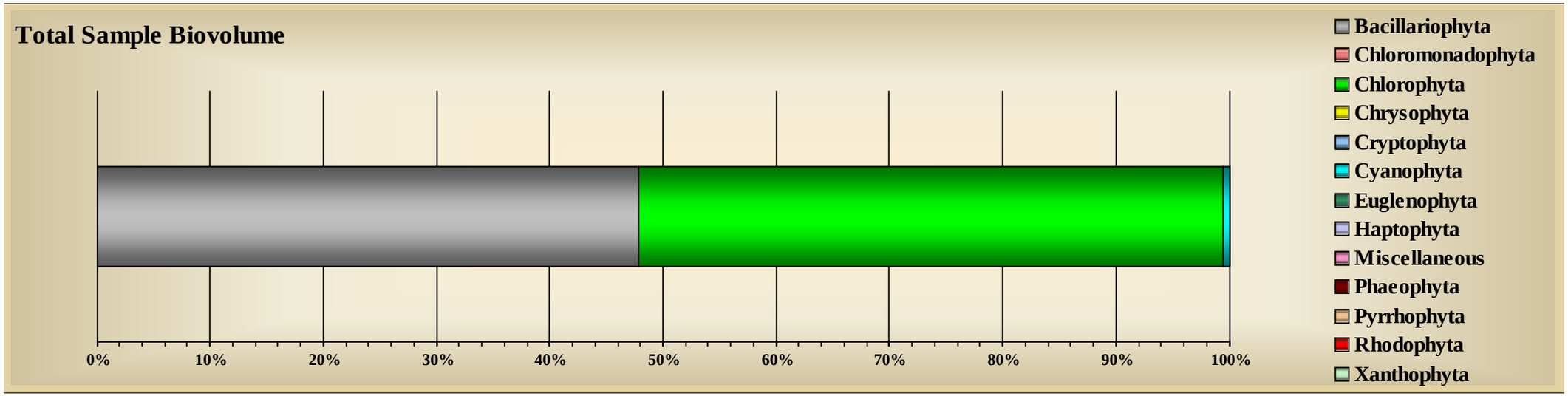
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4052	*Aphanocapsa*	*koordersi*	.	.	.	.	Vegetative	8.00	2,195.780	158,935.608
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	16.00	2,195.780	75,347.313
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	40.00	6,587.340	165,557.641
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	33.33	10,978.900	229,482.067
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	32,936.700	105,957.365
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	1,251,594.608	503,266.192
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,119,847.807	300,231.197
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	37,328.260	167,081.293
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		2,463,665.176	1,705,858.675

Total Richness ~ 45 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,023,025.516	242,283,145.727
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060017-222	**Sample ID:**	SEEP1-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 1 Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.71	261,316.274	17,139,551.465
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	20.00	5,387.964	487,491.705
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	5,387.964	10,156,073.677
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	30.80	5,387.964	5,881,967.464
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	32.67	1,514.512	1,244,727.080
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	91.00	908.707	17,102,234.363
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.13	83,513.448	3,907,686.109
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.70	35,021.769	14,947,402.921
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	11.20	5,387.964	604,031.220
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.96	13,469.911	9,342,503.983
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	40.00	16,163.893	13,597,763.635
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	25.60	5,387.964	1,295,143.797
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	11.20	2,693.982	189,580.107
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	18.00	5,387.964	498,324.746
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	33.60	8,081.947	2,398,458.281
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.31	102,371.324	71,271,969.974
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	36.00	10,775.929	2,234,496.598

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	29.68	70,043.537	14,454,296.418
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	200.00	908.707	6,542,692.366

Summary for Division ~ Bacillariophyta (19 detail records) **Sum Total Bacillariophyta** 639,111.726 193,296,395.908

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.20	16,163.893	398,659.797
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	320.00	3.189	320,566.833
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	524.00	41.454	8,370,160.304
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	4.80	2,693.982	69,332.057
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	52.00	605.805	2,231,410.009
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	19.20	2,693.982	779,986.512
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	336.00	63.775	17,028,510.193
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	802.00	31.887	5,522,565.123
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,840.00	22.321	28,327,849.940
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	480.00	3.189	692,424.360

Summary for Division ~ Chlorophyta (10 detail records) **Sum Total Chlorophyta** 22,323.477 63,741,465.128

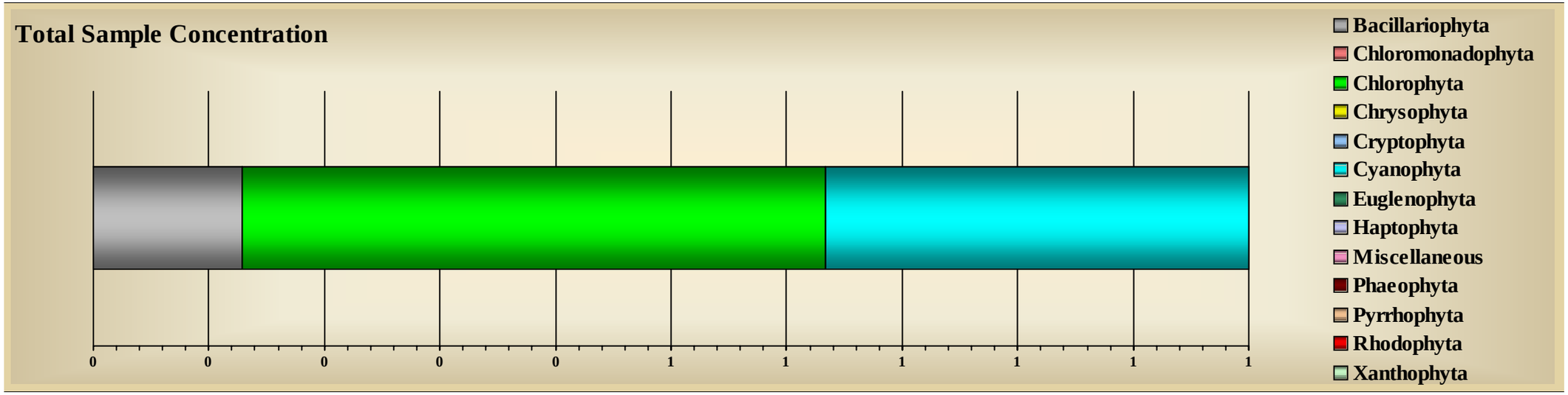
Division: Cyanophyta

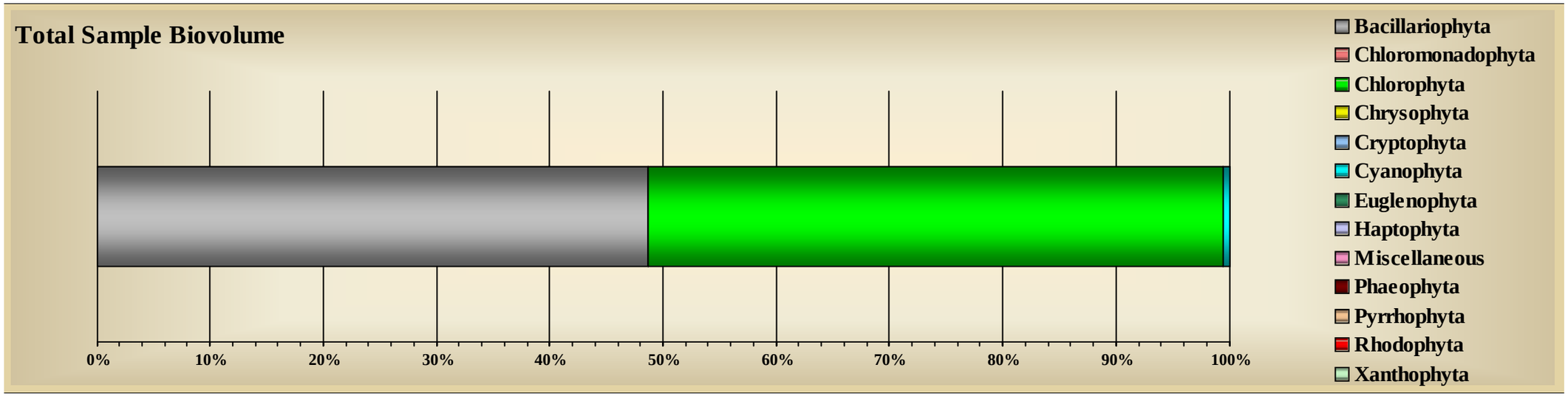
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	8.00	2,693.982	23,110.596
☑ 4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.00	5,387.964	63,193.279
4080	*Chroococcus*	*spp*	.	.	.	.	Vegetative	10.67	1,514.512	319,313.375
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	19.50	142,781.057	296,056.521
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	16.00	2,693.982	29,249.373
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	25.20	5,387.964	68,248.806
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	12.80	5,387.964	77,998.867

4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.20	137,393.092	158,840.154
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	226,294.505	90,993.021
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,131,472.525	303,347.784
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.80	145,475.039	497,248.231
Summary for Division ~ Cyanophyta (11 detail records)							**Sum Total Cyanophyta**		1,806,482.588	1,927,600.006

Total Richness ~ 40 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,467,917.791	258,965,461.042
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060018-222	**Sample ID:**	SEEP1-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 1 Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.84	608,851.049	44,094,515.086
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	18.40	4,141.844	344,765.427
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	32.00	4,141.844	14,989,808.034
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	29.33	37,276.595	45,677,818.571
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.40	8,283.688	11,204,529.291
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	32.00	4,141.844	1,000,934.557
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	86.67	2,062.364	35,857,642.545
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	12.18	132,539.004	5,641,668.491
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.72	86,978.721	30,978,419.647
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	9.60	4,141.844	290,271.187
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	412.473	186,598.318
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	42.13	12,425.532	6,169,138.521
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	20.00	4,141.844	772,151.113
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	24.00	412.473	147,000.921
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	44.00	412.473	2,309,154.397
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	32.00	4,141.844	799,456.633
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	24.00	12,425.532	1,798,777.113

9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	41.60	4,141.844	2,078,586.831
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.20	173,957.443	79,343,155.054
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	42.40	4,141.844	1,011,537.677
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.35	66,269.502	13,908,212.311
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	145.00	412.473	2,730,570.474
Summary for Division ~ Bacillariophyta (22 detail records)							**Sum Total**	**Bacillariophyta**	1,175,854.071	301,334,712.199

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.48	37,276.595	4,013,272.752
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	2,013.33	42.021	261,986,684.526
2211	*Dictyosphaerium*	*pulchellum*	.	.	.	.	Vegetative	24.00	4,141.844	672,343.030
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	570.00	33.617	6,600,712.622
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	11.20	8,283.688	1,021,527.805
2380	*Pediastrum*	*spp*	.	.	.	.	Vegetative	72.00	412.473	3,922,850.230
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	32.00	412.473	250,496.719
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	8.40	8,283.688	281,975.074
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	664.00	50.426	29,868,594.265
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	752.00	54.628	6,738,429.895
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,096.00	21.011	14,912,329.960
Summary for Division ~ Chlorophyta (11 detail records)							**Sum Total**	**Chlorophyta**	59,012.463	330,269,216.880

Division: Chrysophyta

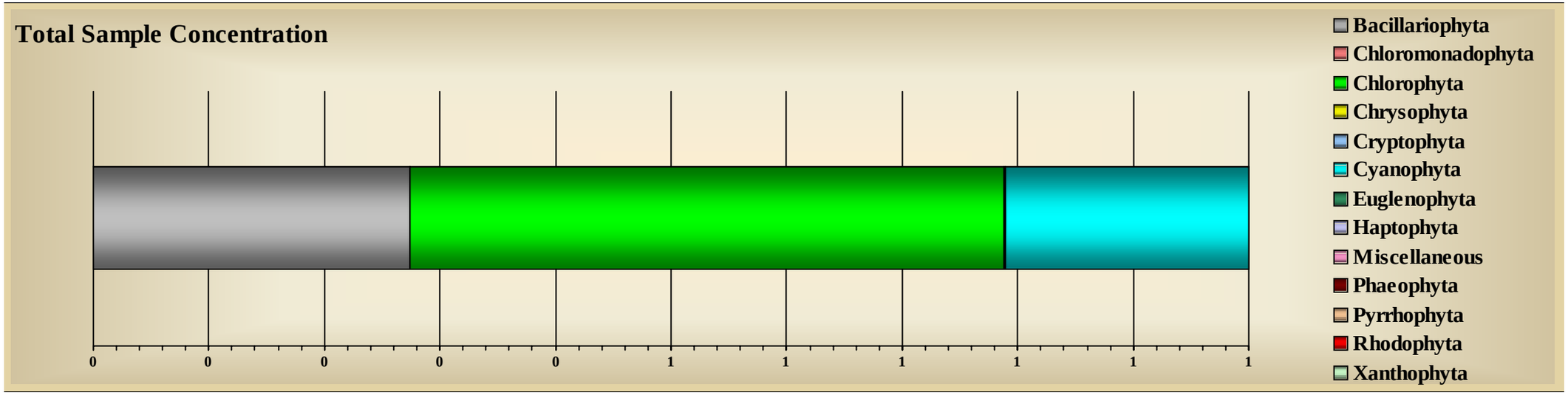
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	4.00	4,141.844	133,298.204
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	4,141.844	133,298.204

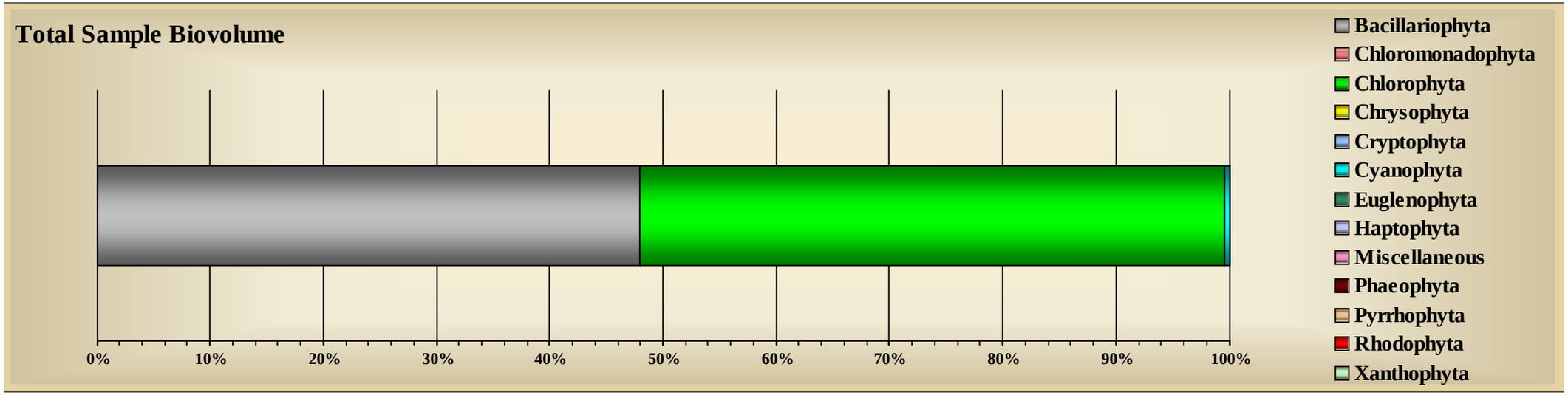
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	11.20	16,567.376	333,106.965
4080	*Chroococcus*	*spp*	.	.	.	.	Vegetative	8.00	4,141.844	17,765.611
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	16.00	115,971.628	191,202.424
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	29.33	33,134.751	899,389.799
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	10.67	12,425.532	149,897.886
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.27	99,404.253	169,881.868
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	74,553.190	29,977.838
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.13	136,680.848	757,266.569
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	410,042.543	109,932.406
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		902,921.964	2,658,421.365

Total Richness ~ 43 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,141,930.342	634,395,648.647
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060019-222	**Sample ID:**	SEEP1-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 1 Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.68	591,775.630	39,978,467.892
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.20	4,288.229	749,883.927
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	257.807	485,955.177
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	25,729.375	30,448,212.110
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	38.67	17,152.917	22,043,556.459
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	26.00	6,432.344	1,070,342.009
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	102.00	2,835.880	38,719,208.004
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.20	66,467.553	4,660,485.450
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	18.63	113,638.074	27,052,179.867
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	44.00	25,729.375	29,461,361.923
1161	*Gomphonema*	*parvulum*	.	.	.	.	Vegetative	24.00	2,144.115	869,421.104
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.60	2,144.115	496,626.900
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.00	12,864.688	1,541,612.824
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	20.00	2,144.115	129,329.991
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	18.93	6,432.344	734,594.246
1316	*Synedra*	*nana*	.	.	.	.	Vegetative	40.00	2,144.115	219,557.335
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	32.64	231,564.377	55,925,205.320

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.88	334,481.878	76,824,868.062
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	226.67	3,093.687	34,154,301.462

Summary for Division ~ Bacillariophyta (19 detail records) **Sum Total Bacillariophyta** 1,451,320.615 365,565,170.064

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	400.00	3.626	393,638.506
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	2.60	164,024.767	1,593,992.686
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	960.00	21.753	28,062,051.731
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	24.00	257.807	311,011.317
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	640.00	10.877	3,455,271.332
☑ 2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	582.22	32.630	3,622,932.178
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	56.00	1,031.229	1,201,857.488
8302	*Scenedesmus*	*quadricauda*	.	longispina	.	.	Vegetative	24.00	2,144.115	248,313.557
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	381.09	65.260	13,157,665.279
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	1,024.00	47.132	9,438,576.626
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,248.00	43.507	41,338,603.793
8211	*Uronema*	*elongatum*	.	.	.	.	Vegetative	40.00	21.753	43,737.612
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	600.00	10.877	1,312,128.354

Summary for Division ~ Chlorophyta (13 detail records) **Sum Total Chlorophyta** 167,715.332 104,179,780.458

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	4.80	2,144.115	120,052.622

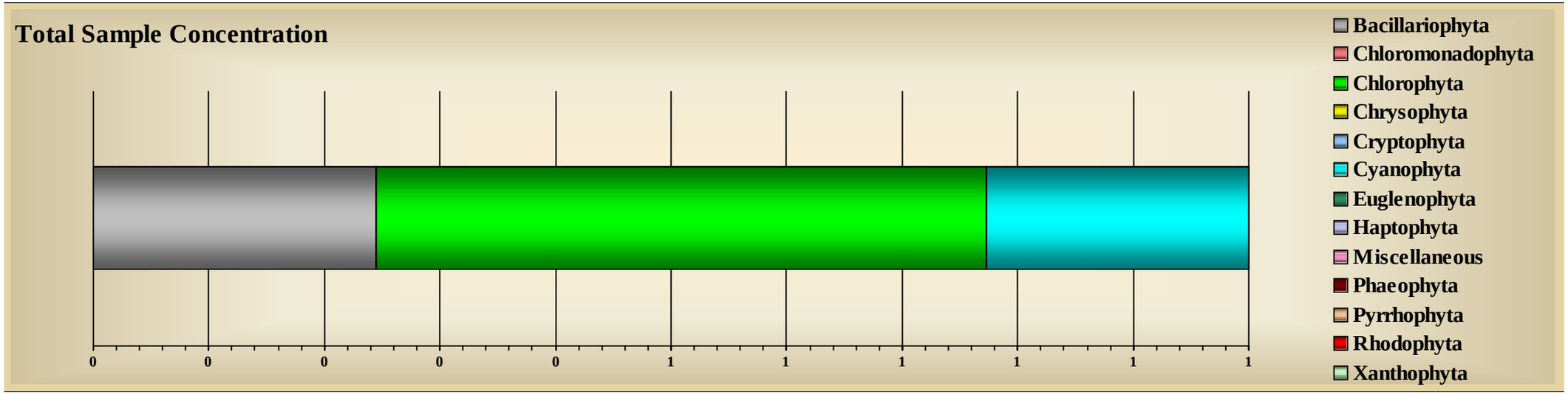
Summary for Division ~ Chrysophyta (1 detail record) **Sum Total Chrysophyta** 2,144.115 120,052.622

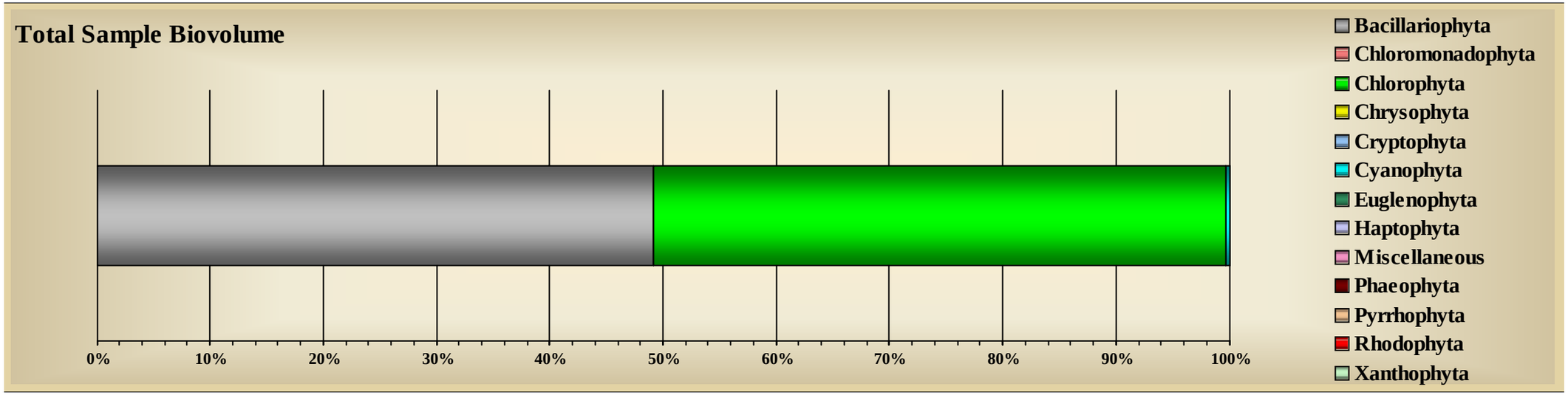
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4052	*Aphanocapsa*	*koordersi*	.	.	.	.	Vegetative	32.00	2,144.115	1,241,567.571
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	24.00	4,288.229	80,831.405
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.20	102,917.501	303,493.418
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	321,617.190	129,322.272
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	836,204.695	224,186.479
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	77,188.126	323,325.621
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total Cyanophyta**		1,344,359.856	2,302,726.766

Total Richness ~ 39 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,965,539.917	472,167,729.909
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060020-222	**Sample ID:**	SEEP1-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 1 Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.68	396,402.874	37,874,154.066
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	8.00	5,285.372	501,588.113
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	30.00	438.628	1,033,491.954
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.23	42,282.973	57,349,952.647
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	33.60	10,570.743	11,763,461.425
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.00	438.628	87,374.619
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	88.00	3,070.393	61,113,516.451
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.12	79,280.575	3,605,894.602
☑ 1115	*Cymbella*	*minuta*	.	.	.	.	Vegetative	9.60	5,285.372	168,861.282
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.00	42,282.973	19,886,181.264
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	15.20	10,570.743	2,776,469.156
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	41.80	21,141.487	7,642,844.033
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	44.00	21,141.487	12,128,801.113
1169	*Gomphonema*	*clavatum*	.	.	.	.	Vegetative	50.00	1,315.883	1,703,582.822
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	24.00	438.628	156,322.186
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	32.00	5,285.372	2,082,866.662
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	20.00	10,570.743	1,487,762.355

9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.00	438.628	110,239.136
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	16.00	5,285.372	369,815.341
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	20.00	5,285.372	828,895.852
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	22.40	5,285.372	1,140,589.546
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	35.49	216,700.238	90,975,462.291
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	29.20	21,141.487	3,555,828.919
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	30.64	142,705.035	29,673,514.107
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	163.33	3,070.393	25,746,270.730
Summary for Division ~ Bacillariophyta (25 detail records)							**Sum Total**	**Bacillariophyta**	1,055,714.768	373,763,740.670

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.49	52,853.717	1,358,076.247
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,260.00	31.280	111,395,334.030
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	228.00	4.469	920,927.034
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	464.00	26.812	3,537,707.510
2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	30.00	438.628	137,798.942
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	20.00	877.255	212,210.317
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	417.78	44.686	11,111,022.103
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	1,160.00	22.343	5,103,283.467
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,160.00	22.343	14,936,987.259
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	1,360.00	17.874	7,636,955.892
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total**	**Chlorophyta**	54,339.406	156,350,302.801

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	8.00	438.628	111,782.491

Summary for Division ~ Chrysophyta (1 detail record)	**Sum Total Chrysophyta**	438.628	111,782.491

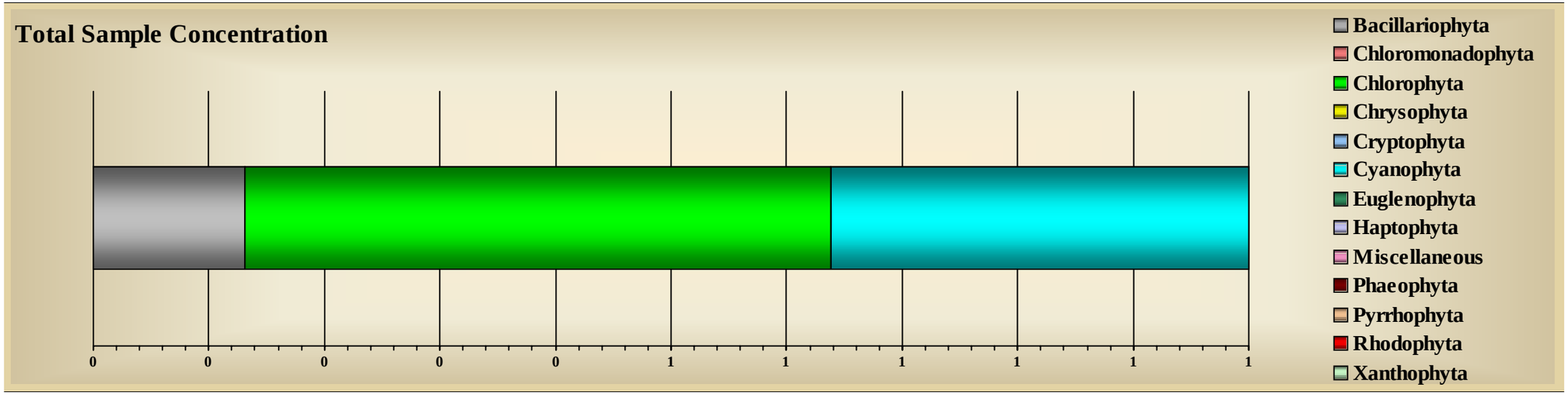
Division: Cyanophyta

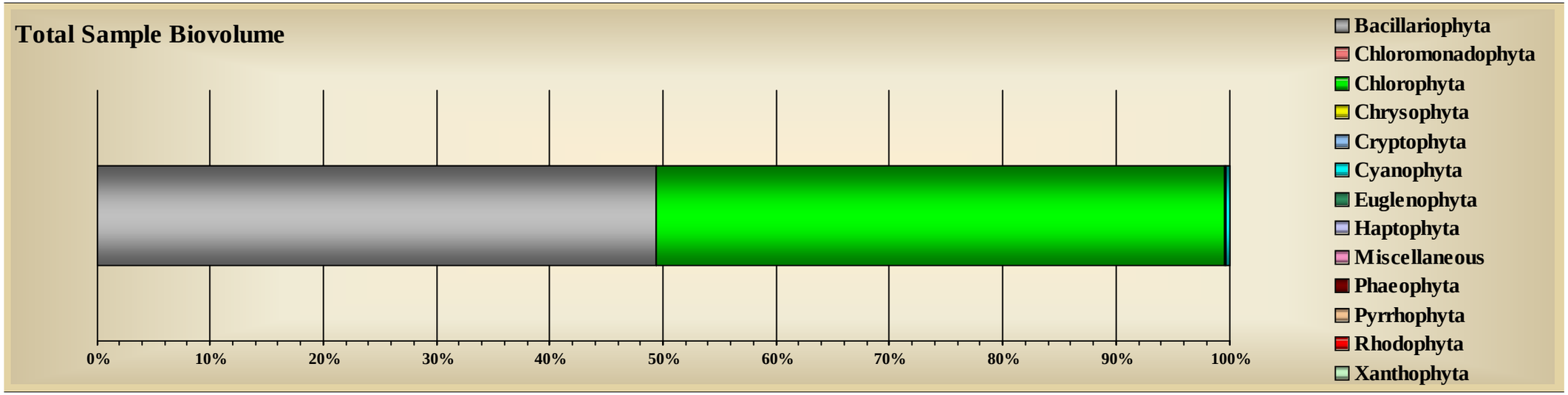
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	18.16	301,266.185	596,657.678
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	24.00	5,285.372	103,611.783
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	6.40	10,570.743	76,513.154
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	317,122.300	797,023.475
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	634,244.599	255,029.753
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.20	63,424.460	378,314.218
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,585,611.497	425,102.442

Summary for Division ~ Cyanophyta (7 detail records)	**Sum Total Cyanophyta**	2,917,525.155	2,632,252.505

Total Richness ~ 43 Taxa	Total Sample Concentration	Total Sample Biovolume
	4,028,017.957	532,858,078.467
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060021-222	**Sample ID:**	SEEP1-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/27/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 1 Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.08	371,560.422	25,953,086.760
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	19.20	7,431.208	448,240.089
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	8.80	14,862.417	1,859,896.225
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	26.00	1,480.100	4,352,280.058
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.00	37,156.042	48,050,390.700
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	35.20	14,862.417	15,937,457.108
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.08	96,605.710	6,076,257.627
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	18.00	118,899.335	37,771,607.837
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	28.00	7,431.208	1,673,429.370
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	46.93	29,724.834	16,096,794.107
1169	*Gomphonema*	*clavatum*	.	.	.	.	Vegetative	40.00	740.050	862,282.691
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	34.40	7,431.208	6,492,534.603
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	20.00	7,431.208	1,362,287.645
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.80	7,431.208	753,042.994
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	25.60	14,862.417	2,294,989.020
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	35.93	349,266.797	134,524,856.770
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	33.60	7,431.208	1,438,206.357

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.24	208,073.836	51,913,922.785
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	260.00	740.050	9,620,651.257

Summary for Division ~ Bacillariophyta (19 detail records) **Sum Total Bacillariophyta** 1,303,421.677 367,482,214.002

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	280.00	3.770	298,440.037
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.37	89,174.501	2,358,594.219
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,280.00	3.770	16,371,567.752
2211	*Dictyosphaerium*	*pulchellum*	.	.	.	.	Vegetative	11.20	7,431.208	502,626.132
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	352.00	3.770	600,290.818
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	390.40	18.849	3,863,993.167
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	48.00	1,480.100	2,969,740.669
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	24.00	740.050	223,193.855
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	499.56	30.158	11,181,174.420
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	240.00	740.050	7,030,606.316
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	1,548.00	49.006	26,800,862.762
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	300.00	7.539	1,244,921.298

Summary for Division ~ Chlorophyta (12 detail records) **Sum Total Chlorophyta** 99,682.771 73,446,011.444

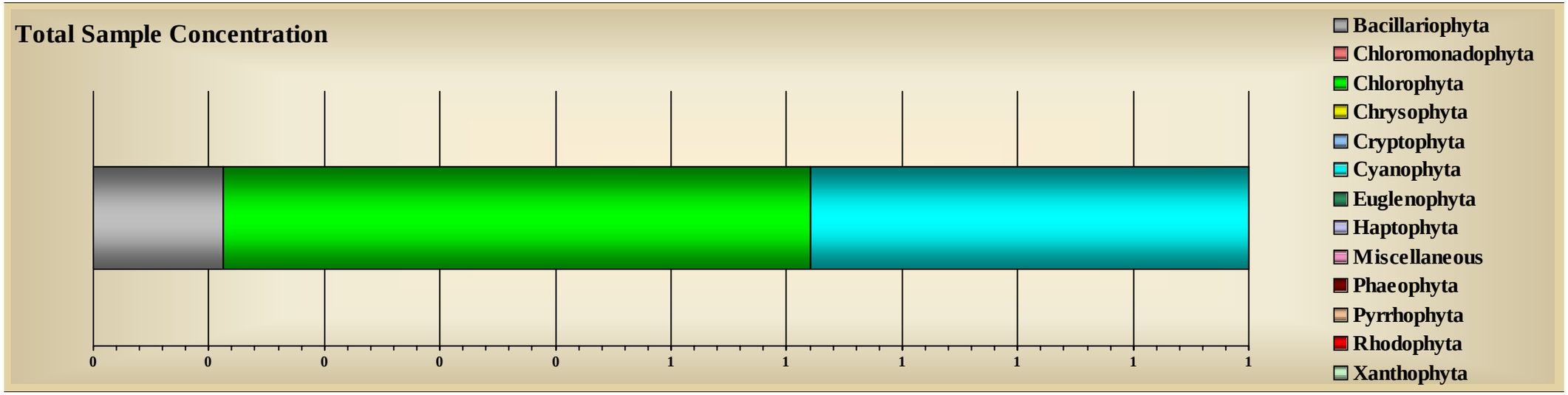
Division: Cyanophyta

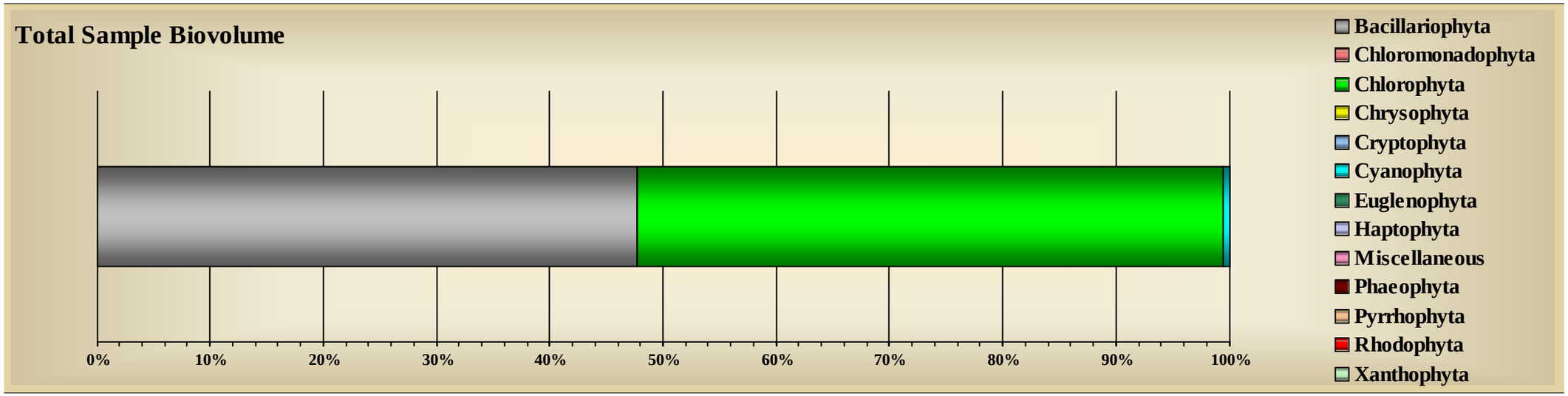
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	20.00	740.050	334,790.745
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	16.18	713,396.010	1,083,719.879
4157	*Lyngbya*	*diguetii*	.	.	.	.	Vegetative	56.00	7,431.208	597,653.453
4309	*Lyngbya*	*perelegans*	.	.	.	.	Vegetative	8.00	7,431.208	67,236.088
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	80.00	740.050	50,218.616

4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	40.00	7,431.208	149,413.363
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	11.20	22,293.625	125,506.423
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	111,468.127	168,093.935
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	2,273,949.783	914,355.208
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	312,110.755	669,383.935
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	936,332.263	251,030.680
Summary for Division ~ Cyanophyta (11 detail records)							**Sum Total Cyanophyta**		4,393,324.288	4,411,402.323

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	5,796,428.736	445,339,627.769
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060022-222	**Sample ID:**	SEEP2-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 2 Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.68	442,669.251	38,253,883.049
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	28.00	4,339.895	977,298.265
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	20.00	173.942	174,865.789
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	33.14	15,189.631	20,621,883.758
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	36.40	8,679.789	10,141,326.863
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.00	6,509.842	666,607.813
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	96.00	1,739.422	26,717,525.851
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.17	32,549.210	1,767,464.396
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	18.64	47,738.841	14,001,028.631
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	2,169.947	628,263.108
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	48.00	2,169.947	837,684.072
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	34.30	23,869.420	19,859,221.708
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	28.80	2,169.947	1,184,339.013
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	24.00	4,339.895	833,988.435
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.60	2,169.947	502,610.356
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.00	8,679.789	1,084,917.235
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	18.00	4,339.895	602,085.298

1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	25.33	6,509.842	785,329.102
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.92	130,196.839	40,701,406.545
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.12	81,373.024	19,387,871.613
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	226.00	695.769	12,131,426.582
Summary for Division ~ Bacillariophyta (21 detail records)							**Sum Total**	**Bacillariophyta**	828,274.084	211,861,027.482

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2687	*Chlorococcaceae	*spp*	.	.	.	> 1 um ovoid	Vegetative	12.00	347.885	139,892.652
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	320.00	7.339	601,998.166
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	3.33	52,078.735	1,216,970.681
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	16.00	173.942	69,946.326
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	586.67	11.008	3,976,433.960
☑ 2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	512.00	55.039	7,336,852.641
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	68.00	521.827	3,307,522.622
8302	*Scenedesmus*	*quadricauda*	.	longispina	.	.	Vegetative	15.43	1,391.538	139,093.249
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	233.60	44.031	6,574,174.082
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	32.00	173.942	437,164.491
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	548.57	33.023	4,426,061.879
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	848.00	66.046	39,960,948.062
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	240.00	11.008	531,174.852
Summary for Division ~ Chlorophyta (13 detail records)							**Sum Total**	**Chlorophyta**	54,915.361	68,718,233.661

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	4.80	4,339.895	325,835.816

Summary for Division ~ Chrysophyta (1 detail record)	**Sum Total Chrysophyta**	4,339.895	325,835.816

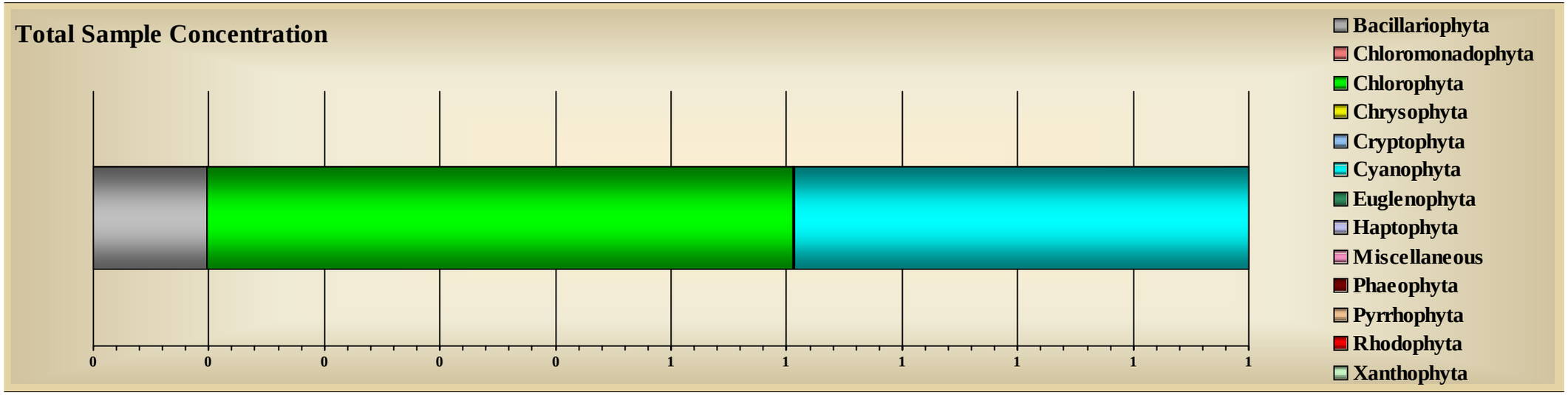
Division: Cyanophyta

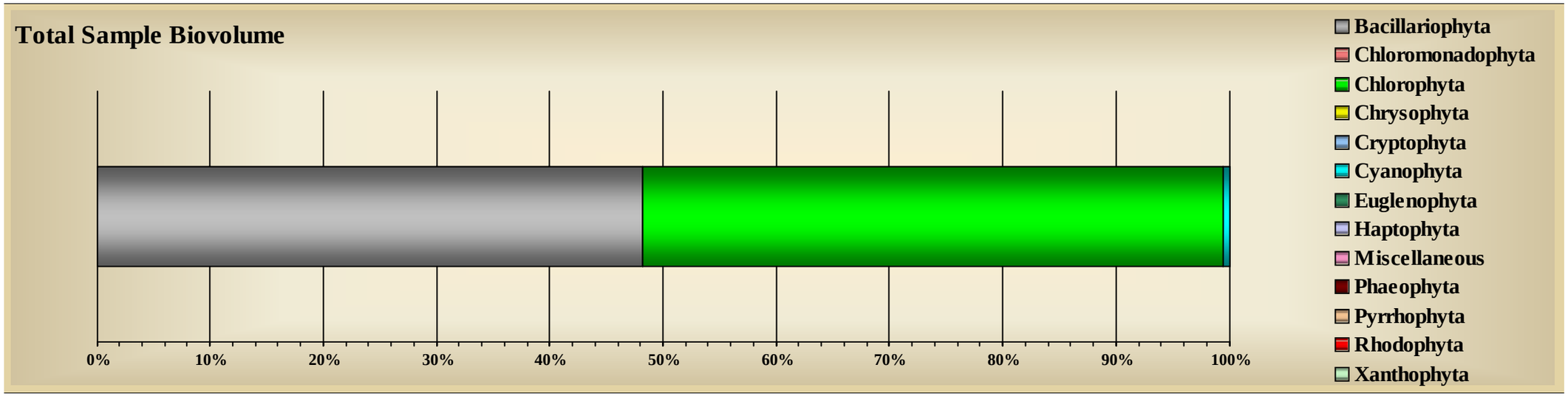
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4157	*Lyngbya*	*diguetii*	.	.	.	.	Vegetative	160.00	2,169.947	558,456.120
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	40.00	6,509.842	147,249.369
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	25.60	6,509.842	83,768.646
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	52,078.735	167,537.292
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	1,367,066.804	549,697.562
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.20	39,059.052	223,163.891
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,822,755.739	488,680.814

Summary for Division ~ Cyanophyta (7 detail records)	**Sum Total Cyanophyta**	3,296,149.961	2,218,553.694

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	4,183,679.301	283,123,650.653
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060023-222	**Sample ID:**	SEEP2-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 2 Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.84	160,291.941	10,635,434.404
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	2,195.780	476,806.823
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	22.40	2,195.780	2,991,521.030
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	31.07	15,370.460	21,055,273.952
☑ 1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	32.00	6,587.340	5,962,066.432
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	96.00	364.451	9,078,039.323
☑ 1113	*Cymbella*	*hustedtii*	.	.	.	.	Vegetative	22.40	2,195.780	663,151.255
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.44	54,894.500	2,314,807.759
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	19.47	8,783.120	4,356,252.764
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	17.60	2,195.780	521,047.399
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	17.60	2,195.780	951,847.580
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	22.40	2,195.780	1,186,719.190
1169	*Gomphonema*	*clavatum*	.	.	.	.	Vegetative	40.00	2,195.780	1,637,409.625
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	28.00	2,195.780	1,010,289.803
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	20.00	364.451	103,046.104
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	28.00	4,391.560	1,011,815.431
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.60	68,069.180	24,673,559.966

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.28	41,719.820	10,537,158.317
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	260.00	364.451	3,411,262.207

Summary for Division ~ Bacillariophyta (19 detail records) **Sum Total Bacillariophyta** 378,767.516 102,577,509.364

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	3.713	214,999.345
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	2.64	10,978.900	138,847.953
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	960.00	14.852	44,791,530.155
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	140.00	7.426	169,834.552
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	352.00	11.139	980,934.511
8221	*Scenedesmus*	*quadricauda*	.	quadrispina	.	.	Vegetative	20.00	728.902	146,554.457
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	443.33	51.981	38,750,583.576
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	855.00	40.842	10,294,236.747
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,738.67	14.852	21,698,012.575
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	480.00	3.713	358,332.241

Summary for Division ~ Chlorophyta (10 detail records) **Sum Total Chlorophyta** 11,856.319 117,543,866.113

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	4.80	2,195.780	122,945.456

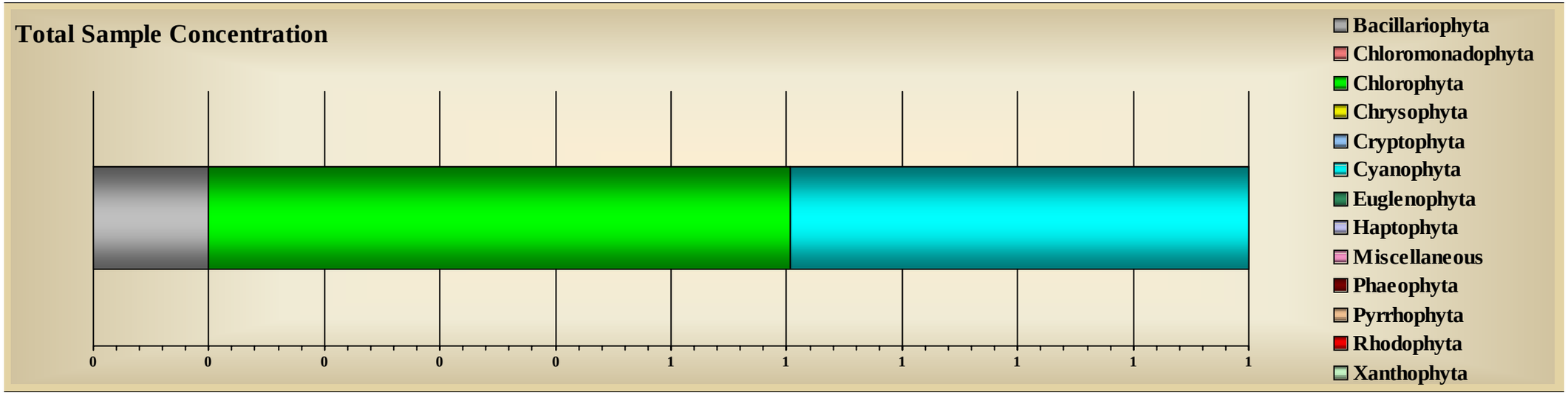
Summary for Division ~ Chrysophyta (1 detail record) **Sum Total Chrysophyta** 2,195.780 122,945.456

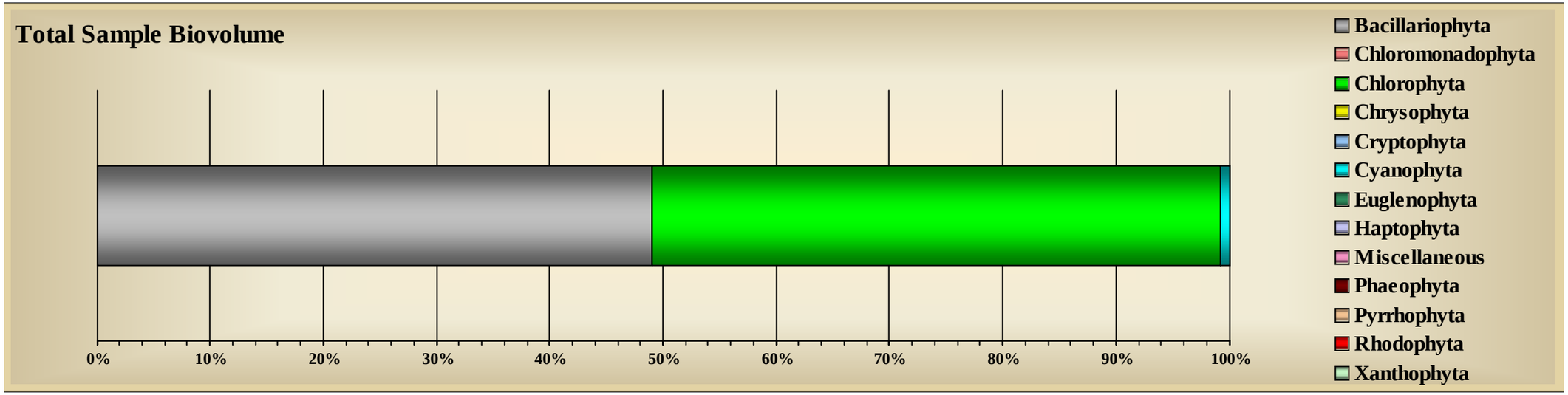
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	8.00	2,195.780	18,836.718
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	2,195.780	52,978.463
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	20.88	111,984.781	248,796.587
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	44.00	4,391.560	125,161.657
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	6.40	2,195.780	15,893.495
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.16	171,270.841	244,489.126
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	461,113.803	185,413.860
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	658,734.004	176,606.587
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.10	92,222.761	547,000.860
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		1,506,305.090	1,615,177.352

Total Richness ~ 39 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,899,124.704	221,859,498.286
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060024-222	**Sample ID:**	SEEP2-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 2 Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.70	336,651.825	24,634,160.659
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	25.60	3,117.147	722,003.766
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	2,328.199	5,434,490.534
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	33.80	12,468.586	22,945,071.222
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	36.00	3,117.147	2,370,028.850
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.80	9,351.440	2,389,659.392
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	84.00	1,552.133	24,824,192.422
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	12.96	62,342.931	2,850,312.553
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.93	37,405.758	13,821,674.592
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	17.60	3,117.147	739,682.974
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	15.73	9,351.440	3,692,748.833
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	20.80	6,234.293	1,286,069.198
1169	*Gomphonema*	*clavatum*	.	.	.	.	Vegetative	32.00	3,117.147	1,704,157.100
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	22.40	3,117.147	2,343,254.743
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	24.40	6,234.293	2,157,240.582
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	24.00	3,117.147	921,306.946
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.80	9,351.440	1,421,445.002

9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	38.40	3,117.147	7,220,038.905
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.00	3,117.147	225,626.235
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	27.00	15,585.733	2,933,141.370
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	36.15	134,037.301	45,980,155.661
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	36.00	6,234.293	1,292,743.009
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.52	87,280.103	19,662,461.567
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	200.00	776.066	5,587,678.366
Summary for Division ~ Bacillariophyta (24 detail records)							**Sum Total**	**Bacillariophyta**	762,123.005	197,159,344.481

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.43	68,577.224	2,600,071.146
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,960.00	27.672	129,265,867.613
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	16.00	776.066	312,074.863
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	1,200.00	7.906	6,485,813.567
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	4.80	6,234.293	160,445.143
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	40.00	776.066	1,480,707.527
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	774.55	79.063	91,983,519.052
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	11.00	1,552.133	482,740.798
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	1,306.67	23.719	8,878,252.149
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	2,320.00	7.906	14,752,046.544
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total**	**Chlorophyta**	78,062.049	256,401,538.403

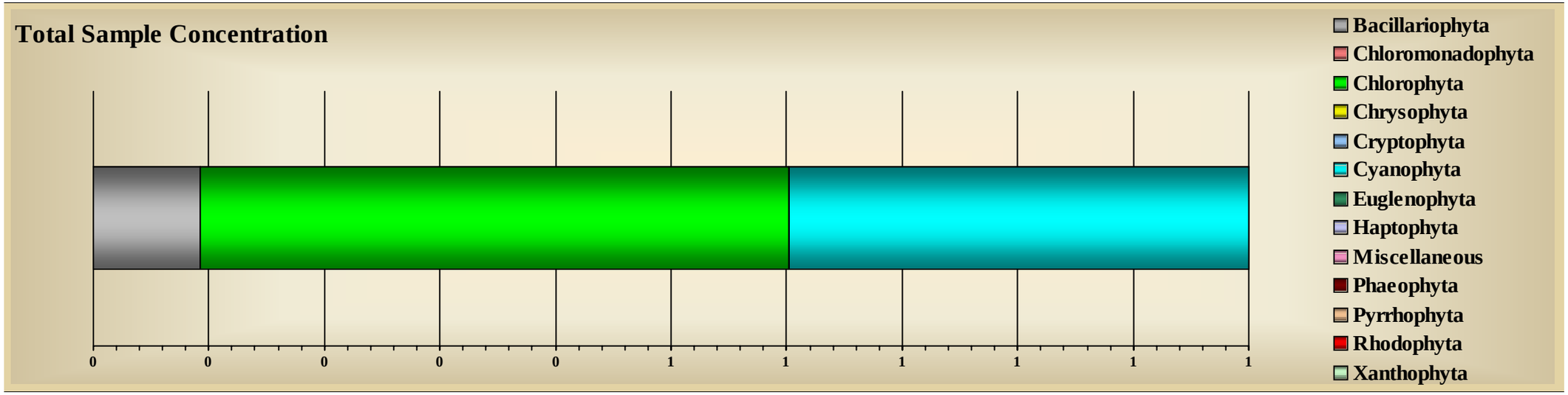
Division: Cyanophyta

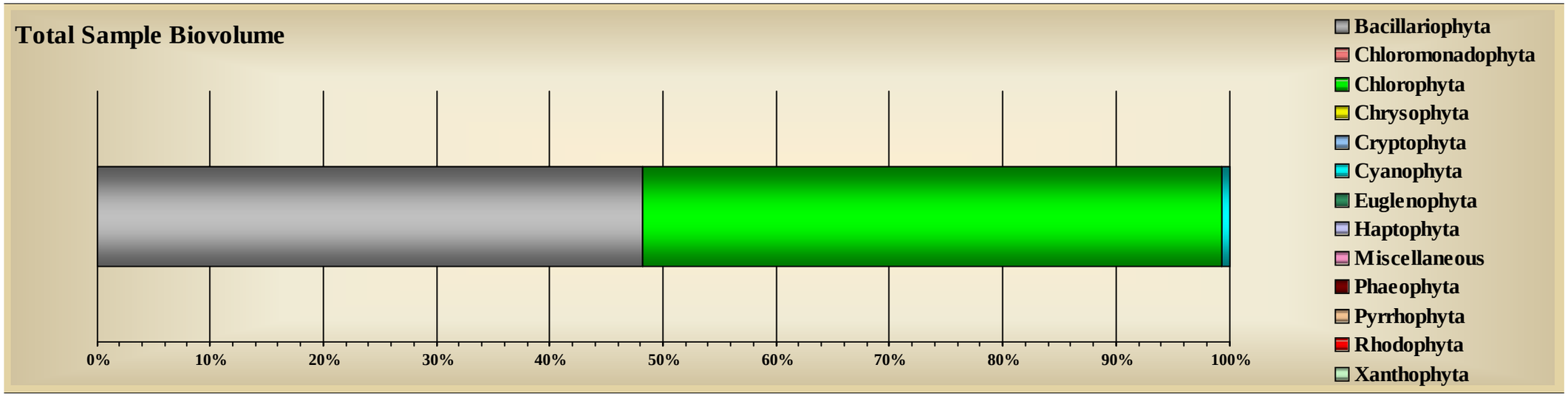
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	16.00	6,234.293	80,222.883
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.00	3,117.147	10,027.860

1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	16.67	149,623.033	288,293.661
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	40.00	15,585.733	669,828.032
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	29.87	9,351.440	140,389.422
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	4.80	3,117.147	16,922.053
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	84,162.956	152,301.286
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	1,683,259.126	676,838.495
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	65,460.077	140,392.227
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,262,444.345	338,461.329
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		3,282,355.296	2,513,677.248

Total Richness ~ 44 Taxa	Total Sample Concentration	Total Sample Biovolume
	4,122,540.350	456,074,560.132
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060025-222	**Sample ID:**	SEEP2-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 2 Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.28	604,640.318	57,843,097.392
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	20.80	4,288.229	403,509.503
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.00	2,144.115	5,099,910.803
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	30.63	21,441.146	28,190,115.518
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.80	6,432.344	9,067,718.160
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	20.00	2,144.115	182,964.375
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	96.00	4,124.916	81,662,329.671
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.16	87,908.699	4,510,305.231
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	18.48	94,341.043	22,341,572.093
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	12.00	2,144.115	323,324.763
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	46.40	6,432.344	3,052,187.017
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	34.04	36,449.948	23,922,494.686
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	23.47	6,432.344	4,531,959.287
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.20	4,288.229	1,557,132.355
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	11.20	4,288.229	358,675.209
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	32.00	2,144.115	413,855.928
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	13.87	6,432.344	413,855.714

1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	20.27	6,432.344	863,924.237
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	24.00	2,144.115	387,989.759
1754	*Rhopalodia*	*gibba*	.	minuta	.	.	Vegetative	120.00	2,144.115	49,400,400.431
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	33.84	257,293.752	66,749,821.063
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	36.64	167,240.939	63,963,638.478
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	205.33	2,578.072	57,611,321.796

Summary for Division ~ Bacillariophyta (23 detail records) **Sum Total Bacillariophyta** 1,333,909.927 482,852,103.469

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	3.20	38,594.063	724,248.464
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,253.33	10.877	26,971,527.276
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	80.00	3.626	58,316.816
☑ 2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	416.00	47.132	7,277,938.603
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	32.00	2,144.115	1,627,863.479
8302	*Scenedesmus*	*quadricauda*	.	longispina	.	.	Vegetative	16.00	343.743	57,594.685
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	353.45	50.758	15,553,094.758
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	80.00	171.872	414,681.756
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	672.00	21.753	2,449,306.261
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	360.00	7.251	1,716,701.263

Summary for Division ~ Chlorophyta (10 detail records) **Sum Total Chlorophyta** 41,395.189 56,851,273.361

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	4.80	2,144.115	120,052.622

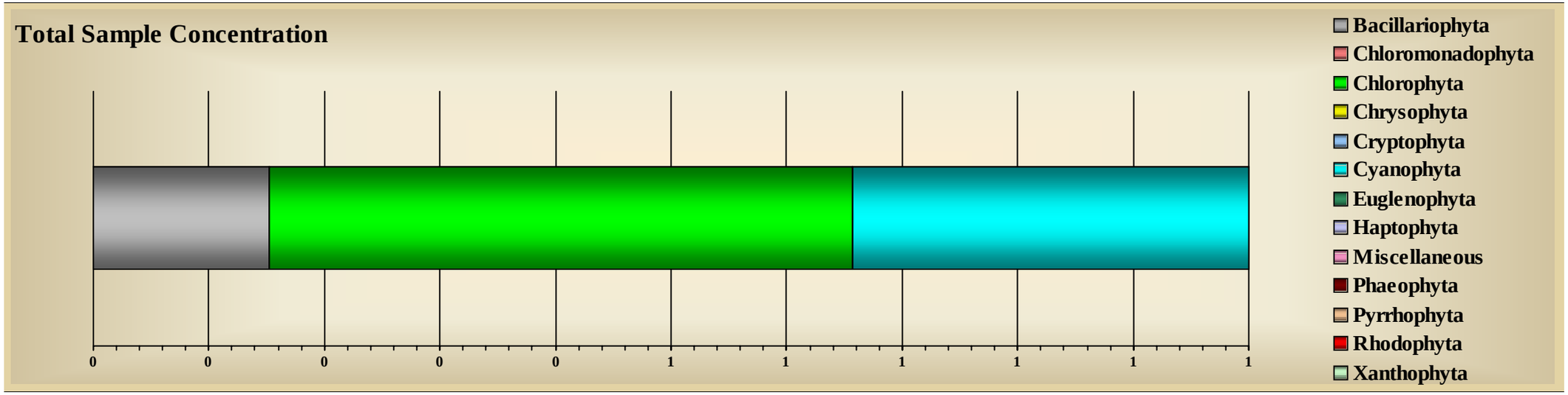
Summary for Division ~ Chrysophyta (1 detail record) **Sum Total Chrysophyta** 2,144.115 120,052.622

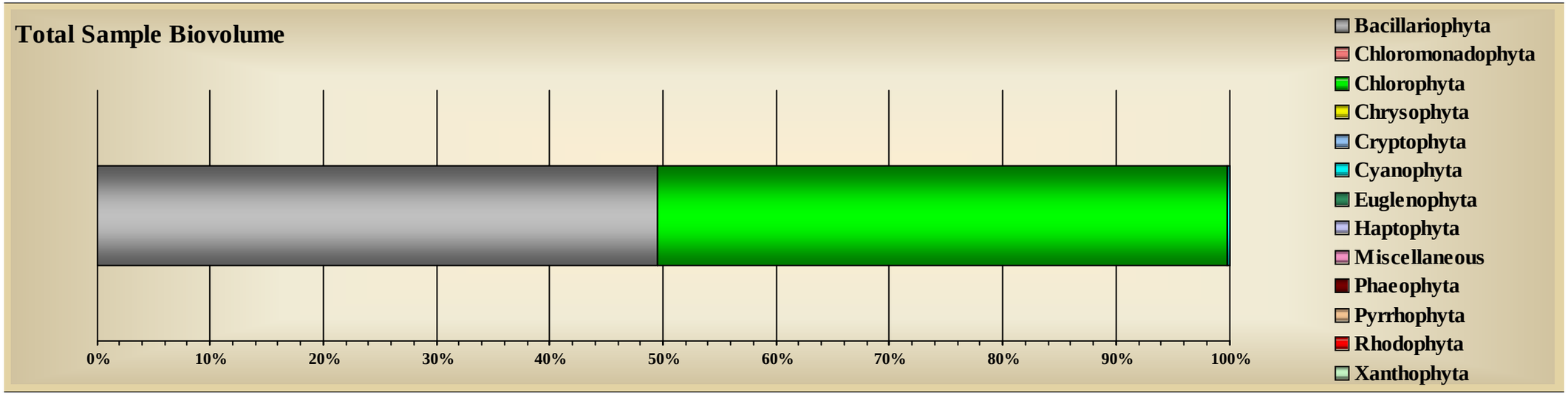
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	8.00	2,144.115	4,490.634
4052	*Aphanocapsa*	*koordersi*	.	.	.	.	Vegetative	80.00	171.872	364,466.374
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	32.00	6,432.344	102,386.189
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	4,288.229	80,831.405
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	25,729.375	68,975.309
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	836,204.695	336,237.908
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.20	19,297.031	110,253.589
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	2,122,673.456	569,088.754
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		3,016,941.117	1,636,730.162

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	4,394,390.346	541,460,159.613
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060026-222	**Sample ID:**	SEEP2-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 2 Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.28	223,969.561	13,401,442.679
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	33.60	13,174.680	26,390,170.059
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	33.33	1,822.256	1,263,430.386
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	27.20	8,783.120	1,248,654.898
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	91.00	728.902	7,189,891.113
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.40	48,307.160	2,941,509.944
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.40	26,349.360	10,934,502.277
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	14.00	364.451	144,264.575
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	40.00	4,391.560	2,207,438.728
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	68.00	364.451	2,179,997.873
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	40.00	364.451	849,293.533
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	20.00	364.451	106,161.687
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	28.00	4,391.560	1,112,549.034
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	15.47	13,174.680	962,443.317
1220	*Nitzschia*	*spp*	.	.	.	.	Vegetative	38.40	4,391.560	5,425,001.696
9117	*Nitzschia*	*intermedia*	.	.	.	.	Vegetative	64.00	364.451	586,217.903
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.00	8,783.120	676,359.091

1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	20.00	8,783.120	905,049.580
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	24.00	8,783.120	1,059,571.011
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	128.00	4,391.560	2,248,478.735
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	35.12	193,228.641	62,698,829.511
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.10	118,572.121	33,119,754.487
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	202.00	2,551.158	28,766,853.476
Summary for Division ~ Bacillariophyta (23 detail records)								**Sum Total**	**Bacillariophyta** 696,399.495	206,417,865.592

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.60	8,783.120	222,509.807
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,920.00	3.713	62,185,574.367
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	16.00	364.451	146,554.494
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	280.00	7.426	1,672,217.126
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	200.00	7.426	147,438.787
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	16.00	364.451	167,857.681
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	400.00	55.694	19,855,245.475
☑ 130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	40.00	364.451	732,772.397
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	1,005.00	37.129	9,623,180.306
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	608.00	7.426	4,909,151.705
Summary for Division ~ Chlorophyta (10 detail records)								**Sum Total**	**Chlorophyta** 9,995.287	99,662,502.144

Division: Chrysophyta

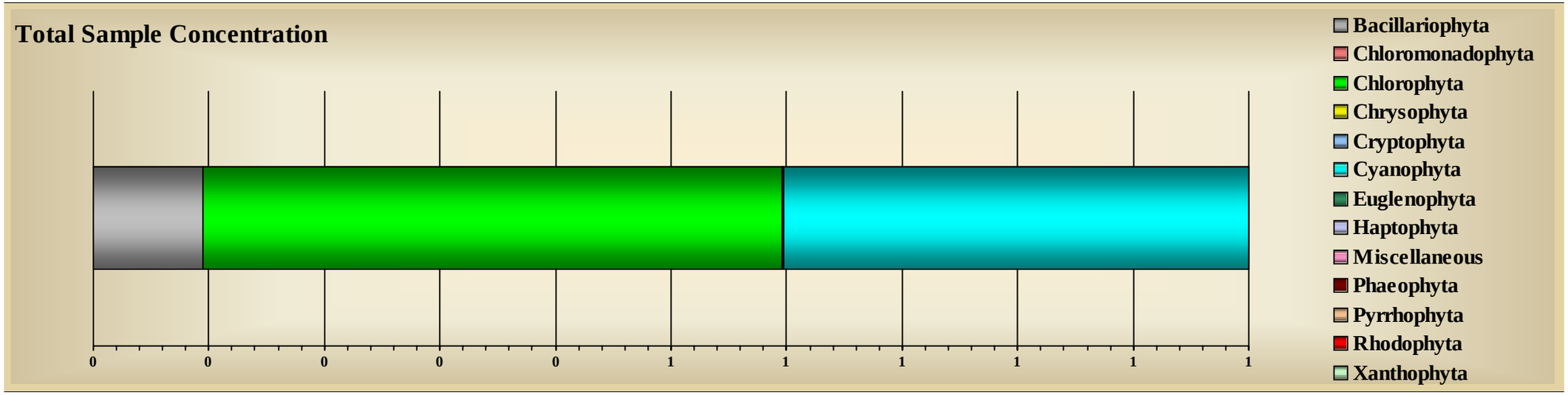
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	6.00	1,822.256	192,581.787
Summary for Division ~ Chrysophyta (1 detail record)								**Sum Total**	**Chrysophyta** 1,822.256	192,581.787

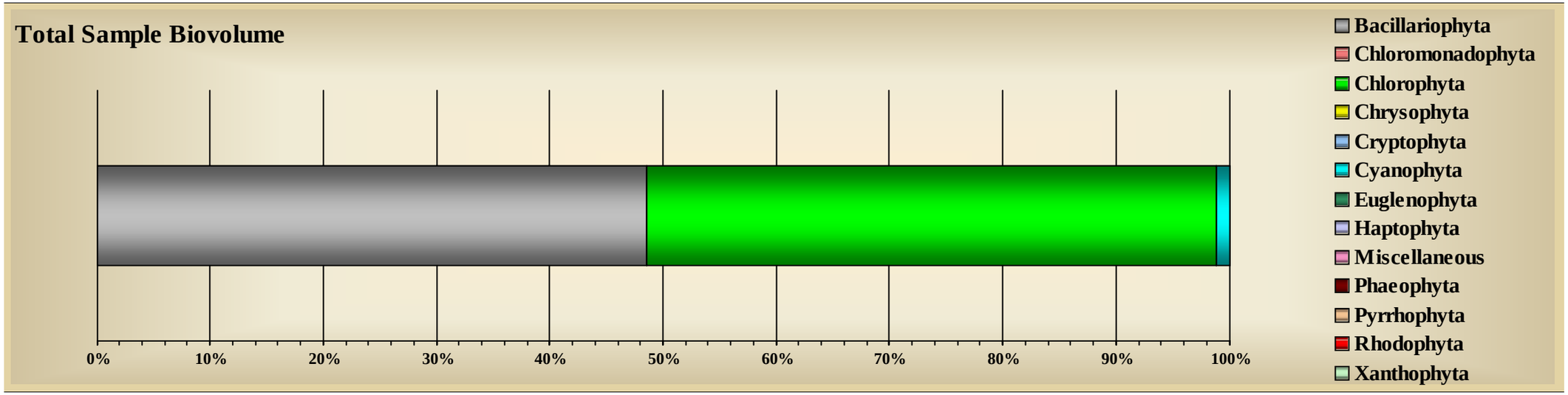
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4080	*Chroococcus*	*spp*	.	.	.	.	Vegetative	24.00	8,783.120	1,205,556.128
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	18.72	303,017.642	651,912.155
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	80.00	8,783.120	615,875.013
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	19.20	8,783.120	84,765.892
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	9.60	4,391.560	21,191.473
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.67	276,668.282	562,466.617
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	856,354.206	344,340.026
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,251,594.608	335,552.514
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.94	237,144.242	1,026,265.420
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		2,955,519.899	4,847,925.237

Total Richness ~ 43 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,663,736.937	311,120,874.761
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060027-222	**Sample ID:**	SEEP2-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	Seep 2 Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.52	123,859.215	9,697,371.418
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	2,135.504	2,836,951.106
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	43.20	2,135.504	2,810,418.540
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.00	2,135.504	267,877.584
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	100.00	425.336	11,909,404.106
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	12.40	59,794.104	2,385,258.546
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.14	36,303.563	14,187,693.767
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	17.60	2,135.504	925,718.431
109195	*Eucocconeis*	*flexella*	.	.	.	.	Vegetative	12.80	4,271.007	879,346.609
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	34.67	6,406.511	4,963,499.571
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	22.40	4,271.007	640,061.284
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	13.20	4,271.007	354,228.812
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	36.00	425.336	1,154,504.482
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	12.00	2,135.504	154,572.670
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	28.00	8,542.015	2,359,809.321
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	34.98	98,233.170	37,033,404.177
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	30.40	49,116.585	12,853,265.127

1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	210.00	850.672	9,493,496.416

Summary for Division ~ Bacillariophyta (18 detail records) **Sum Total Bacillariophyta** 407,447.047 114,906,881.964

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	2.80	36,303.563	481,751.910
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,528.00	34.666	201,723,233.576
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	240.00	4.333	209,097.402
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	160.00	8.666	1,115,186.144
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	4.80	6,406.511	92,743.858
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	908.00	90.997	103,043,199.682
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	448.00	25.999	2,373,255.511
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,413.33	13.000	11,639,755.376

Summary for Division ~ Chlorophyta (8 detail records) **Sum Total Chlorophyta** 42,887.735 320,678,223.458

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	4.80	2,135.504	119,570.483

Summary for Division ~ Chrysophyta (1 detail record) **Sum Total Chrysophyta** 2,135.504 119,570.483

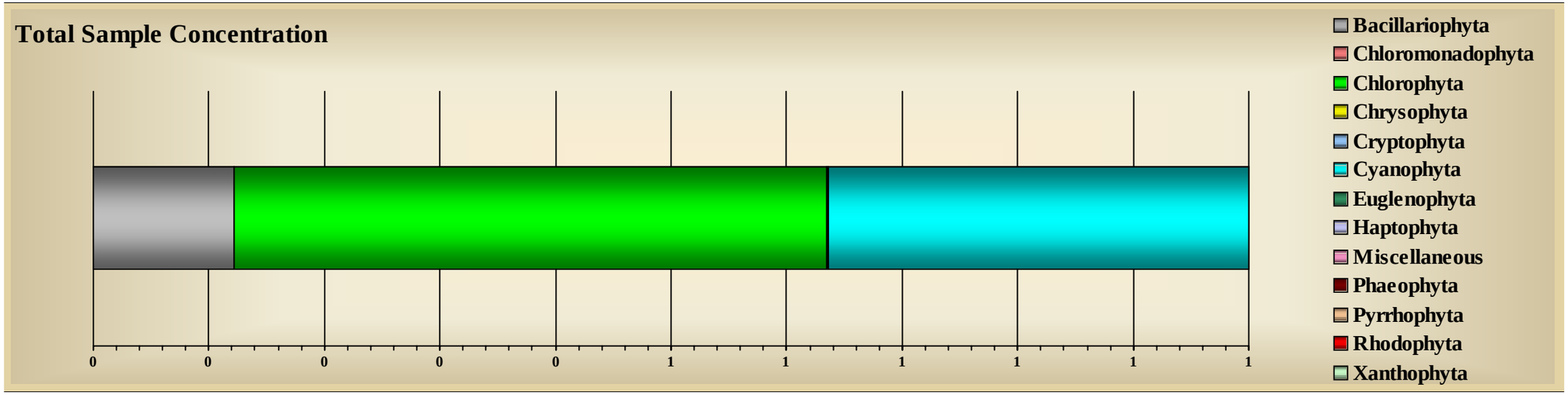
Division: Cyanophyta

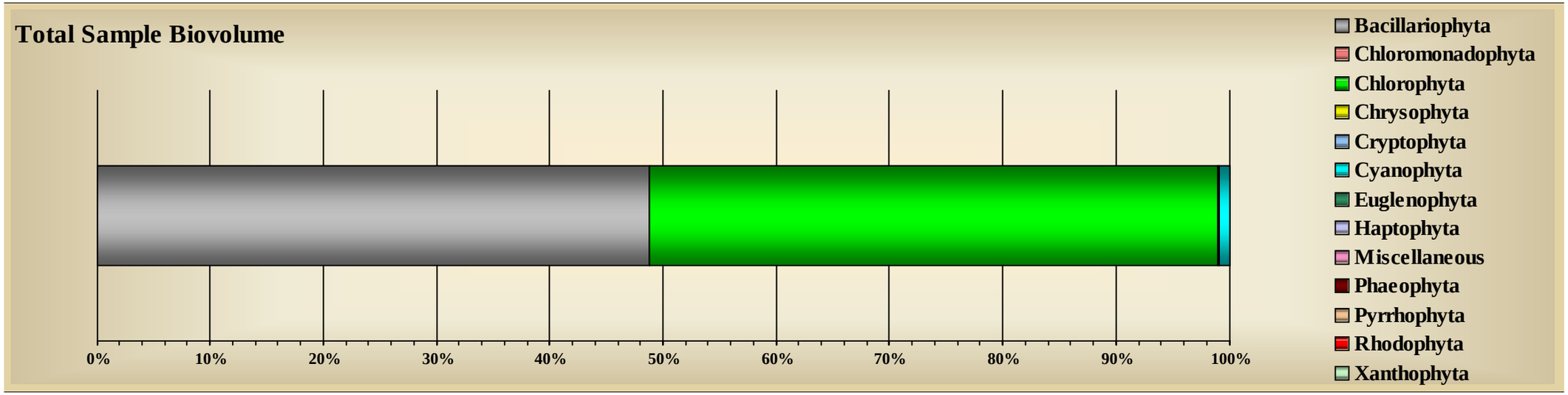
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	4,271.007	77,286.442
☑ 4069	*Aphanothece*	*stagnina*	.	.	.	.	Vegetative	48.00	2,135.504	536,710.593
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	30.40	147,349.755	503,656.199

107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	62.40	8,542.015	479,175.425
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	16.00	2,135.504	17,174.789
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	32,032.556	48,305.094
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	192,195.333	77,281.743
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	768,781.332	206,110.275
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.80	57,658.600	197,082.860
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		1,215,101.605	2,142,783.419

Total Richness ~ 36 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,667,571.890	437,847,459.323
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060028-222	**Sample ID:**	WCKD-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.40	553,336.564	40,774,928.700
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	21.60	8,783.120	712,561.356
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	25.00	880.065	1,916,701.206
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	33.33	13,174.680	16,213,030.076
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	33.60	4,391.560	4,910,677.556
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	94.67	528.039	6,158,106.972
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.17	74,656.521	2,999,684.062
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	19.20	79,048.081	21,018,781.845
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	12.80	4,391.560	1,017,187.626
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	36.80	21,957.800	10,525,067.474
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	64.00	176.013	4,113,423.640
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	19.20	8,783.120	1,564,224.497
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.60	4,391.560	1,017,187.626
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	14.80	8,783.120	816,751.996
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	56.00	176.013	557,384.731
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	44.00	176.013	1,167,853.724
9117	*Nitzschia*	*intermedia*	.	.	.	.	Vegetative	128.00	176.013	1,274,022.246

1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	16.00	4,391.560	423,828.141
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.12	136,138.361	39,389,075.319
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.23	48,307.160	8,967,576.996
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	173.33	528.039	8,392,298.219
Summary for Division ~ Bacillariophyta (21 detail records)							**Sum Total**	**Bacillariophyta**	973,174.961	173,930,354.005

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	3.713	143,332.896
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	3.00	39,524.040	643,688.520
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	520.00	7.426	4,703,110.667
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	24.00	176.013	212,337.044
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	248.00	11.139	355,346.139
☑ 2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	341.33	59.407	6,575,396.629
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	538.18	126.239	64,239,198.153
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	822.86	55.694	17,140,758.772
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	650.91	100.249	37,961,432.601
8211	*Uronema*	*elongatum*	.	.	.	.	Vegetative	80.00	11.139	69,986.766
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	760.00	7.426	2,347,822.706
Summary for Division ~ Chlorophyta (11 detail records)							**Sum Total**	**Chlorophyta**	40,082.483	134,392,410.893

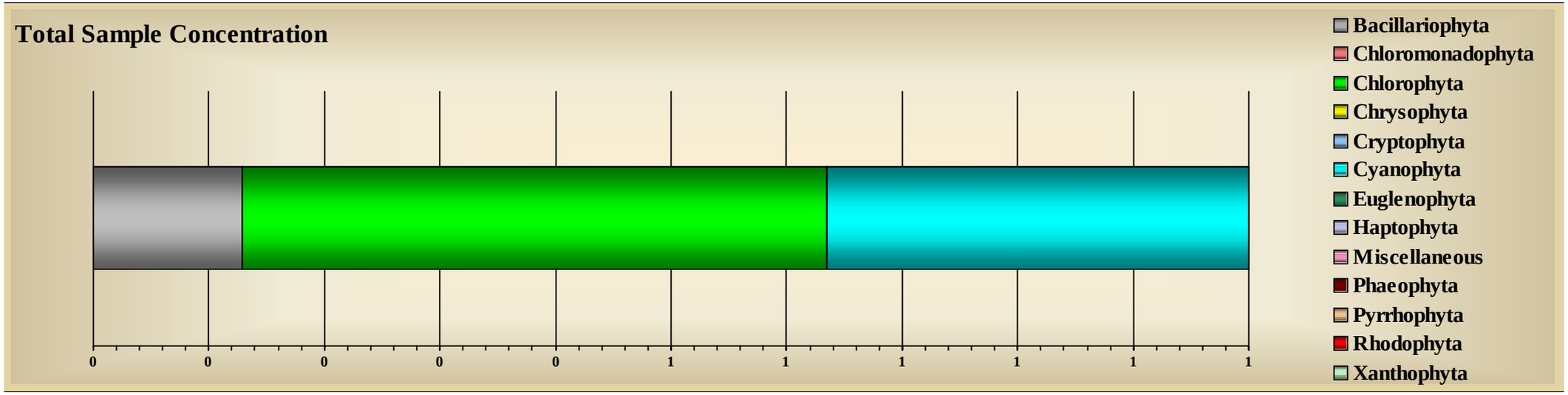
Division: Cyanophyta

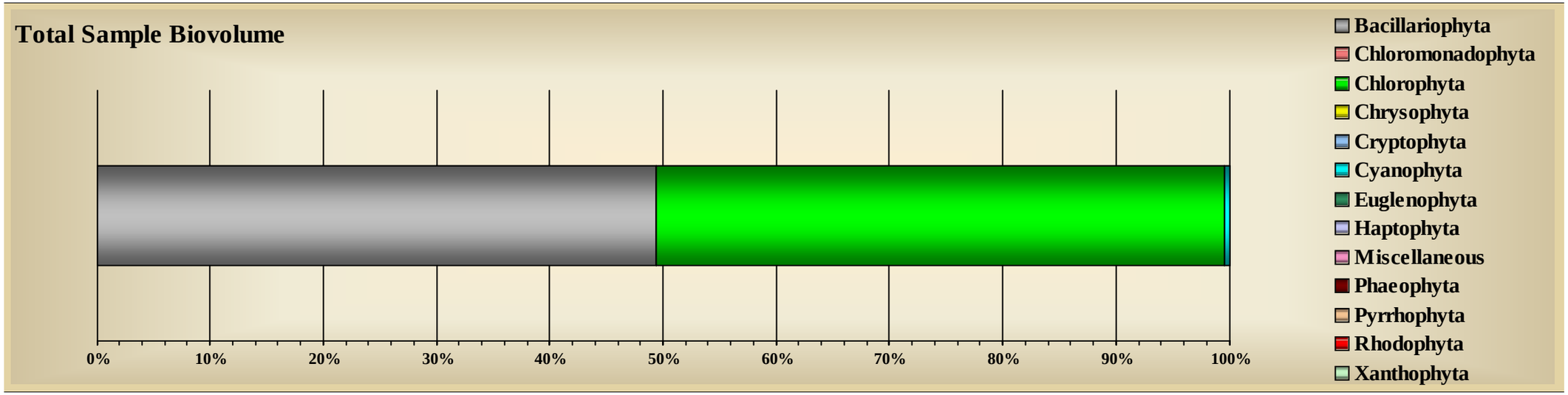
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
☑ 4512	*Chroococcus*	*cohaerens*	.	.	.	.	Vegetative	4.80	4,391.560	47,092.016
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	32.00	4,391.560	110,371.761
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	65,873.400	176,593.412
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	1,251,594.608	503,266.192

4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,383,341.409	370,873.832
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	39,524.040	165,558.300
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total**	**Cyanophyta**	2,749,116.578	1,373,755.512

Total Richness ~ 38 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,762,374.022	309,696,520.409
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060029-222	**Sample ID:**	WCKD-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
9338	*Achnanthes*	*lanceolata*	lanceolata	.	.	.	Vegetative	6.40	1,456.319	74,959.496
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.24	241,748.921	22,142,702.355
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	32.00	1,456.319	3,958,794.851
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	30.72	16,019.507	19,699,753.048
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	36.00	1,456.319	1,230,298.125
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.00	1,456.319	263,954.871
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.36	43,689.564	1,915,686.900
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.88	29,126.376	10,716,566.577
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	17.60	1,456.319	541,331.175
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	1,456.319	421,646.818
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	44.00	1,456.319	805,228.230
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	25.60	2,912.638	700,131.673
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	25.60	2,912.638	986,323.657
9411	*Mastogloia*	*smithii*	.	.	.	.	Vegetative	30.00	193.374	455,625.485
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	24.00	1,456.319	316,235.114
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	11.20	2,912.638	204,967.260
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	36.00	386.747	962,281.028

9117	*Nitzschia*	*intermedia*	.	.	.	.	Vegetative	156.00	193.374	1,421,551.506
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.80	1,456.319	73,788.179
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	25.33	4,368.956	958,075.005
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	36.40	88,835.447	35,856,358.321
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	33.28	18,932.144	3,934,493.404
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	230.00	580.120	8,539,372.036
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total**	**Bacillariophyta**	465,919.313	116,180,125.112

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	200.00	3.940	202,801.996
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.40	13,106.869	368,502.250
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,240.00	7.880	18,426,462.633
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	280.00	27.580	3,937,210.632
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	60.00	193.374	548,156.659
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	9.60	1,456.319	168,658.756
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	12.80	1,456.319	124,932.347
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	520.00	114.262	89,221,355.529
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	1,360.00	39.401	14,067,125.078
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	928.00	66.981	40,327,889.942
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total**	**Chlorophyta**	16,472.924	167,393,095.822

Division: Chrysophyta

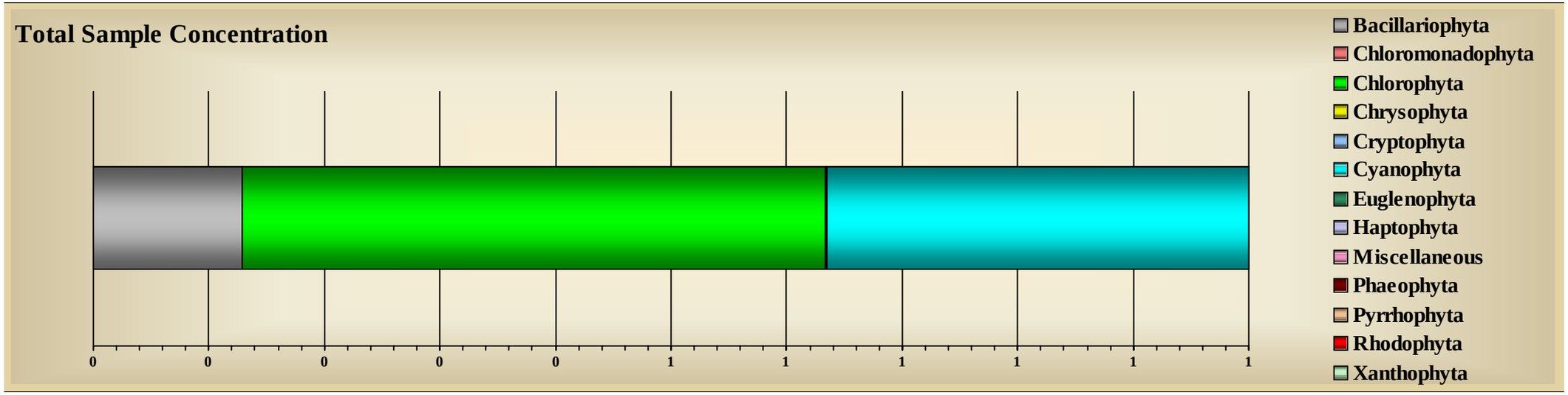
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	7.60	2,912.638	926,135.458
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	2,912.638	926,135.458

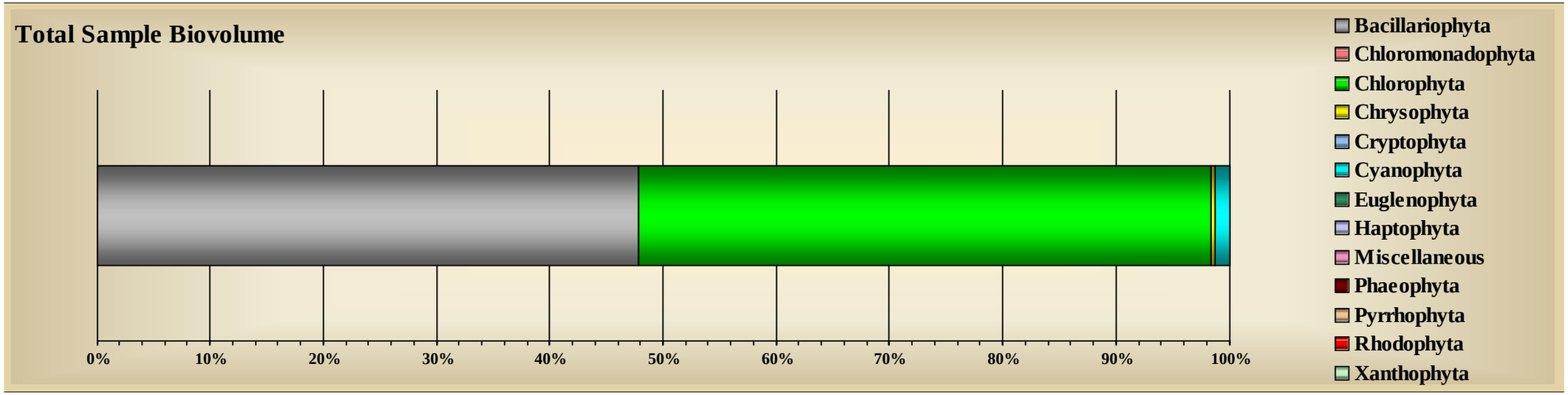
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
☑ 4055	*Aphanocapsa*	*rivularis*	.	.	.	.	Vegetative	32.00	1,456.319	843,293.636
☑ 4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	1,456.319	52,705.779
4080	*Chroococcus*	*spp*	.	.	.	.	Vegetative	8.00	1,456.319	199,891.843
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	32.00	62,413.663	167,318.548
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	58.67	16,019.507	733,831.181
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	16.80	10,194.232	121,955.632
4190	*Phormidium*	*spp*	.	.	.	.	Vegetative	30.00	1,456.319	171,293.965
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	96,117.041	241,570.959
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	244,661.559	98,378.413
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	48,058.521	225,461.743
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	838,839.631	224,892.905
Summary for Division ~ Cyanophyta (11 detail records)							**Sum Total Cyanophyta**		1,322,129.428	3,080,594.605

Total Richness ~ 45 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,807,434.302	287,579,950.996
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060030-222	**Sample ID:**	WCKD-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.84	110,520.927	8,857,511.839
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	25.60	1,300.246	3,279,377.997
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.13	5,200.985	8,155,055.258
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	58.50	647.437	1,982,580.489
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	23.20	2,600.492	455,622.913
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.68	35,106.648	1,806,268.611
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.74	16,903.201	7,079,241.300
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	15.20	2,600.492	548,425.126
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	25.60	1,300.246	1,740,078.148
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	22.40	1,300.246	190,905.268
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	28.00	2,600.492	658,803.546
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	14.40	1,300.246	117,643.546
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	25.60	1,300.246	200,778.298
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	24.00	1,300.246	188,229.622
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	36.27	32,506.155	16,030,823.221
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.96	10,401.970	3,212,527.659
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	200.00	431.624	4,044,320.897

Summary for Division ~ Bacillariophyta (17 detail records)	**Sum Total Bacillariophyta**	227,321.901	58,548,193.737

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	3.298	95,485.003
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	2.97	19,503.693	351,062.575
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	890.00	16.490	6,349,089.616
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	345.33	23.086	2,189,689.941
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	8.00	2,600.492	64,834.697
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	12.00	107.906	10,169.913
8221	*Scenedesmus*	*quadricauda*	.	quadrispina	.	.	Vegetative	16.00	107.906	10,169.913
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	356.67	65.959	25,805,264.149
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	40.00	107.906	97,631.147
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	96.00	3.298	63,656.669
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	968.00	16.490	10,609,444.791

Summary for Division ~ Chlorophyta (11 detail records)	**Sum Total Chlorophyta**	22,556.523	45,646,498.414

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	12.00	1,300.246	376,459.243

Summary for Division ~ Cryptophyta (1 detail record)	**Sum Total Cryptophyta**	1,300.246	376,459.243

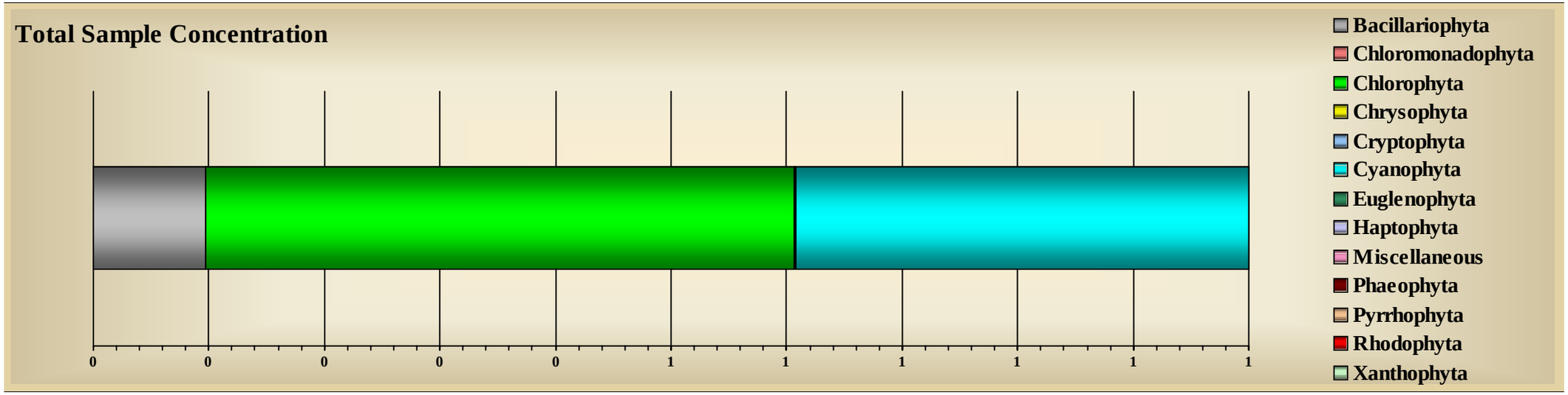
Division: Cyanophyta

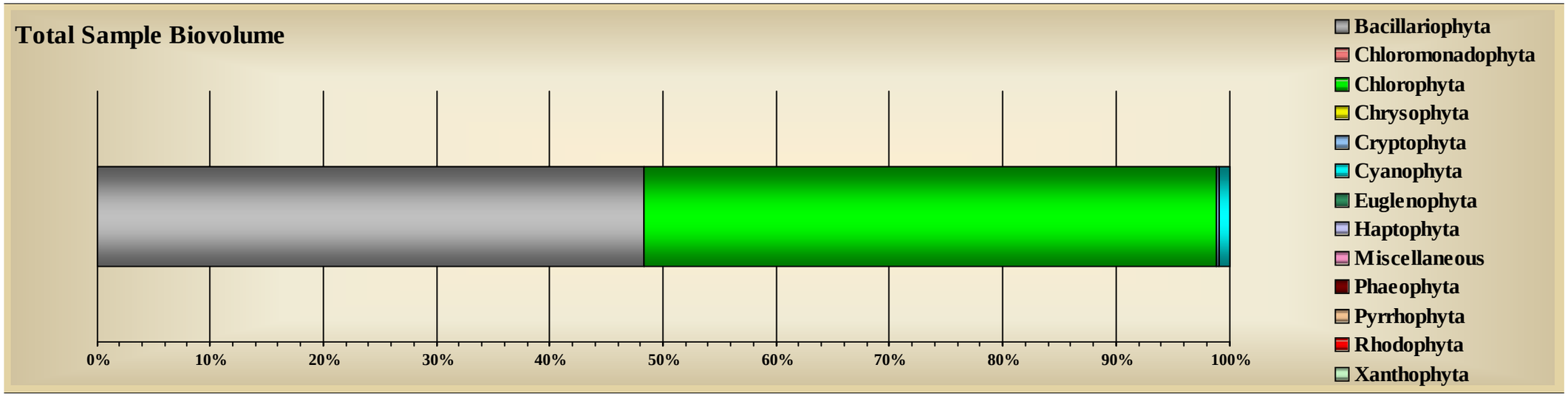
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	4.80	1,300.246	11,154.292

4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	1,300.246	31,371.560
☑ 4069	*Aphanothece*	*stagnina*	.	.	.	.	Vegetative	32.00	1,300.246	196,072.447
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	18.40	70,213.295	144,702.580
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	15.80	5,200.985	68,233.280
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	43.20	2,600.492	56,468.913
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	6.40	1,300.246	4,182.892
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	7.20	1,300.246	10,587.905
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	1.80	58,511.079	79,411.237
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	351,066.475	141,163.830
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	390,073.861	104,578.802
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.27	35,106.648	218,423.029
Summary for Division ~ Cyanophyta (12 detail records)							**Sum Total Cyanophyta**		919,274.066	1,066,350.766

Total Richness ~ 41 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,170,452.737	105,637,502.160
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060031-222	**Sample ID:**	WCKD-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.72	584,800.800	48,243,551.318
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	26.00	637.788	1,302,385.874
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	40.00	3,978.237	6,178,466.992
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.00	7,956.474	10,754,606.051
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	26.40	23,869.420	5,222,502.673
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	100.00	318.894	3,401,536.867
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	12.64	43,760.604	1,416,023.130
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	23.84	31,825.894	9,053,422.912
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	3,978.237	1,151,815.698
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	76.00	318.894	4,677,413.745
1161	*Gomphonema*	*parvulum*	.	.	.	.	Vegetative	19.20	3,978.237	590,418.070
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	22.40	3,978.237	858,508.261
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	20.00	3,978.237	479,923.340
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	33.60	3,978.237	769,932.024
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	28.93	91,499.445	22,502,522.515
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	30.40	15,912.947	3,584,868.684
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	202.00	318.894	4,357,368.713

Summary for Division ~ Bacillariophyta (17 detail records)	**Sum Total Bacillariophyta**	825,089.474	124,545,266.866

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	2.80	43,760.604	580,707.592
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,173.33	26.908	43,975,211.838
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	240.00	10.090	568,061.995
☑ 2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	493.33	23.544	3,361,033.466
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	454.67	110.994	37,778,489.543
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	48.00	159.447	225,412.943
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	668.00	10.090	1,924,817.203
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	402.40	57.179	16,848,684.937
8211	*Uronema*	*elongatum*	.	.	.	.	Vegetative	132.00	13.454	50,212.623

Summary for Division ~ Chlorophyta (9 detail records)	**Sum Total Chlorophyta**	44,172.311	105,312,632.141

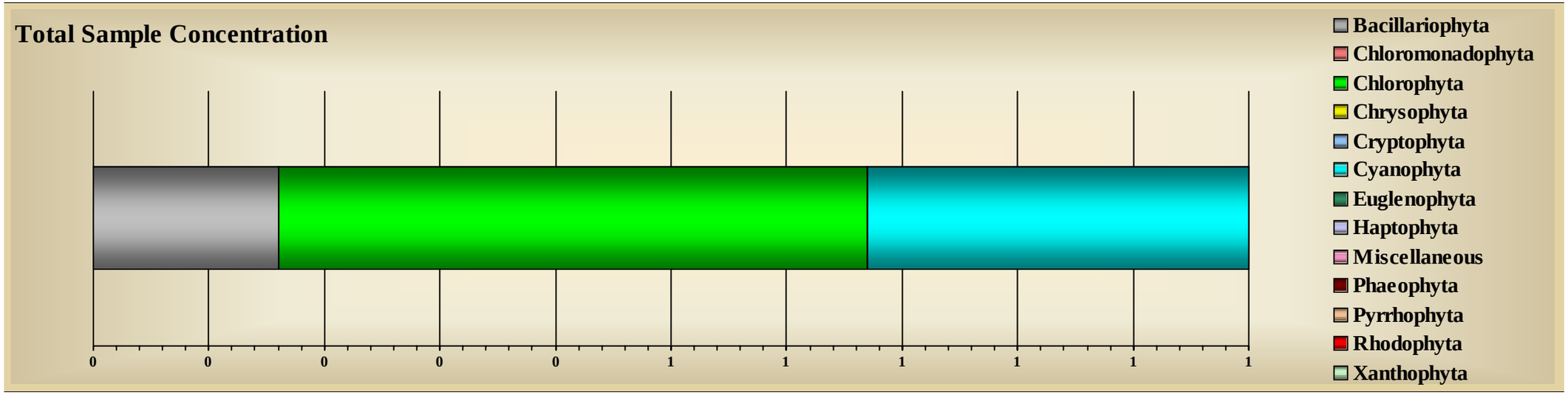
Division: Cyanophyta

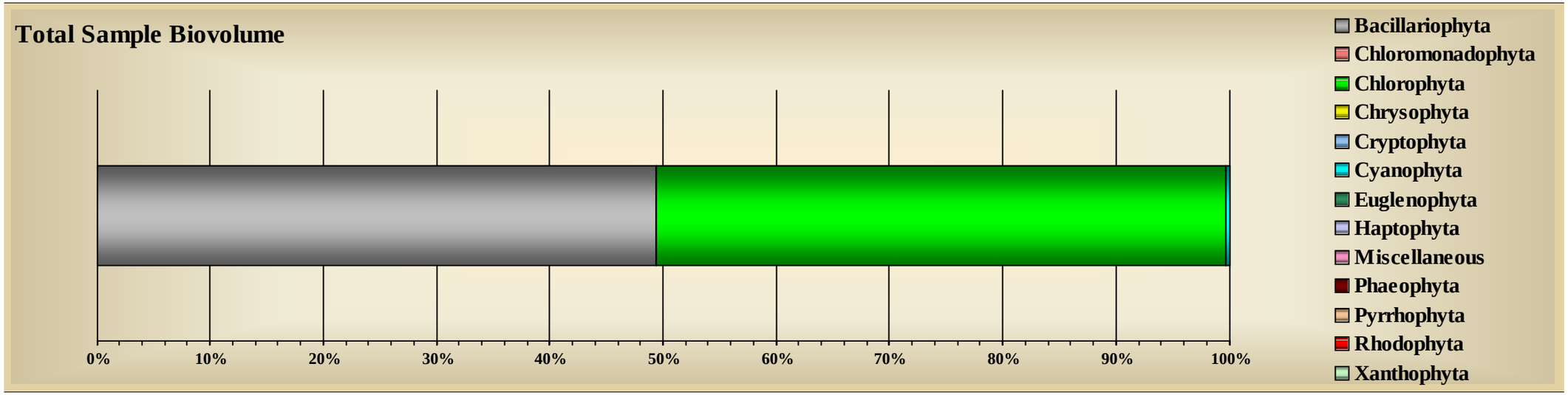
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	3,978.237	74,988.171
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	7,956.474	11,998.362
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	596,735.510	239,947.349
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,074,123.918	287,972.622
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.40	11,934.710	86,385.819

Summary for Division ~ Cyanophyta (5 detail records)	**Sum Total Cyanophyta**	1,694,728.848	701,292.323

Total Richness ~ 31 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,563,990.632	230,559,191.330
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060032-222	**Sample ID:**	WCKD-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.92	293,201.214	28,567,942.972
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	8.00	2,932.012	496,765.539
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.00	188.380	596,549.035
9212	*Cocconeis*	*placentula*	.	lineata	.	.	Vegetative	14.00	188.380	51,783.778
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.53	17,592.073	28,976,974.498
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	45.80	2,637.326	4,805,488.949
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	10.88	61,572.255	2,306,367.366
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.36	49,844.206	22,157,519.179
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	2,932.012	1,155,451.448
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	52.00	5,864.024	13,356,074.673
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	80.00	188.380	3,635,961.582
1169	*Gomphonema*	*clavatum*	.	.	.	.	Vegetative	36.00	188.380	270,789.872
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	23.00	565.141	140,301.737
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	18.40	11,728.049	1,763,831.652
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	48.00	188.380	355,088.712
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	19.47	8,796.036	1,003,946.171
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	26.80	5,864.024	1,917,106.104

9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	28.00	2,932.012	515,826.550
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	38.33	90,892.376	36,061,868.394
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	34.00	17,592.073	4,895,381.288
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	230.00	941.902	14,731,348.208
Summary for Division ~ Bacillariophyta (21 detail records)							**Sum Total**	**Bacillariophyta**	576,828.638	167,762,367.704

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	5.07	8,796.036	934,579.748
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,280.00	3.966	2,296,698.883
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	19.20	2,932.012	1,584,619.153
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	589.33	35.696	3,787,160.762
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	4.80	2,932.012	75,457.971
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	40.00	2,932.012	3,556,479.998
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	12.00	188.380	17,754.439
8221	*Scenedesmus*	*quadricauda*	.	quadrispina	.	.	Vegetative	28.00	188.380	37,876.124
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	552.00	126.921	113,405,887.059
☑ 130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	54.80	941.902	1,003,125.599
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	355.20	23.798	1,558,884.366
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,048.00	71.393	50,914,943.356
Summary for Division ~ Chlorophyta (12 detail records)							**Sum Total**	**Chlorophyta**	19,172.509	179,173,467.457

Division: Chrysophyta

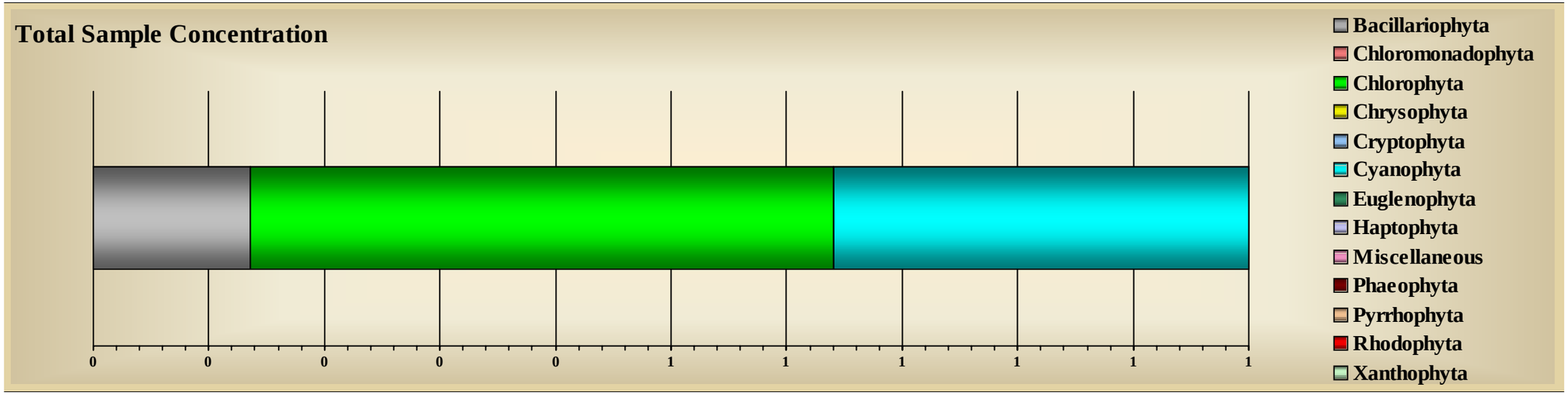
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	8.00	188.380	48,007.994
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	188.380	48,007.994

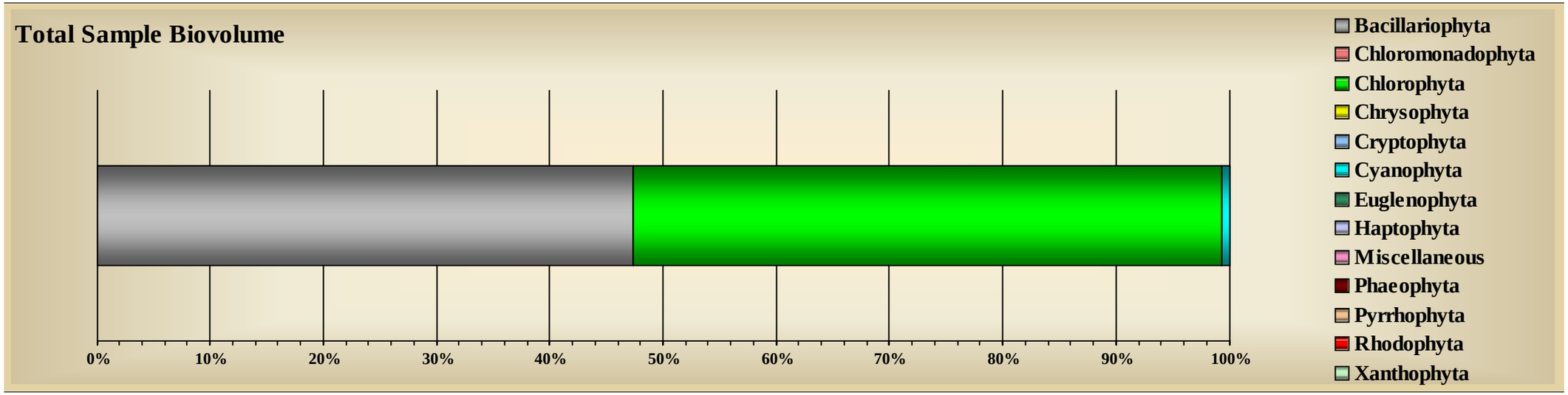
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	2,932.012	88,427.434
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	19.00	64,504.267	129,692.279
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	64.00	5,864.024	400,576.189
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	9.60	2,932.012	14,148.425
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	8.00	14,660.061	132,641.297
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.20	123,144.510	204,272.113
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	422,209.748	169,770.540
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	774,051.204	207,523.128
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.27	123,144.510	766,168.196
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		1,533,442.347	2,113,219.600

Total Richness ~ 43 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,129,631.875	349,097,062.755
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060033-222	**Sample ID:**	WCKD-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/28/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.36	180,828.942	12,770,682.395
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	27.25	2,572.596	6,909,646.405
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.32	9,687.265	17,641,299.624
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	40.67	1,607.873	2,306,332.254
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	27.20	1,614.544	331,650.613
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	88.00	321.575	5,388,044.922
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.32	41,978.147	2,478,767.622
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.27	14,530.897	7,240,927.687
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	14.40	1,614.544	239,562.183
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	1,614.544	636,261.810
10372	*Fragilaria*	*capucina*	.	distans	.	.	Vegetative	22.40	1,614.544	654,440.770
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	25.87	6,458.177	1,579,833.367
1169	*Gomphonema*	*clavatum*	.	.	.	.	Vegetative	32.00	1,614.544	494,411.354
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	24.00	643.149	407,487.040
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	28.00	1,614.544	417,858.874
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	17.60	3,229.088	442,786.144
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	38.40	1,614.544	2,267,169.505

9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	14.40	1,614.544	203,344.083
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	26.00	4,843.632	1,272,020.206
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	35.35	51,665.412	17,770,194.494
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	24.00	3,229.088	446,389.161
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.07	16,145.441	2,982,127.586
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	198.00	1,125.511	10,346,820.055
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total**	**Bacillariophyta**	351,783.146	95,228,058.153

Division: Chlorophyta

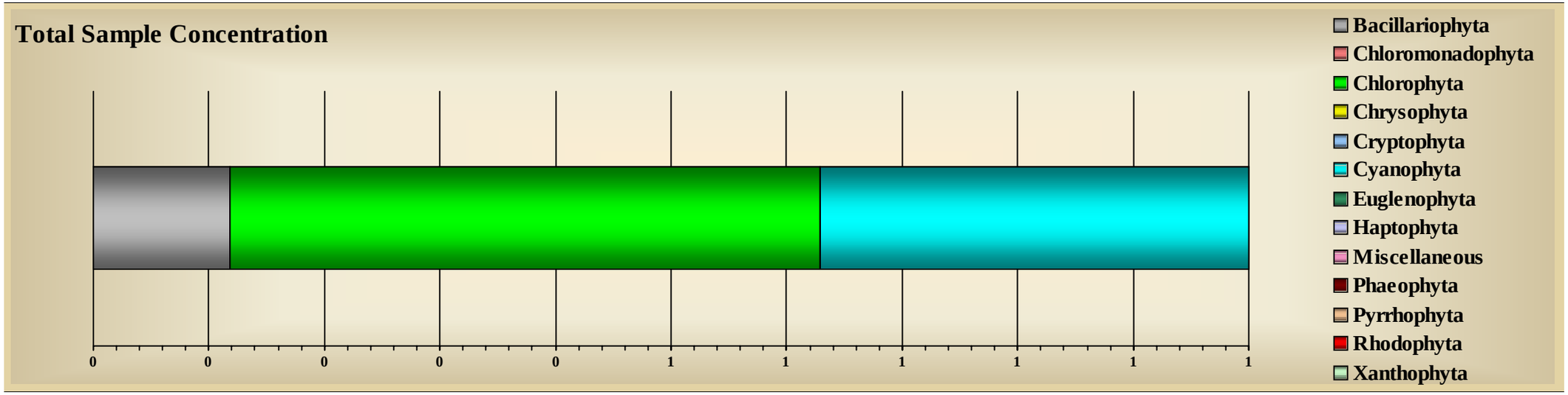
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.60	27,447.250	761,565.127
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	2,691.43	68.798	757,477,470.859
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	820.00	6.552	2,430,599.210
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	387.20	19.657	2,236,941.712
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	4.00	1,614.544	19,477.376
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	24.00	160.787	249,897.949
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	16.00	160.787	32,328.189
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	10.00	160.787	21,047.002
8303	*Scenedesmus*	*opoliensis*	.	carinatus	.	.	Vegetative	16.00	1,614.544	81,155.868
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	810.91	108.111	107,875,130.792
2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	400.00	3.276	131,739.795
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	26.00	321.575	280,851.198
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	520.00	6.552	862,895.654
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,560.00	32.761	38,632,694.761
Summary for Division ~ Chlorophyta (14 detail records)							**Sum Total**	**Chlorophyta**	31,725.982	911,093,795.493

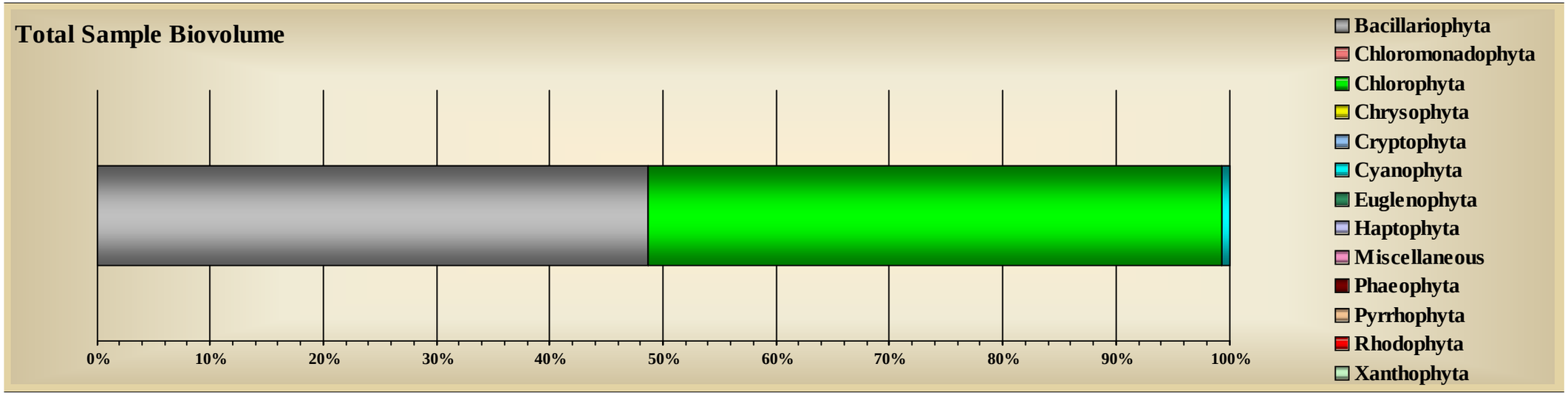
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	40.00	160.787	28,413.454
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	10.40	3,229.088	17,313.403
4085	*Chroococcus*	*prescottii*	.	.	.	.	Vegetative	20.00	160.787	344,834.071
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	16.00	53,279.956	96,415.409
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	24.00	1,614.544	35,059.341
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	9.60	4,843.632	23,372.948
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	4.80	3,229.088	7,790.821
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	7.20	1,614.544	13,147.233
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.10	77,498.118	172,696.807
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	232,494.354	93,485.980
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	697,483.063	186,995.209
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.40	29,061.794	210,355.080
Summary for Division ~ Cyanophyta (12 detail records)							**Sum Total Cyanophyta**		1,104,669.758	1,229,879.755

Total Richness ~ 49 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,488,178.886	1,007,551,733.40
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060034-222	**Sample ID:**	WREF-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/29/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.12	362,319.202	25,212,887.466
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	20.80	7,548.317	710,273.957
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	16.00	201.690	91,242.467
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.60	12,580.528	17,186,275.445
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	34.00	10,064.422	7,343,002.493
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	19.20	2,516.106	206,119.368
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	90.00	1,210.141	17,426,029.138
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.40	75,483.167	3,435,321.965
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.26	75,483.167	25,717,069.732
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.80	5,032.211	2,784,435.144
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	29.20	10,064.422	2,108,561.886
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	22.40	2,516.106	531,965.859
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	20.80	5,032.211	980,069.919
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	24.00	2,516.106	546,364.524
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	33.60	2,516.106	1,019,880.496
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	35.28	173,611.284	46,382,268.484
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	26.00	5,032.211	1,024,155.611

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.20	83,031.484	18,078,278.901
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	204.00	1,613.521	17,890,723.248

Summary for Division ~ Bacillariophyta (19 detail records) **Sum Total Bacillariophyta** 838,372.401 188,674,926.103

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2687	**Chlorococcaceae*	*spp*	.	.	.	> 1 um ovoid	Vegetative	4.80	2,516.106	64,754.241
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	120.00	8.509	164,242.637
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	2.40	40,257.689	291,393.205
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,600.00	4.255	12,318,197.752
☑ 2961	*Dispora*	*crucigenioides*	.	.	.	.	Vegetative	40.00	201.690	360,119.864
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	488.00	55.309	11,498,695.427
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	444.80	25.527	6,675,949.923
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	4.00	2,516.106	30,353.543
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	64.00	403.380	986,441.080
8302	*Scenedesmus*	*quadricauda*	.	longispina	.	.	Vegetative	16.00	201.690	27,034.810
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	325.60	616.912	122,499,344.062
2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	160.00	4.255	161,676.345
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	341.60	195.710	18,612,454.629
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	478.00	344.620	116,002,777.909
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	520.00	8.509	1,390,074.399

Summary for Division ~ Chlorophyta (15 detail records) **Sum Total Chlorophyta** 47,360.266 291,083,509.828

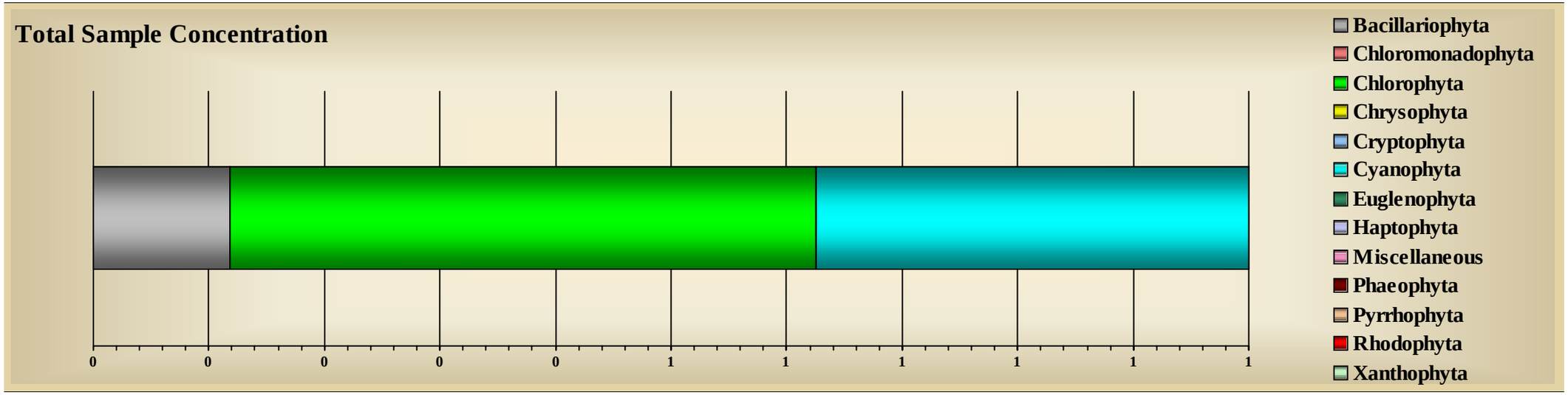
Division: Cyanophyta

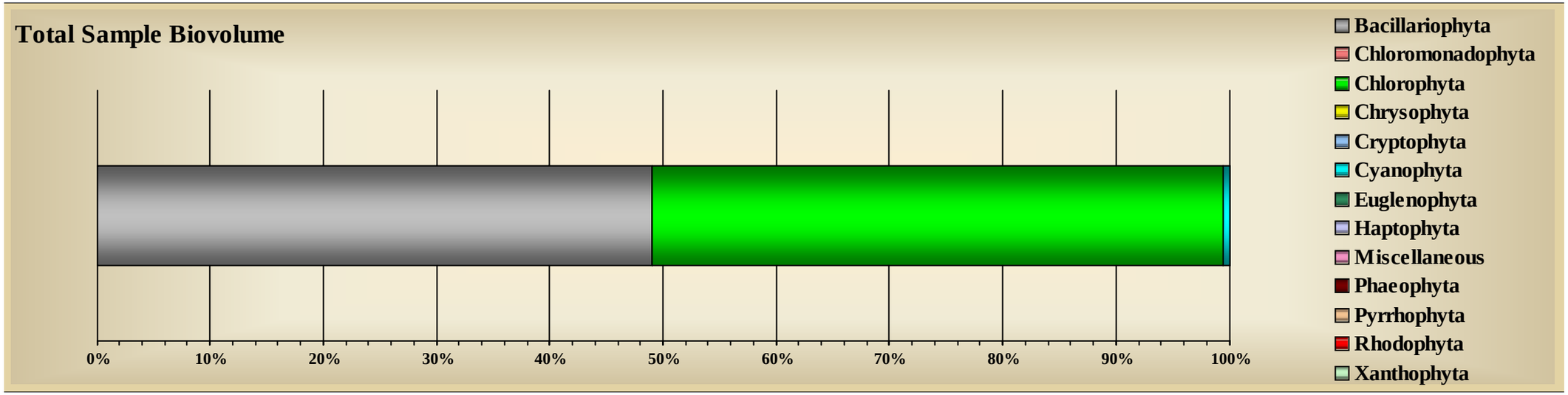
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
☑ 4069	*Aphanothece*	*stagnina*	.	.	.	.	Vegetative	32.00	2,516.106	323,771.458
4309	*Lyngbya*	*perelegans*	.	.	.	.	Vegetative	192.00	2,516.106	379,419.662

4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	105,676.434	283,297.384
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	830,314.838	333,869.596
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,660,629.676	445,214.816
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	45,289.900	189,710.334
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total Cyanophyta**		2,646,943.059	1,955,283.250

Total Richness ~ 40 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,532,675.726	481,713,719.181
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060035-222	**Sample ID:**	WREF-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/29/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.12	294,895.839	20,921,296.841
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	29.20	4,680.886	6,516,992.087
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	41.60	4,680.886	8,684,210.162
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	23.20	9,361.773	2,133,944.931
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	79.00	776.924	8,800,166.007
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	12.13	81,915.511	3,611,327.213
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.78	30,425.761	13,056,433.470
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	38.40	2,340.443	1,626,303.744
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	32.13	4,680.886	11,634,158.561
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	80.00	388.462	11,813,711.994
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	28.00	7,021.330	7,268,737.985
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	25.33	1,553.848	355,682.942
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	27.00	776.924	296,554.599
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	57.60	2,340.443	23,129,654.290
9117	*Nitzschia*	*intermedia*	.	.	.	.	Vegetative	70.00	388.462	384,422.642
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	2,340.443	258,815.801
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	24.40	4,680.886	534,572.198

1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.60	93,617.727	52,310,093.750
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	25.60	2,340.443	345,112.388
1000540	*Synedra*	*tenera*	.	.	.	.	Vegetative	33.60	2,340.443	805,262.238
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	33.40	30,425.761	7,502,749.302
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	194.00	776.924	6,491,976.708

Summary for Division ~ Bacillariophyta (22 detail records) **Sum Total Bacillariophyta** 582,751.007 188,482,179.855

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	3.958	238,712.508
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	32.00	7,021.330	14,983,076.924
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	320.00	7.915	1,145,820.038
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	675.00	43.533	20,372,123.269
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	501.82	174.131	138,835,194.528
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	617.60	75.193	8,653,805.829
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	424.73	91.023	41,049,798.544

Summary for Division ~ Chlorophyta (7 detail records) **Sum Total Chlorophyta** 7,417.082 225,278,531.639

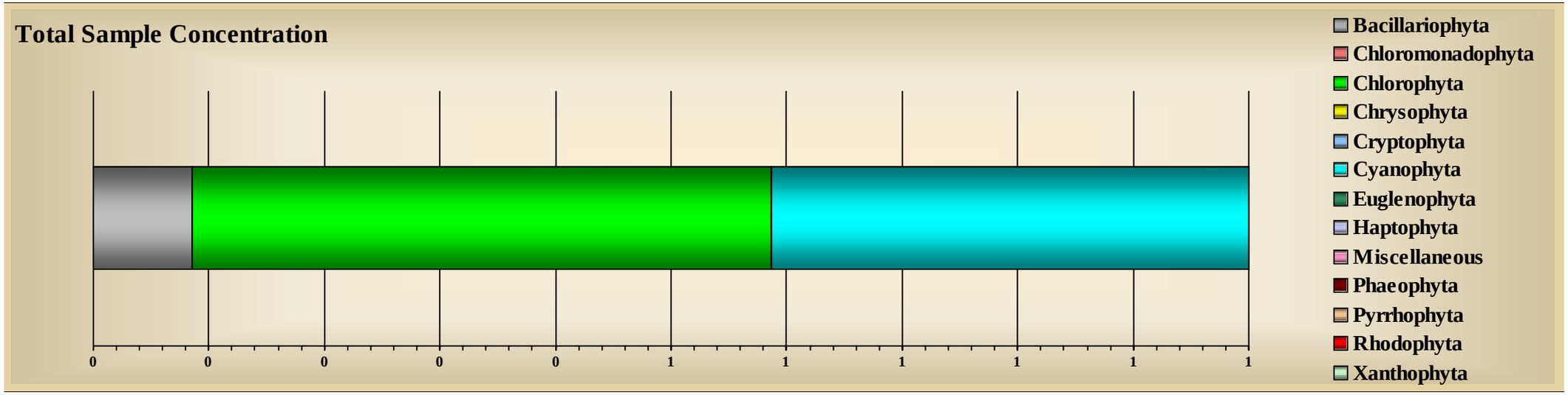
Division: Cyanophyta

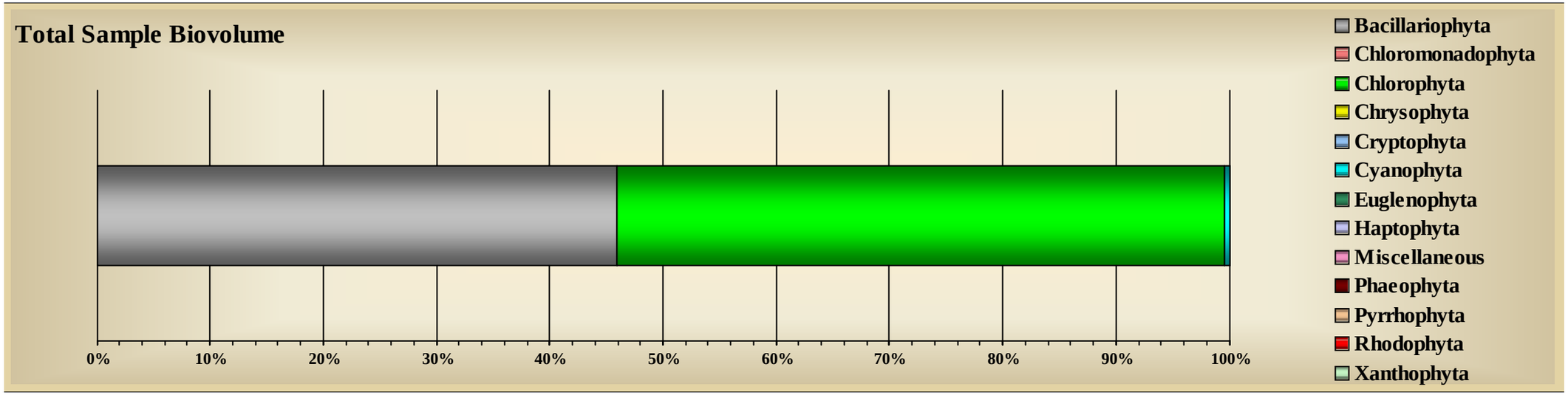
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	15.36	77,234.625	121,899.408
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	12.80	4,680.886	38,116.457
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	70,213.295	105,881.649
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	912,772.836	367,025.957
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,685,119.081	451,780.426
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	84,255.954	395,278.383

Summary for Division ~ Cyanophyta (6 detail records)	**Sum Total Cyanophyta**	2,834,276.676	1,479,982.280

Total Richness ~ 35 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,424,444.765	415,240,693.774
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060036-222	**Sample ID:**	WREF-NS-7-1	**Replicate:**	7
Customer ID:	222	**Sample Date:**	6/29/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Near Shore Replicate 7 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.49	198,808.506	14,390,216.906
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	26.80	3,823.241	8,370,847.045
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	43.50	1,586.434	2,554,899.384
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	26.00	5,734.861	1,126,051.377
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	12.56	34,409.165	1,475,640.459
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.52	26,762.684	8,638,234.163
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	13.40	1,269.147	621,595.744
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	36.80	1,911.620	565,769.246
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	60.00	7,646.481	32,393,360.141
1169	*Gomphonema*	*clavatum*	.	.	.	.	Vegetative	56.00	317.287	912,408.257
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	29.33	951.861	1,295,396.847
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	24.00	1,269.147	383,207.613
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	22.40	1,911.620	387,428.840
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	20.00	1,911.620	230,612.514
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	34.80	3,823.241	1,217,633.662
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	32.00	1,911.620	626,399.723
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	35.71	61,171.848	18,202,607.045

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.40	34,409.165	9,187,522.183
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	226.67	951.861	14,439,723.712
Summary for Division ~ Bacillariophyta (19 detail records)							**Sum Total**	**Bacillariophyta**	390,581.406	117,019,554.860

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.00	5,734.861	309,020.677
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,577.14	35.557	122,290,111.658
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	533.33	12.930	3,769,514.656
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	480.00	29.092	3,252,181.265
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	8.00	1,911.620	184,489.897
2884	*Scenedesmus*	*quadricauda*	.	.	.	.	Vegetative	16.00	3,823.241	524,771.491
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	611.64	271.523	249,638,766.798
2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	160.00	3.232	175,477.407
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	100.00	317.287	753,570.186
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	722.40	80.811	11,471,835.445
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	996.80	106.670	103,182,664.697
Summary for Division ~ Chlorophyta (11 detail records)							**Sum Total**	**Chlorophyta**	12,326.822	495,552,404.177

Division: Chrysophyta

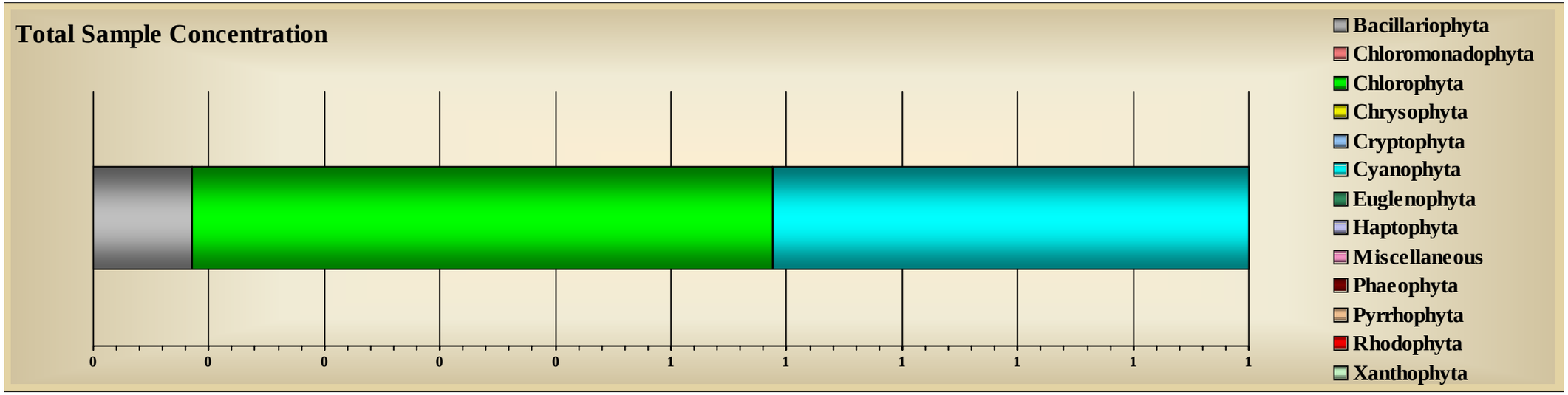
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	9.00	317.287	120,571.820
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	317.287	120,571.820

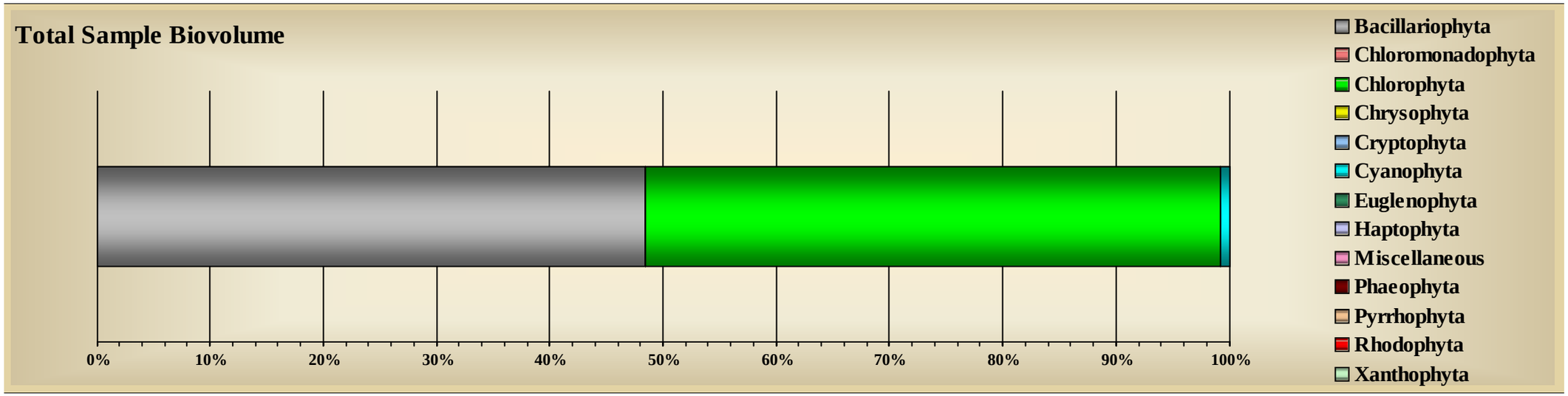
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	10.00	5,734.861	24,598.538
4080	*Chroococcus*	*spp*	.	.	.	.	Vegetative	16.00	1,911.620	24,598.729
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	16.00	317.287	85,059.079
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	14.08	68,818.329	91,321.923
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	21.33	3,823.241	63,418.384
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	21.20	11,469.722	122,224.793
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	9.60	1,911.620	20,755.035
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	68,818.329	156,816.326
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	745,531.897	299,778.376
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.27	114,697.215	713,611.662
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	860,229.111	230,627.425
Summary for Division ~ Cyanophyta (11 detail records)							**Sum Total Cyanophyta**		1,883,263.231	1,832,810.269

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,286,488.746	614,525,341.126
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060037-222	**Sample ID:**	WREF-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	6/29/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	9.92	397,100.357	22,164,077.027
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	4.80	3,151.590	124,198.179
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	25.00	757.891	1,650,617.980
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	28,364.311	35,241,332.104
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	36.00	6,303.180	6,389,912.037
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	89.33	1,705.255	19,038,225.004
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	11.68	88,244.524	4,120,525.095
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.00	88,244.524	27,435,028.331
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	39.31	37,819.082	47,372,779.223
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	64.00	189.473	1,265,137.027
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	18.40	9,454.770	1,406,735.580
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	29.87	9,454.770	2,108,836.431
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	33.76	182,792.228	42,611,354.321
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	32.00	3,151.590	580,901.094
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.00	110,305.655	20,331,538.298
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	198.40	2,463.146	31,441,568.089
Summary for Division ~ Bacillariophyta (16 detail records)							**Sum Total Bacillariophyta**		969,502.347	263,282,765.819

☑ = Identification is Uncertain

✱ = Family Level Identification

Division: Chlorophyta

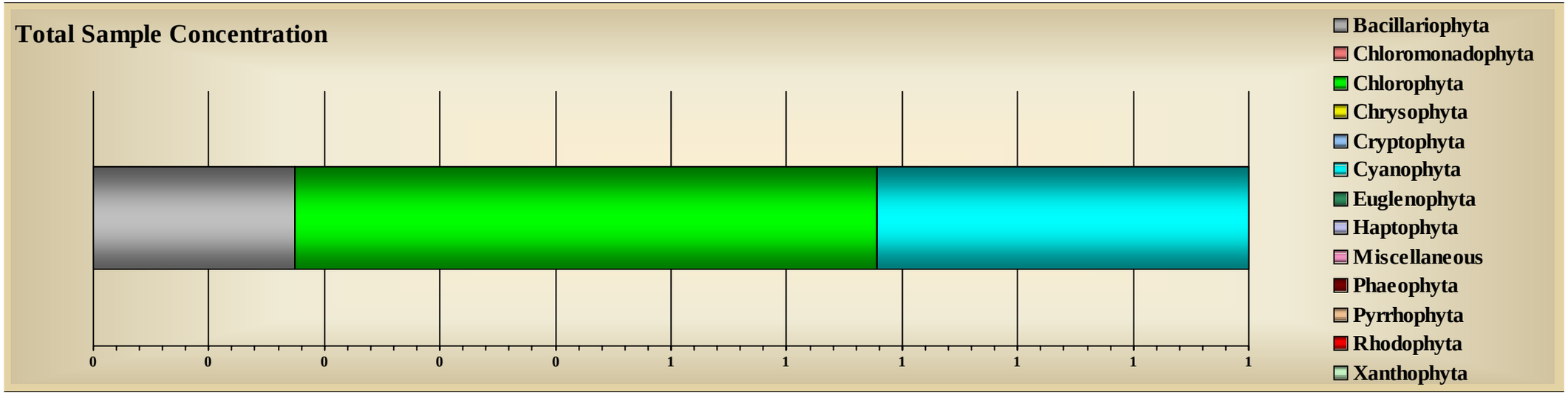
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	184.00	10.658	480,024.681
2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	2.40	15,757.951	114,059.199
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,040.00	5.329	7,714,682.371
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	28.00	189.473	293,337.383
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	372.44	26.646	4,300,221.099
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	230.40	18.652	921,797.396
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	40.00	568.418	1,551,990.462
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	304.80	205.171	62,950,736.655
2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	320.00	2.665	51,431.216
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	516.00	63.950	5,994,951.093
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,030.86	42.633	34,521,366.779
Summary for Division ~ Chlorophyta (11 detail records)							**Sum Total**	**Chlorophyta**	16,891.545	118,894,598.333

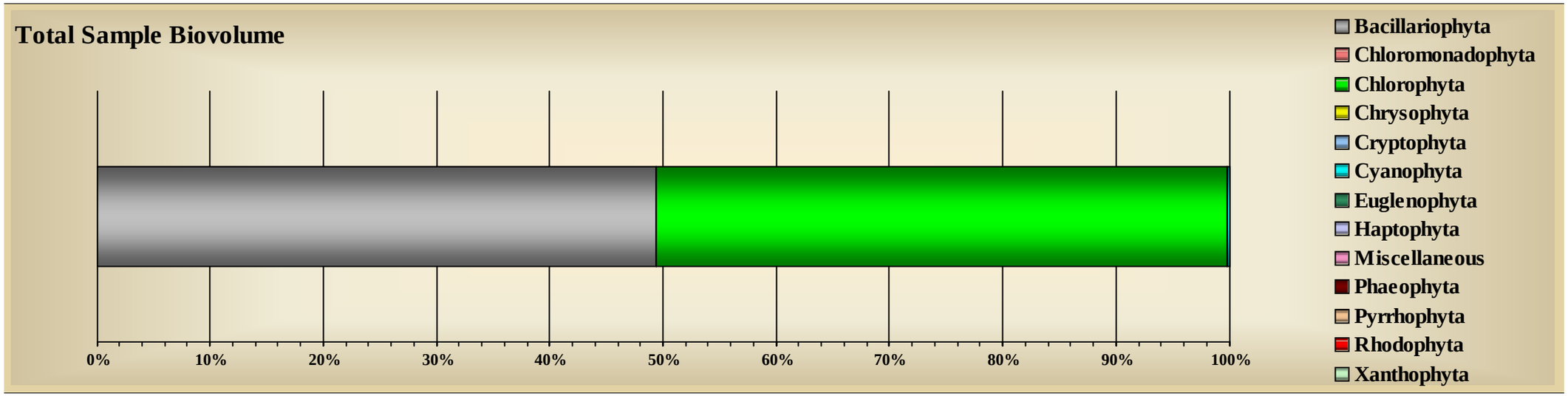
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	3,151.590	16,897.881
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	40.00	189.473	101,588.693
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	24.00	3,151.590	39,604.142
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	22.40	6,303.180	70,970.658
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	37,819.082	121,663.986
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	283,643.112	114,052.896
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.40	37,819.082	273,742.077
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,418,215.562	380,223.592
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total**	**Cyanophyta**	1,790,292.671	1,118,743.924

Total Richness ~ 35 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,776,686.563	383,296,108.077
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060038-222	**Sample ID:**	WREF-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	6/29/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	10.69	350,291.494	22,800,193.113
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.00	686.026	2,172,454.636
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.20	12,399.699	19,876,005.599
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	30.40	8,266.466	6,472,797.411
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	25.60	4,133.233	799,082.890
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	110.00	686.026	9,961,091.452
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.75	47,532.179	2,096,036.010
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.88	43,398.946	16,974,872.846
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	9.60	2,066.617	144,833.856
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	15.20	4,133.233	1,602,237.014
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	37.33	18,599.548	9,066,600.940
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	100.00	686.026	31,973,402.973
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	28.00	2,066.617	557,472.897
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	24.00	2,058.077	417,674.121
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.80	2,066.617	314,131.492
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	35.20	74,398.193	38,691,822.063
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	30.16	43,398.946	10,447,966.457

1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	240.00	343.013	5,268,676.471

Summary for Division ~ Bacillariophyta (18 detail records) **Sum Total Bacillariophyta** 617,210.954 179,637,352.239

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	400.00	3.495	910,585.460
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.20	8,266.466	248,202.293
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	320.00	3.495	3,597,374.657
2246	*Euastrum*	*spp*	.	.	.	.	Vegetative	14.00	343.013	263,433.824
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	1,537.78	34.945	43,987,429.484
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	52.00	2,066.617	5,403,376.079
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	10.00	343.013	28,736.171
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	326.15	150.264	50,384,864.033
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	540.00	45.429	7,067,400.846
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	715.64	69.890	41,866,747.033

Summary for Division ~ Chlorophyta (10 detail records) **Sum Total Chlorophyta** 11,326.625 153,758,149.879

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1653	*.	*spp*	.	.	.	.	Cyst	9.00	343.013	130,347.913

Summary for Division ~ Chrysophyta (1 detail record) **Sum Total Chrysophyta** 343.013 130,347.913

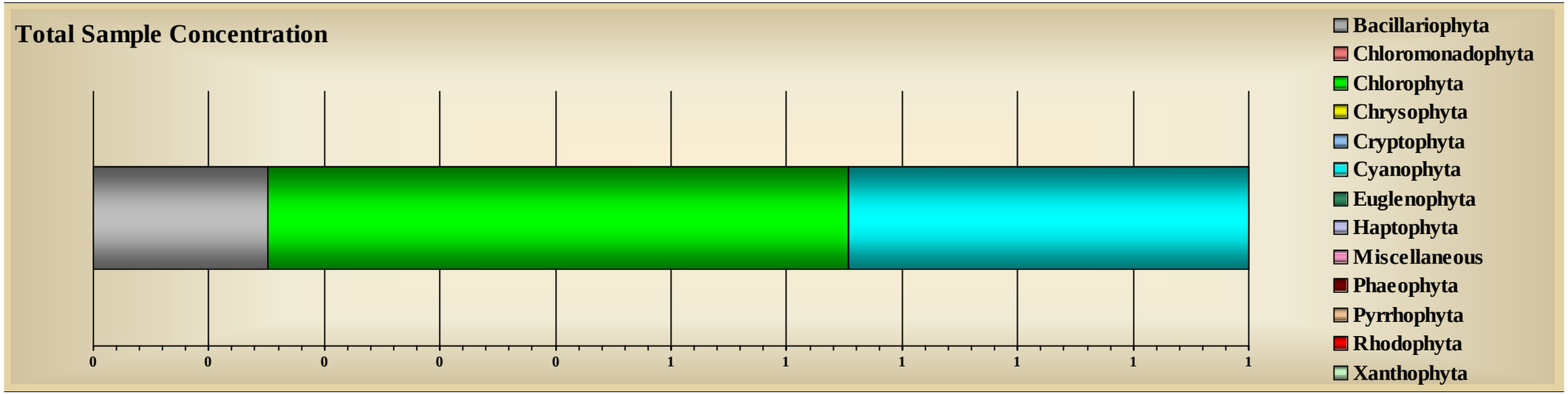
Division: Cyanophyta

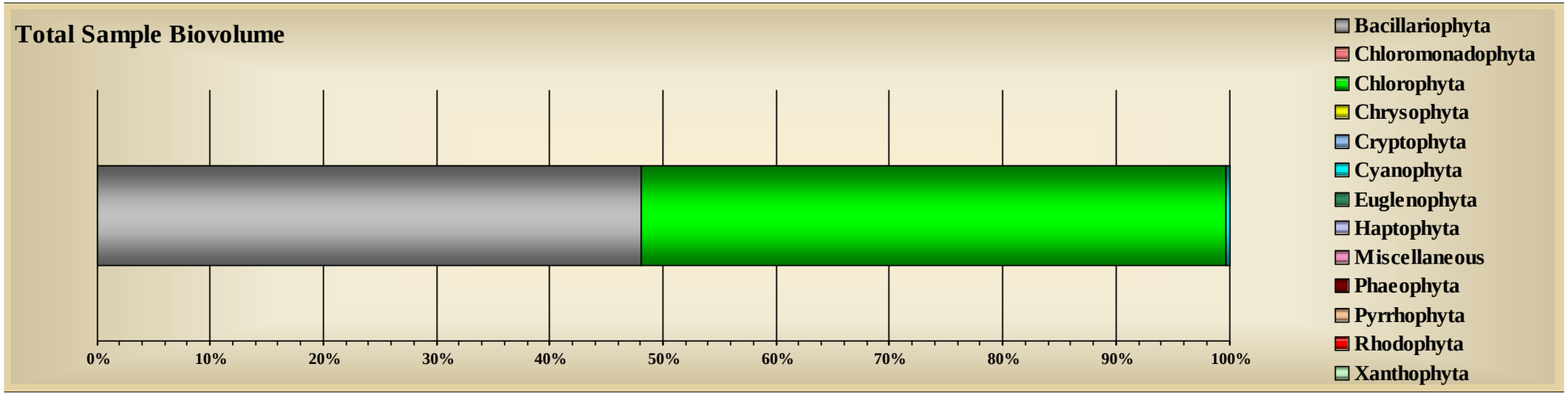
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	12.00	2,066.617	44,321.897

1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	13.44	99,197.591	163,547.069
4309	*Lyngbya*	*perelegans*	.	.	.	.	Vegetative	100.00	2,066.617	186,983.120
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	16.00	2,066.617	37,396.665
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	8.32	12,399.699	116,677.447
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	24,799.398	53,601.418
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	743,981.934	299,155.136
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	495,987.956	132,974.371
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.80	37,199.097	127,150.233
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		1,419,765.524	1,161,807.355

Total Richness ~ 38 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,048,646.116	334,687,657.386
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Tracking Code:	060039-222	**Sample ID:**	WREF-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	6/29/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.24	253,263.850	18,601,697.936
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	36.80	1,963.286	9,296,963.724
1090	*Cymbella*	*spp*	.	.	.	.	Vegetative	17.60	1,963.286	114,995.138
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.40	13,743.000	20,218,358.837
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	39.20	3,926.571	5,661,030.931
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	29.60	3,926.571	877,742.612
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	96.00	325.862	6,994,826.599
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	13.60	23,559.428	1,121,645.516
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.60	56,935.284	24,613,920.424
109036	*Cymbella*	*ventricosa*	.	ventricosa	.	.	Vegetative	11.20	1,963.286	220,099.047
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.67	977.587	630,615.311
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	41.33	5,889.857	6,446,136.890
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	36.00	325.862	299,785.457
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	19.20	3,926.571	485,625.383
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.60	1,963.286	454,742.703
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.00	5,889.857	852,642.790
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	36.00	325.862	1,768,998.770

9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	1,963.286	270,950.894
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	27.20	3,926.571	837,484.654
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	24.00	1,963.286	206,055.272
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.09	49,082.142	25,726,895.285
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	31.92	37,302.428	8,202,953.025
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	210.00	325.862	2,463,517.865
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total**	**Bacillariophyta**	475,432.879	136,367,685.063

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.04	19,632.857	323,162.709
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	280.00	3.320	2,990,317.684
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	240.00	3.320	250,305.610
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	293.71	29.878	4,655,255.247
8393	*Scenedesmus*	*dispar*	.	.	.	.	Vegetative	12.80	1,963.286	303,161.933
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	592.00	162.669	122,061,029.953
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	40.00	325.862	294,833.134
☑ 103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	454.40	39.837	4,551,156.717
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	640.00	23.239	10,068,960.326
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total**	**Chlorophyta**	22,184.267	145,498,183.312

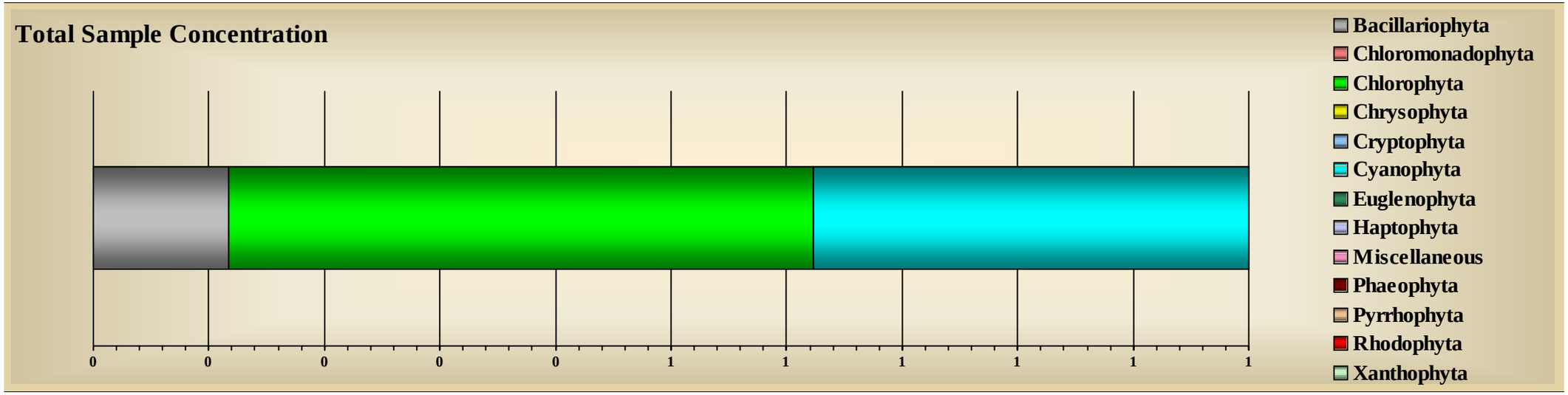
Division: Cyanophyta

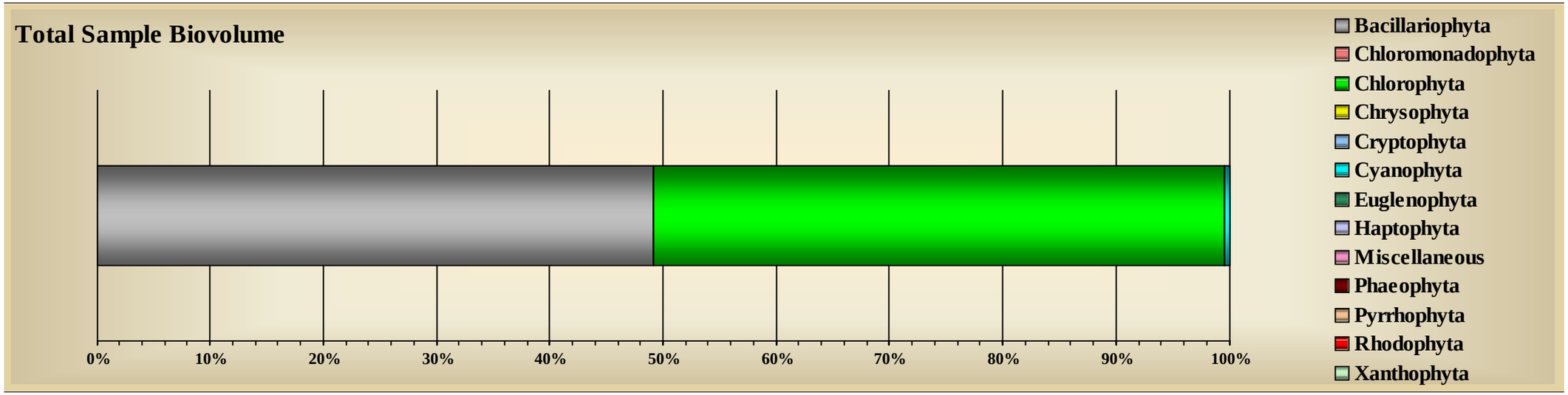
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Concentration NU/ square_cm	Total Biovolume µm^3 / square_cm
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	12.00	1,963.286	33,684.681
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	8.00	1,963.286	67,369.362
1000544	*Lyngbya*	*spp*	.	.	.	sp. 4	Vegetative	24.80	129,576.854	314,495.981
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	48.00	5,889.857	238,029.146

4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	7.20	1,963.286	15,987.035
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	3.20	3,926.571	14,210.654
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	23,559.428	35,527.617
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	353,391.419	142,098.690
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	64,788.427	138,951.739
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	942,377.117	252,651.305
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		1,529,399.529	1,253,006.210

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,027,016.676	283,118,874.585
	NU/ square_cm	µm^3 / square_cm

SUMMARY GRAPHICS





Species List

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
10939	Achnanthes	laevis	.	.	.	.	Vegetative	Ostrup
108169	Achnanthes	lanceolata	.	lanceolatoides	.	.	Vegetative	(Sovereign) Reimer
9338	Achnanthes	lanceolata	lanceolata	.	.	.	Vegetative	(de Brebisson) Grunow
1013	Achnanthes	minutissima	.	.	.	.	Vegetative	Kutzing
9765	Achnanthes	taeniata	.	.	.	.	Vegetative	Grunow in Cleve & Grunow
1343	Amphora	pediculus	.	.	.	.	Vegetative	(Kutzing) Grunow
108384	Anomoeneis	vitrea	.	.	.	.	Vegetative	(Grunow) Ross
1066	Cocconeis	pediculus	.	.	.	.	Vegetative	Ehrenb.
9212	Cocconeis	placentula	.	lineata	.	.	Vegetative	(Ehrenb.) Van Heurck
9854	Cyclotella	sp. 1	.	(small) Job 07	.	.	Vegetative	(Kutzing) de Brebisson
1090	Cymbella	spp	.	.	.	.	Vegetative	(Schmidt) Cleve
1862	Cymbella	affinis	.	.	.	.	Vegetative	Kltz.
1098	Cymbella	caespitosa	.	.	.	.	Vegetative	(Kutzing) Brun
1099	Cymbella	cistula	.	.	.	.	Vegetative	(Ehrenberg in Hemprich & Ehrenberg) Kirchner in
9371	Cymbella	gracilis	.	.	.	.	Vegetative	(Ehrenberg) Kutzing
9379	Cymbella	helmckei	.	.	.	.	Vegetative	Kramer
1113	Cymbella	hustedtii	.	.	.	.	Vegetative	Krasske
1091	Cymbella	microcephala	.	.	.	.	Vegetative	Grunow
1115	Cymbella	minuta	.	.	.	.	Vegetative	Hilse
1095	Cymbella	silesiaca	.	.	.	.	Vegetative	Bleisch
109036	Cymbella	ventricosa	.	ventricosa	.	.	Vegetative	C. A. Agardh
109046	Denticula	tenuis	.	.	.	.	Vegetative	Kltz.
1109	Diatoma	tenuis	.	.	.	.	Vegetative	Agardh

4272	Diatoma	vulgaris	.	.	.	distorta	Vegetative	Grunow in Van Heurck
1108	Diatoma	vulgaris	.	vulgaris	.	.	Vegetative	Bory
109195	Eucocconeis	flexella	.	.	.	.	Vegetative	(Kützing) Cleve
10372	Fragilaria	capucina	.	distans	.	.	Vegetative	Sippe
10379	Fragilaria	capucina	.	mesolepta	.	.	Vegetative	Rabenh.
9397	Fragilaria	capucina	.	vaucheriae	.	.	Vegetative	(Kutzing) Lange-Bertalot
9045	Fragilaria	construens	.	.	venter	.	Vegetative	(Ehrenberg) Hustedt
1155	Fragilaria	leptostauron	.	.	.	.	Vegetative	(Ehrenberg) Hustedt
9321	Gomphoneis	herculeana	.	.	.	.	Vegetative	(Ehrenb.) Cleve
1169	Gomphonema	clavatum	.	.	.	.	Vegetative	Ehrenberg
9286	Gomphonema	olivaceum	.	.	.	.	Vegetative	(Lyngbye) Desmazieres
1161	Gomphonema	parvulum	.	.	.	.	Vegetative	(Kützing) Kützing
9055	Gomphonema	pumilum	.	.	.	.	Vegetative	(Grunow) Reichardt & Lange-Bertalot
9411	Mastogloia	smithii	.	.	.	.	Vegetative	Thwaites
1214	Navicula	cryptocephala	.	.	.	.	Vegetative	Kützing
9072	Navicula	cryptotenella	.	.	.	.	Vegetative	Lange-Bert.
9305	Navicula	decussis	.	decussis	.	.	Vegetative	Ostrup
1216	Navicula	halophila	.	.	.	.	Vegetative	(Grunow) Cleve
9223	Navicula	viridula	.	linearis	.	.	Vegetative	Hust.
1220	Nitzschia	spp	.	.	.	.	Vegetative	Hassall
9236	Nitzschia	constricta	.	.	.	.	Vegetative	(Kutzing) Ralfs .
9113	Nitzschia	dissipata	.	.	.	.	Vegetative	(Kützing) Grunow
1222	Nitzschia	gracilis	.	.	.	.	Vegetative	Hantzsch
9117	Nitzschia	intermedia	.	.	.	.	Vegetative	Hantzsch
9123	Nitzschia	palea	.	.	.	.	Vegetative	(Kützing) W. Sm.
1223	Nitzschia	perminuta	.	.	.	.	Vegetative	(Grunow) M. Perag.
9124	Nitzschia	recta	.	.	.	.	Vegetative	Hantzsch

1271	Rhoicosphenia	curvata	.	.	.	.	Vegetative	(kutzing) Grunow
1754	Rhopalodia	gibba	.	minuta	.	.	Vegetative	Krammer
1477	Synedra	filiformis	.	.	.	.	Vegetative	Grunow
1316	Synedra	nana	.	.	.	.	Vegetative	F. Meister
1000541	Synedra	radians	.	.	.	.	Vegetative	.
1000481	Synedra	radians	.	.	.	.	Vegetative	Kutz
1000540	Synedra	tenera	.	.	.	.	Vegetative	.
9504	Synedra	tenera	.	.	.	.	Vegetative	W. Sm.
1315	Synedra	ulna	.	.	.	.	Vegetative	(Nitzsch) Ehrenb.

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
2687	*Chlorococcaceae	spp	.	.	.	> 1 um ovoid	Vegetative	(Brandt) Beijerinck
8190	Bulbochaete	spp	.	.	.	.	Vegetative	Transeau and Brown In Tiff.
2100	Chlorococcum	spp	.	.	.	.	Vegetative	(Naegeli) Rabenhor
2101	Chlorococcum	humicola	.	.	.	.	Vegetative	(Naegeli) Rabenhor
2791	Cladophora	fracta	.	.	.	.	Vegetative	(Dillw.) Kuetzing
2180	Cosmarium	spp	.	.	.	.	Vegetative	Corda
2211	Dictyosphaerium	pulchellum	.	.	.	.	Vegetative	Wood
2961	Dispora	crucigenioides	.	.	.	.	Vegetative	Printz
2246	Euastrum	spp	.	.	.	.	Vegetative	Nordstedt
2340	Mougeotia	spp	.	.	.	.	Vegetative	Kisselew
2350	Oedogonium	spp	.	.	.	.	Vegetative	De Bary
2363	Oocystis	parva	.	.	.	.	Vegetative	West & West
2380	Pediastrum	spp	.	.	.	.	Vegetative	(Ehrenberg) Meneg.
2382	Pediastrum	boryanum	.	.	.	.	Vegetative	(Turpin) Meneghini
2484	Scenedesmus	abundans	.	.	.	.	Vegetative	(Kirchn.) Chodat
8399	Scenedesmus	acutus	.	.	.	.	Vegetative	Lagh. Chodat

2483	Scenedesmus	bijuga	.	.	.	.	Vegetative	(Turpin) Lagerh.
2488	Scenedesmus	denticulatus	.	.	.	.	Vegetative	Lagerhiem
8393	Scenedesmus	dispar	.	.	.	.	Vegetative	(Brebisson) Rabenhorst .
8303	Scenedesmus	opoliensis	.	carinatus	.	.	Vegetative	Lemmermann
2884	Scenedesmus	quadricauda	.	.	.	.	Vegetative	(Turpin) Breb.
8302	Scenedesmus	quadricauda	.	longispina	.	.	Vegetative	(Chodat) G. M. Smith
8221	Scenedesmus	quadricauda	.	quadrispina	.	.	Vegetative	(Chodat) Smith
2500	Selenastrum	spp	.	.	.	.	Vegetative	Lagerheim
2950	Spirogyra	spp	.	.	.	.	Vegetative	Skuja
2540	Stigeoclonium	spp	.	.	.	.	Vegetative	(Hazen) Collins Em Cox and Bold
2550	Tetraedron	spp	.	.	.	.	Vegetative	(Reinsch) De Toni
130069	Trentepohlia	spp	.	.	.	.	Vegetative	(Flotow) Hansgrig
103684	Ulothrix	aequalis	.	.	.	.	Vegetative	Kuetzing
103705	Ulothrix	zonata	.	.	.	.	Vegetative	(Weber and Mohr) Kuetzing
8211	Uronema	elongatum	.	.	.	.	Vegetative	Hodgetts
2740	Zygnema	spp	.	.	.	.	Vegetative	Czurda

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1653	*.	spp	.	.	.	.	Cyst	N/A
1000035	*Chrysocapsaceae	spp	.	.	.	>1 um spherical	Vegetative	N/A

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
3015	Cryptomonas	erosa	.	.	.	.	Vegetative	Ehrenberg .

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
4054	Aphanocapsa	delicatissima	.	.	.	.	Vegetative	West & West

4051	Aphanocapsa	elachista	.	.	.	.	Vegetative	West & West
4052	Aphanocapsa	koordersi	.	.	.	.	Vegetative	Strom
4055	Aphanocapsa	rivularis	.	.	.	.	Vegetative	(Carm.) Rabenhorst
4062	Aphanothece	nidulans	.	.	.	.	Vegetative	P. Richter
4069	Aphanothece	stagnina	.	.	.	.	Vegetative	(Spreg.) A. Br. .
4310	Calothrix	spp	.	.	.	.	Vegetative	(Naeg.) Born. and Flah.
4080	Chroococcus	spp	.	.	.	.	Vegetative	(Breb.) Naegeli
4512	Chroococcus	cohaerens	.	.	.	.	Vegetative	(Breb.) Naegeli
4083	Chroococcus	minimus	.	.	.	.	Vegetative	(Keis.) Lemmermann
4086	Chroococcus	minutus	.	.	.	.	Vegetative	(Kuetzing) Naegeli
4085	Chroococcus	prescottii	.	.	.	.	Vegetative	Drouet and Daily
4511	Chroococcus	turgidus	.	.	.	.	Vegetative	(Kutzing) Nageli .
1000544	Lyngbya	spp	.	.	.	sp. 4	Vegetative	.
4157	Lyngbya	diguetii	.	.	.	.	Vegetative	Lemmermann
4309	Lyngbya	perelegans	.	.	.	.	Vegetative	Lemmermann
107595	Lyngbya	subtillissima	.	.	.	.	Vegetative	.
4169	Merismopedia	elegans	.	.	.	.	Vegetative	A. Br. In Kutz 1849
4168	Merismopedia	punctata	.	.	.	.	Vegetative	Meyer In Wiegmann
4617	Oscillatoria	angustissima	.	.	.	.	Vegetative	West and West
4174	Oscillatoria	tenuis	.	.	.	.	Vegetative	Agardh
4190	Phormidium	spp	.	.	.	.	Vegetative	Lemmermann
4460	Pseudanabaena	spp	.	.	.	.	Vegetative	Lauterborn
4463	Pseudanabaena	galeata	.	.	.	.	Vegetative	Bocher .
4321	Synechococcus	elongatus	.	.	.	.	Vegetative	Nageli
4323	Synechococcus	sp. 1	.	.	.	< 1um ovoid	Vegetative	Nageli
4660	Synechocystis	spp	.	.	.	.	Vegetative	C. Sauvageau 1892
4285	Synechocystis	spp	.	.	.	>1 um spherical	Vegetative	N/A

Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
6034	Gymnodinium	sp. 3	.	.	.	.	Vegetative	Stein

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info@phycotech.com - www.phycotech.com

Algae Analysis with Biovolume Estimates

Report and Data Set

Customer ID: 222

Tracking Code:	060059-222-CJ	**Sample ID:**	EREF-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1010	*Achnanthes*	*spp*	.	.	.	.	Vegetative	20.80	3,823.241	0.13	639,565.051	0.13
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.16	711,122.732	24.35	43,265,631.481	8.54
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	10.13	11,469.722	0.39	1,378,754.574	0.27
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	40.00	11,469.722	0.39	13,767,744.416	2.72
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	60.00	2,284.465	0.08	27,364,847.080	5.40
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	51.20	3,823.241	0.13	7,600,316.508	1.50
1000572	*Cymbella*	*excisa*	.	.	.	.	Vegetative	24.80	3,823.241	0.13	2,022,749.232	0.40
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.72	49,702.126	1.70	2,734,755.133	0.54
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.40	3,823.241	0.13	548,099.757	0.11
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	17.60	3,823.241	0.13	1,217,633.662	0.24
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	44.80	3,823.241	0.13	3,099,431.104	0.61
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	69.33	11,469.722	0.39	279,809,753.373	55.23
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	19.73	11,469.722	0.39	1,282,204.753	0.25
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	40.00	761.488	0.03	1,196,143.155	0.24
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	44.00	2,284.465	0.08	5,605,955.811	1.11
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	19.20	3,823.241	0.13	472,845.768	0.09
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	18.80	7,646.481	0.26	2,055,893.286	0.41

1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	24.00	1,522.977	0.05	516,733.842	0.10
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	14.40	3,823.241	0.13	498,122.740	0.10
9101	*Navicula*	*subminuscula*	.	.	.	.	Vegetative	9.60	3,823.241	0.13	230,612.514	0.05
9102	*Navicula*	*tripunctata*	.	.	.	.	Vegetative	36.00	3,823.241	0.13	6,918,373.130	1.37
9114	*Nitzschia*	*fonticola*	.	.	.	.	Vegetative	17.60	3,823.241	0.13	270,585.258	0.05
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	40.00	3,823.241	0.13	960,885.093	0.19
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	18.00	22,939.443	0.79	1,482,837.709	0.29
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	17.60	3,823.241	0.13	152,204.351	0.03
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	40.80	7,646.481	0.26	2,176,981.430	0.43
1314	*Synedra*	*delicatissima*	.	.	.	.	Vegetative	28.00	3,823.241	0.13	616,612.227	0.12
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	32.00	7,646.481	0.26	6,733,797.019	1.33
1000541	*Synedra*	*radians*	.	.	.	.	Vegetative	20.80	3,823.241	0.13	814,319.640	0.16
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	63.47	7,646.481	0.26	4,859,818.104	0.96
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	176.00	7,646.481	0.26	81,745,163.817	16.14
Summary for Division ~ Bacillariophyta (31 detail records)							**Sum Total**	**Bacillariophyta**	932,077.596	31.92	502,039,371.019	99.10

Division: Chlorophyta

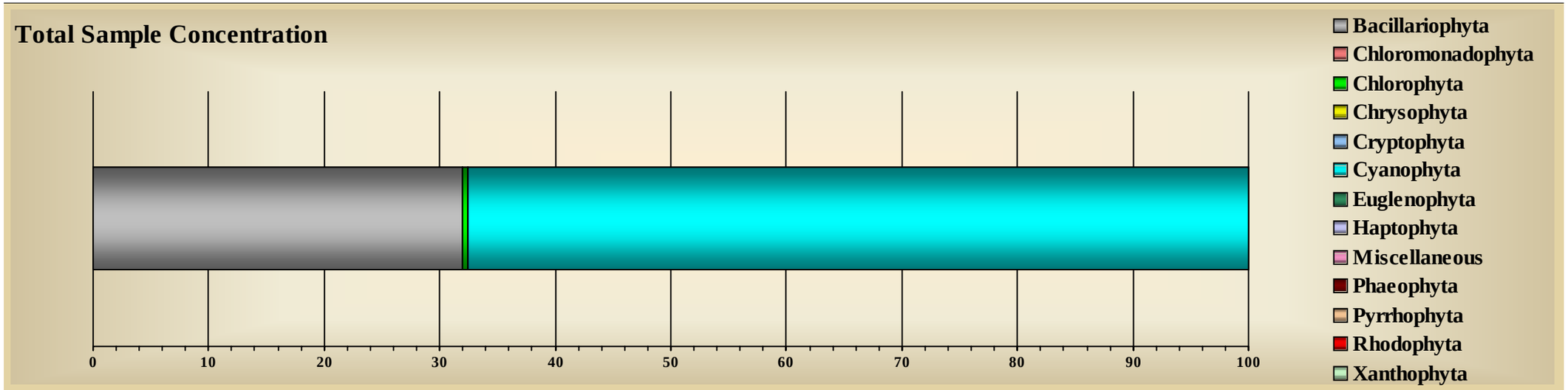
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	2.50	15,292.962	0.52	136,957.650	0.03
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	200.00	7.758	0.00	116,984.937	0.02
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	266.67	15.516	0.00	1,323,229.628	0.26
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	600.00	3.879	0.00	1,052,864.438	0.21
2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	144.00	3.879	0.00	67,022.621	0.01
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	520.00	7.758	0.00	510,834.227	0.10
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	520.00	7.758	0.00	510,834.227	0.10
Summary for Division ~ Chlorophyta (7 detail records)							**Sum Total**	**Chlorophyta**	15,339.509	0.53	3,718,727.729	0.73

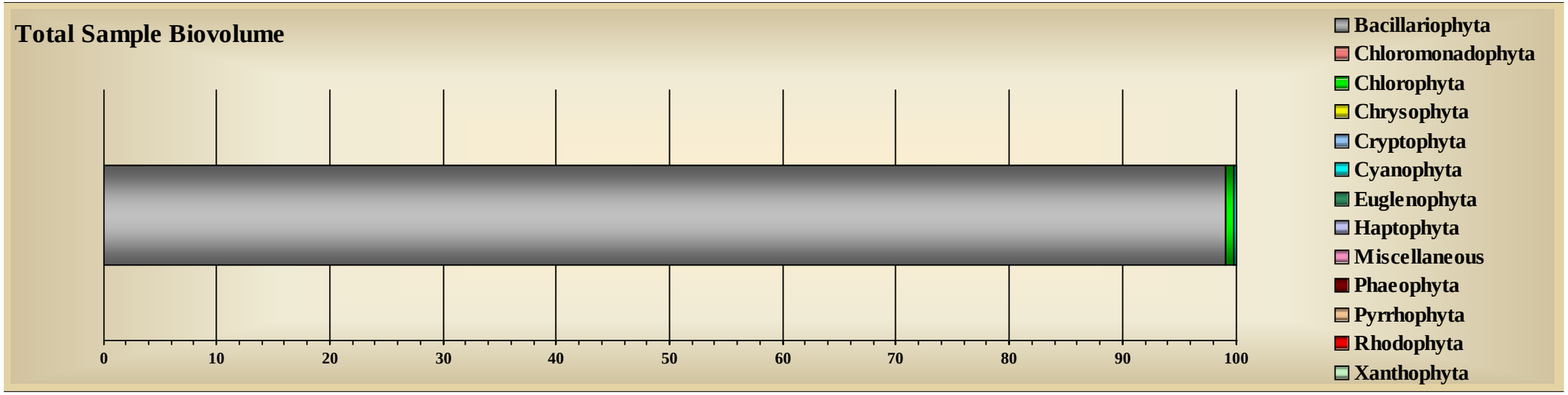
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	40.00	3,823.241	0.13	166,041.041	0.03
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	7.20	7,646.481	0.26	62,265.295	0.01
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.80	57,348.607	1.96	146,055.433	0.03
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	206,454.987	7.07	83,015.550	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,582,821.565	54.20	424,354.462	0.08
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	114,697.215	3.93	480,443.694	0.09
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total Cyanophyta**		1,972,792.096	67.56	1,362,175.474	0.27

Total Richness ~ 44 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,920,209.200	507,120,274.222
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060060-222-CJ	**Sample ID:**	EREF-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	10.24	985,466.070	31.32	47,018,557.148	12.61
☑ 1341	*Amphora*	*ovalis*	.	.	.	.	Vegetative	24.00	4,830.716	0.15	5,547,911.668	1.49
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	19,322.864	0.61	3,172,566.957	0.85
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	26.00	801.792	0.03	1,637,288.302	0.44
9212	*Cocconeis*	*placentula*	.	lineata	.	.	Vegetative	20.00	801.792	0.03	453,402.938	0.12
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	36.67	4,008.962	0.13	9,372,775.148	2.51
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	57.33	2,405.377	0.08	18,677,914.376	5.01
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	110.00	801.792	0.03	22,884,224.100	6.14
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.60	140,090.765	4.45	7,956,861.256	2.13
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	19.20	9,661.432	0.31	1,400,892.191	0.38
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	1,603.585	0.05	671,707.997	0.18
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	69.33	14,492.148	0.46	163,465,261.185	43.85
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	15.20	14,492.148	0.46	1,853,189.234	0.50
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	9.60	4,830.716	0.15	582,764.056	0.16
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	68.00	801.792	0.03	12,556,050.689	3.37
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	28.00	14,492.148	0.46	6,949,828.454	1.86
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	36.00	3,207.170	0.10	4,056,964.986	1.09

1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	26.40	28,984.296	0.92	10,996,755.012	2.95
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.80	38,645.728	1.23	6,235,016.775	1.67
9086	*Navicula*	*minuscula*	.	.	.	.	Vegetative	12.80	4,830.716	0.15	388,509.371	0.10
10356	*Navicula*	*radiosafallax*	.	.	.	.	Vegetative	54.40	4,830.716	0.15	9,510,705.993	2.55
9113	*Nitzschia*	*dissipata*	.	.	.	.	Vegetative	36.80	4,830.716	0.15	1,116,963.958	0.30
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	33.60	9,661.432	0.31	3,146,924.550	0.84
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.80	19,322.864	0.61	915,586.865	0.25
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	17.07	14,492.148	0.46	500,690.674	0.13
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	32.00	801.792	0.03	752,861.735	0.20
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	38.67	14,492.148	0.46	9,918,039.215	2.66
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	39.04	24,153.580	0.77	9,077,108.651	2.43
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	108.00	801.792	0.03	2,770,994.531	0.74
Summary for Division ~ Bacillariophyta (29 detail records)							**Sum Total**	**Bacillariophyta**	1,387,959.201	44.11	363,588,318.013	97.53

Division: Chlorophyta

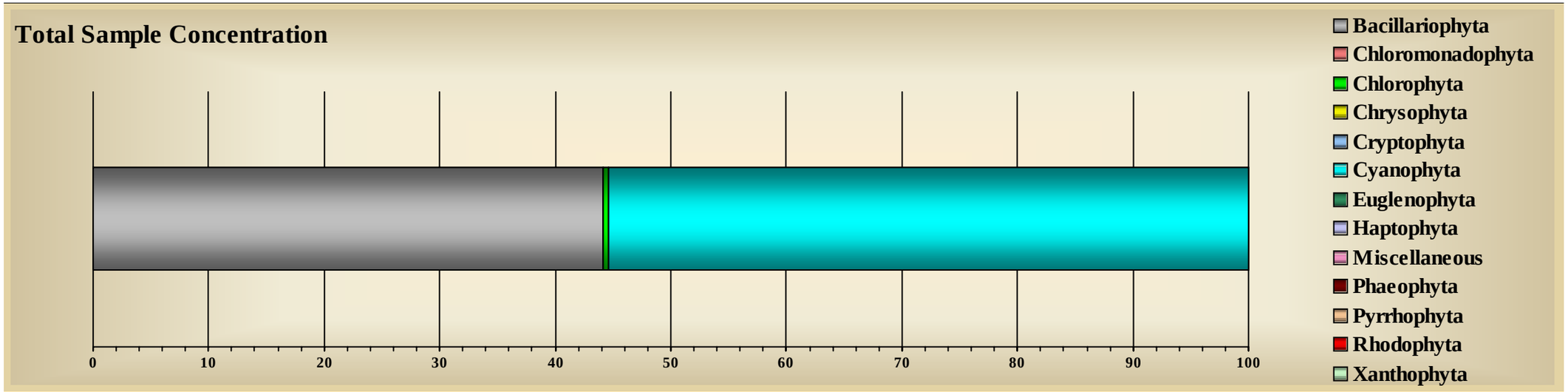
	Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
	2100	*Chlorococcum*	*spp*	.	.	.	.	Vegetative	2.27	14,492.148	0.46	90,165.798	0.02
☑	10170	*Geminella*	*spp*	.	.	.	.	Vegetative	240.00	4.084	0.00	205,294.513	0.06
	2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	424.00	20.421	0.00	2,416,932.304	0.65
	2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	76.00	12.253	0.00	212,405.087	0.06
	2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	560.00	4.084	0.00	718,530.796	0.19
	2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	400.00	4.084	0.00	83,144.278	0.02
☑	103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	176.00	4.084	0.00	20,324.157	0.01
	103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,360.00	4.084	0.00	2,512,804.842	0.67
Summary for Division ~ Chlorophyta (8 detail records)								**Sum Total**	**Chlorophyta**	14,545.243	0.46	6,259,601.775	1.68

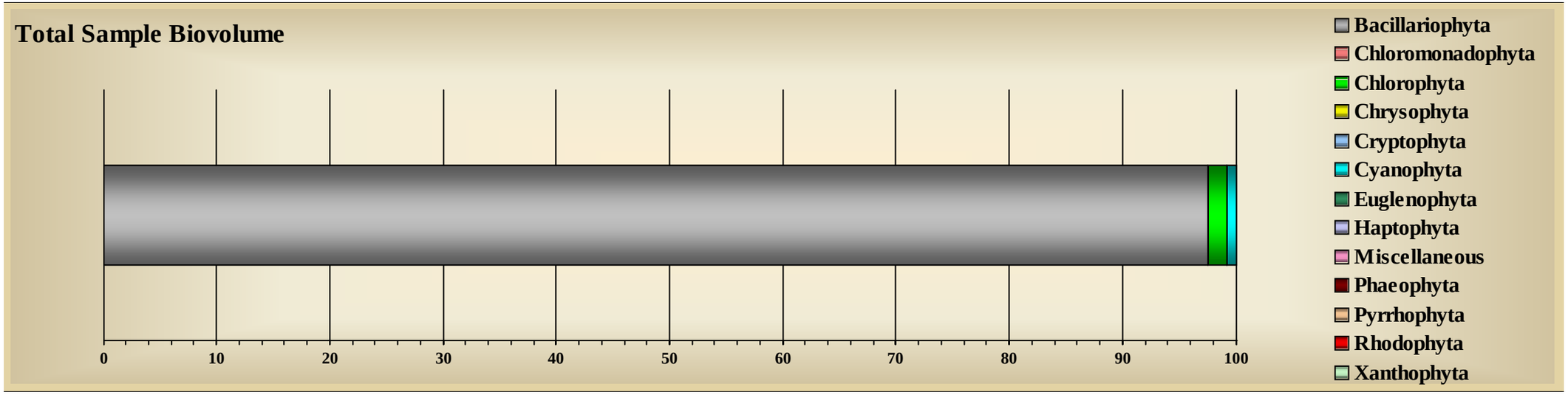
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	16.00	4,830.716	0.15	75,880.887	0.02
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	4,830.716	0.15	104,897.549	0.03
4150	*Lyngbya*	*spp*	.	.	.	.	Vegetative	28.00	4,830.716	0.15	186,484.479	0.05
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	24.56	53,137.876	1.69	1,255,903.080	0.34
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	27.33	48,307.160	1.54	373,332.227	0.10
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	4.80	9,661.432	0.31	13,112.496	0.00
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	8.20	9,661.432	0.31	89,600.121	0.02
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	1.80	130,429.333	4.15	122,381.843	0.03
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	362,303.702	11.51	145,682.319	0.04
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	1,014,450.367	32.24	271,974.143	0.07
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.80	101,445.037	3.22	321,245.998	0.09
Summary for Division ~ Cyanophyta (11 detail records)							**Sum Total Cyanophyta**		1,743,888.487	55.43	2,960,495.141	0.79

Total Richness ~ 48 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,146,392.931	372,808,414.929
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060061-222-CJ	**Sample ID:**	EREF-NS-7-1	**Replicate:**	7
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Near Shore Replicate 7 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	10.91	1,205,483.228	37.47	78,001,274.446	9.81
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	226.302	0.01	273,004.771	0.03
9212	*Cocconeis*	*placentula*	.	lineata	.	.	Vegetative	16.00	226.302	0.01	71,094.999	0.01
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	62.50	4,299.745	0.13	15,135,103.532	1.90
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	27.20	6,587.340	0.20	1,146,724.155	0.14
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	140.00	226.302	0.01	15,207,520.295	1.91
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.12	164,683.501	5.12	9,477,337.866	1.19
1094	*Cymbella*	*naviculiformis*	.	.	.	.	Vegetative	60.00	226.302	0.01	869,001.160	0.11
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	26.80	13,174.680	0.41	3,638,488.288	0.46
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	17.60	6,587.340	0.20	5,827,638.584	0.73
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	57.44	32,936.700	1.02	405,773,173.914	51.04
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	17.60	32,936.700	1.02	3,215,797.781	0.40
9395	*Fragilaria*	*capucina*	.	gracilis	.	.	Vegetative	22.00	13,174.680	0.41	1,774,780.916	0.22
1152	*Fragilaria*	*crotonensis*	.	.	.	.	Vegetative	88.00	226.302	0.01	3,003,052.432	0.38
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	90.67	1,810.419	0.06	63,392,360.247	7.97
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	50.00	226.302	0.01	666,939.087	0.08
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	20.00	452.605	0.01	131,840.149	0.02

9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	46.40	6,587.340	0.20	19,768,145.695	2.49
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	14.88	59,286.060	1.84	6,539,406.604	0.82
9102	*Navicula*	*tripunctata*	.	.	.	.	Vegetative	44.00	452.605	0.01	500,508.731	0.06
9114	*Nitzschia*	*fonticola*	.	.	.	.	Vegetative	15.20	13,174.680	0.41	995,996.592	0.13
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	36.00	13,174.680	0.41	3,920,411.950	0.49
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	13,174.680	0.41	524,487.967	0.07
☑ 1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	16.00	6,587.340	0.20	317,871.435	0.04
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	24.00	6,587.340	0.20	1,589,355.858	0.20
1754	*Rhopalodia*	*gibba*	.	minuta	.	.	Vegetative	132.00	226.302	0.01	2,867,703.827	0.36
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	38.88	32,936.700	1.02	37,369,716.567	4.70
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	40.00	39,524.040	1.23	15,541,485.013	1.95
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	136.00	13,174.680	0.41	80,135,782.097	10.08
Summary for Division ~ Bacillariophyta (29 detail records)							**Sum Total**	**Bacillariophyta**	1,688,371.202	52.48	777,676,004.954	97.82

Division: Chlorophyta

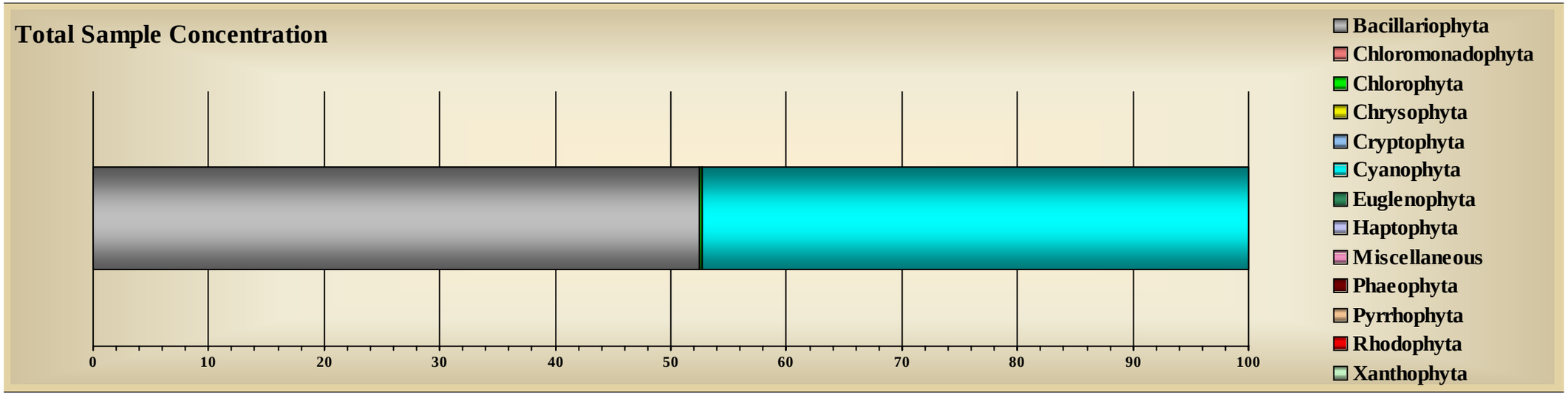
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.20	6,587.340	0.20	113,020.969	0.01
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	320.00	4.456	0.00	1,316,870.986	0.17
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	760.00	31.189	0.00	6,277,532.951	0.79
2380	*Pediastrum*	*spp*	.	.	.	.	Vegetative	64.00	4.456	0.00	45,764.227	0.01
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	48.00	13.367	0.00	92,446.596	0.01
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	320.00	4.456	0.00	286,665.793	0.04
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	540.00	8.911	0.00	488,227.679	0.06
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	560.00	4.456	0.00	2,006,660.551	0.25
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total**	**Chlorophyta**	6,658.628	0.21	10,627,189.752	1.34

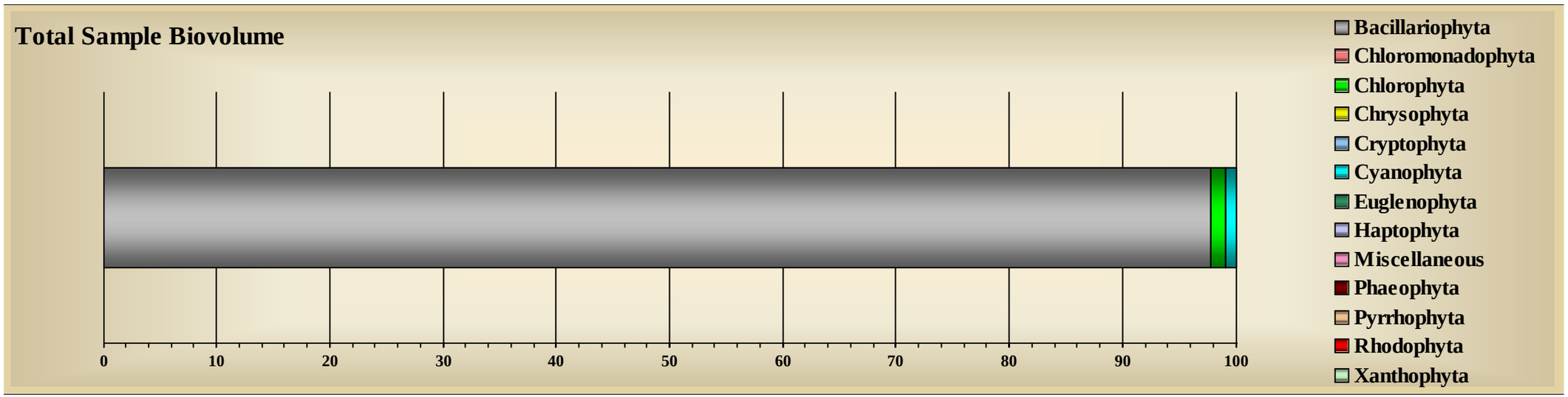
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	20.00	226.302	0.01	87,016.028	0.01
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	33.76	144,921.481	4.50	4,442,118.741	0.56
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	16.00	6,587.340	0.20	52,978.682	0.01
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	8.10	26,349.360	0.82	204,629.131	0.03
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	3.20	79,048.081	2.46	339,060.932	0.04
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	237,144.242	7.37	95,355.700	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	790,480.805	24.57	211,927.904	0.03
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.10	237,144.242	7.37	1,233,742.917	0.16
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		1,521,901.852	47.31	6,666,830.034	0.84

Total Richness ~ 45 Taxa	Total Sample Concentration	Total Sample Biovolume
	3,216,931.682	794,970,024.740
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060062-222-CJ	**Sample ID:**	EREF-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
108135	*Achnanthes*	*deflexa*	.	.	.	.	Vegetative	24.00	138.740	0.01	334,743.104	0.05
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	10.72	739,913.283	37.56	45,904,294.069	6.54
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	4.80	8,653.957	0.44	217,149.404	0.03
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	4,326.978	0.22	939,589.916	0.13
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	416.219	0.02	502,114.657	0.07
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	40.00	693.698	0.04	3,480,699.896	0.50
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.80	17,307.913	0.88	41,132,831.723	5.86
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	20.00	4,326.978	0.22	369,235.334	0.05
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	152.00	138.740	0.01	5,611,740.648	0.80
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.64	151,444.239	7.69	6,642,541.209	0.95
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	25.50	11,237.910	0.57	11,165,987.593	1.59
1096	*Cymbella*	*tumida*	.	.	.	.	Vegetative	80.00	138.740	0.01	1,775,867.294	0.25
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	32.00	138.740	0.01	55,790.522	0.01
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	46.00	17,307.913	0.88	362,246,686.245	51.59
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	19.60	8,653.957	0.44	937,850.038	0.13
9395	*Fragilaria*	*capucina*	.	gracilis	.	.	Vegetative	19.20	12,980.935	0.66	1,492,903.560	0.21
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	82.00	416.219	0.02	6,789,155.620	0.97

1160	*Gomphonema*	*spp*	.	.	.	.	Vegetative	44.00	4,326.978	0.22	4,850,707.924	0.69
1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	40.00	277.479	0.01	161,654.980	0.02
9053	*Gomphonema*	*minutum*	.	.	.	.	Vegetative	16.00	4,326.978	0.22	673,740.372	0.10
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	18.40	8,653.957	0.44	2,422,504.647	0.34
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	28.00	4,326.978	0.22	1,096,188.019	0.16
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	17.60	4,326.978	0.22	689,032.346	0.10
☑ 9076	*Navicula*	*goeppertiana*	.	goeppertiana	.	.	Vegetative	17.60	4,326.978	0.22	1,913,979.122	0.27
9102	*Navicula*	*tripunctata*	.	.	.	.	Vegetative	40.00	8,653.957	0.44	11,287,257.708	1.61
9114	*Nitzschia*	*fonticola*	.	.	.	.	Vegetative	17.60	4,326.978	0.22	459,355.041	0.07
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	40.00	4,326.978	0.22	1,739,981.374	0.25
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	18.40	8,653.957	0.44	730,792.013	0.10
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	29.60	8,653.957	0.44	1,545,103.360	0.22
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	24.00	138.740	0.01	87,902.809	0.01
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	67.73	12,980.935	0.66	5,604,994.996	0.80
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.30	30,288.848	1.54	24,911,486.952	3.55
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	32.00	12,980.935	0.66	2,392,645.900	0.34
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	174.67	21,634.891	1.10	129,601,652.938	18.46
Summary for Division ~ Bacillariophyta (34 detail records)							**Sum Total**	**Bacillariophyta**	1,121,441.659	56.93	679,768,161.331	96.81

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	384.00	2.927	0.00	367,773.593	0.05
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	11.20	8,653.957	0.44	6,366,011.384	0.91
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	48.00	138.740	0.01	697,381.449	0.10
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	742.86	23.413	0.00	5,003,402.119	0.71
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	70.67	96.579	0.00	1,105,891.291	0.16
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	9.60	4,326.978	0.22	208,797.903	0.03
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	560.00	20.487	0.00	3,206,691.514	0.46

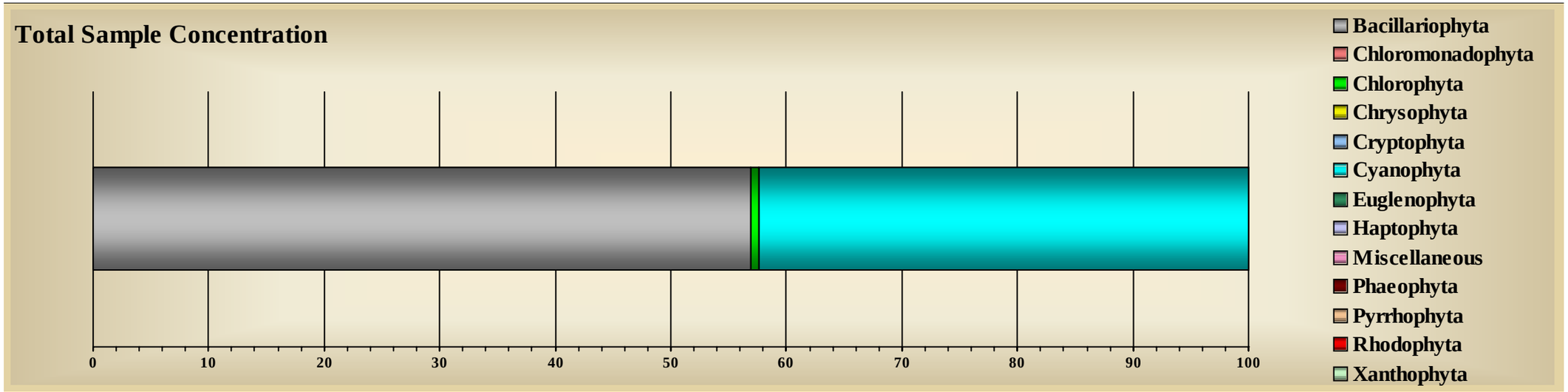
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	608.00	11.707	0.00	1,725,887.918	0.25
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total**	**Chlorophyta**	13,274.787	0.67	18,681,837.171	2.66

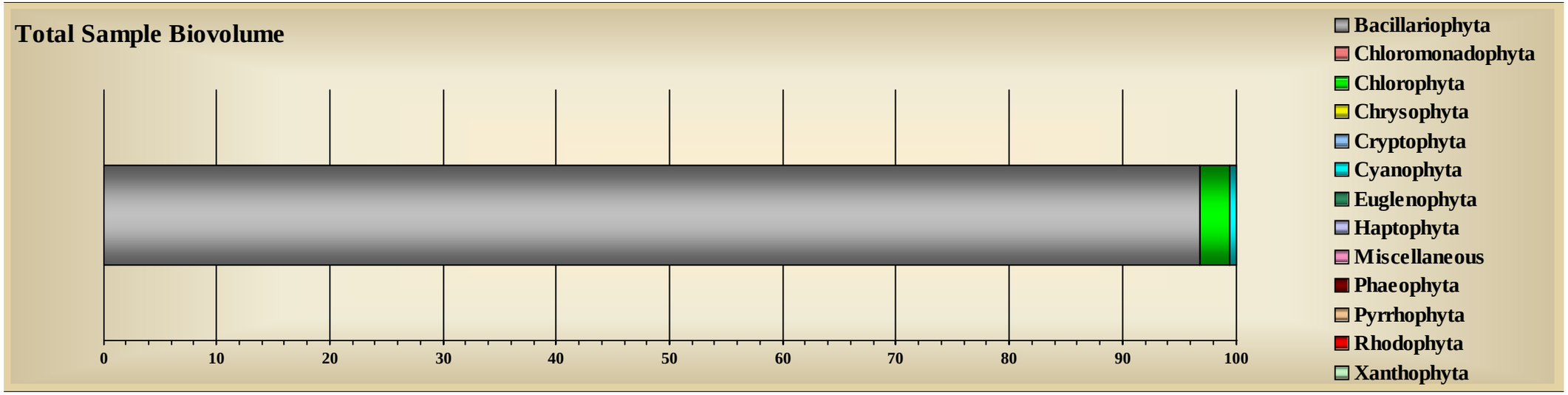
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	3.20	4,326.978	0.22	9,062.423	0.00
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	12.00	4,326.978	0.22	1,159,987.583	0.17
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	37.33	43,269.783	2.20	1,237,922.519	0.18
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	43,269.783	2.20	496,620.276	0.07
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	15.20	12,980.935	0.66	154,967.698	0.02
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.20	103,847.478	5.27	306,235.829	0.04
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	51,923.739	2.64	20,878.536	0.00
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	103,847.478	5.27	222,721.687	0.03
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	467,313.652	23.72	125,286.790	0.02
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total**	**Cyanophyta**	835,106.805	42.40	3,733,683.340	0.53

Total Richness ~ 51 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,969,823.251	702,183,681.843
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060063-222-CJ	**Sample ID:**	EREF-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.88	569,611.168	24.68	60,040,833.542	4.31
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	10,849.737	0.47	2,205,901.165	0.16
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	173.942	0.01	209,838.961	0.02
1090	*Cymbella*	*spp*	.	.	.	.	Vegetative	56.00	5,424.868	0.24	12,702,582.396	0.91
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.40	10,849.737	0.47	16,720,745.977	1.20
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	48.98	65,098.419	2.82	287,841,253.673	20.64
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.68	184,445.521	7.99	8,197,054.074	0.59
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	28.00	5,424.868	0.24	4,666,254.691	0.33
9952	*Cymbella*	*tumidula*	.	.	.	.	Vegetative	92.00	10,849.737	0.47	191,649,746.251	13.74
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	48.00	16,274.605	0.71	227,745,359.889	16.33
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	18.40	10,849.737	0.47	1,269,614.471	0.09
9395	*Fragilaria*	*capucina*	.	gracilis	.	.	Vegetative	20.00	5,424.868	0.24	872,587.349	0.06
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	80.00	5,424.868	0.24	46,267,624.098	3.32
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	50.00	173.942	0.01	579,421.505	0.04
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	18.00	43,398.946	1.88	7,819,153.411	0.56
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	36.00	5,424.868	0.24	1,856,030.796	0.13
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	14.93	32,549.210	1.41	4,397,840.889	0.32

1000065	*Navicula*	*cryptotenelloides*	.	.	.	.	Vegetative	10.40	5,424.868	0.24	354,488.560	0.03
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	30.40	10,849.737	0.47	4,973,749.245	0.36
9117	*Nitzschia*	*intermedia*	.	.	.	.	Vegetative	140.00	173.942	0.01	1,836,090.874	0.13
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.92	48,823.814	2.12	6,408,281.880	0.46
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	20.80	16,274.605	0.71	1,609,924.594	0.12
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	56.00	10,849.737	0.47	3,499,691.019	0.25
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	36.00	97,647.629	4.23	75,638,322.027	5.42
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	52.20	21,699.473	0.94	10,737,940.855	0.77
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	150.86	59,673.551	2.59	390,203,643.146	27.98
Summary for Division ~ Bacillariophyta (26 detail records)							**Sum Total**	**Bacillariophyta**	1,253,666.397	54.32	1,370,303,975.336	98.27

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	24.00	5,424.868	0.24	558,456.012	0.04
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	16.00	695.769	0.03	279,785.305	0.02
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	1,033.33	22.015	0.00	4,743,686.522	0.34
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	45.33	594.416	0.03	4,721,961.382	0.34
102560	*Pediastrum*	*integrum*	.	.	.	.	Vegetative	150.00	7.339	0.00	112,136.913	0.01
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	24.00	173.942	0.01	59,017.206	0.00
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	853.33	11.008	0.00	2,921,461.685	0.21
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	824.00	7.339	0.00	333,459.768	0.02
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total**	**Chlorophyta**	6,936.695	0.30	13,729,964.792	0.98

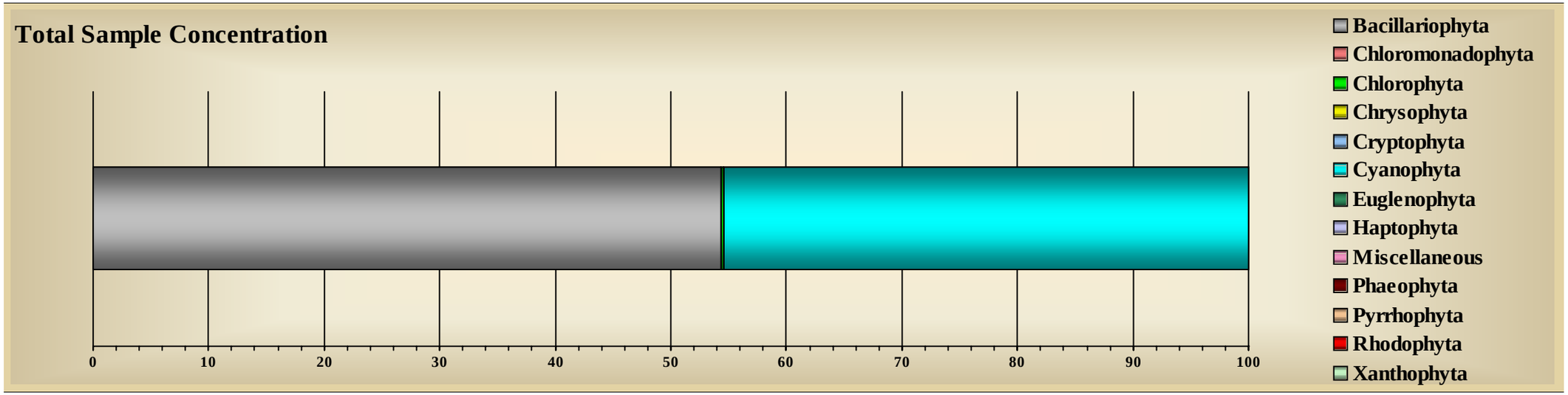
Division: Cyanophyta

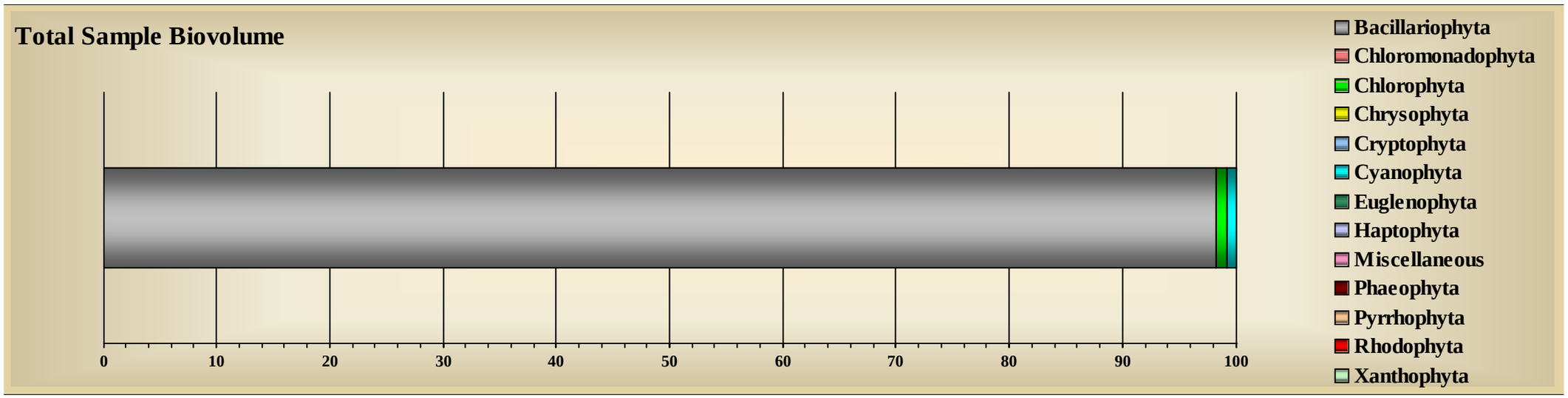
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	120.00	173.942	0.01	491,810.058	0.04
4512	*Chroococcus*	*cohaerens*	.	.	.	.	Vegetative	3.20	5,424.868	0.24	14,724.720	0.00

4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	8.00	5,424.868	0.24	314,131.337	0.02
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	11.20	5,424.868	0.24	2,513,052.324	0.18
4157	*Lyngbya*	*diguetii*	.	.	.	.	Vegetative	80.00	10,849.737	0.47	1,570,657.770	0.11
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	55.20	97,647.629	4.23	4,365,444.661	0.31
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	43,398.946	1.88	523,551.867	0.04
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	16,274.605	0.71	43,628.961	0.00
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	325,492.096	14.10	130,880.372	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	455,688.935	19.75	122,170.203	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	81,373.024	3.53	340,855.323	0.02
Summary for Division ~ Cyanophyta (11 detail records)						**Sum Total Cyanophyta**			1,047,173.519	45.38	10,430,907.597	0.75

Total Richness ~ 45 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,307,776.611	1,394,464,847.72
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060064-222-CJ	**Sample ID:**	EREF-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	10.96	1,120,235.298	38.08	75,634,478.508	7.67
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	6.40	6,329.013	0.22	480,504.995	0.05
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.00	6,329.013	0.22	8,907,664.893	0.90
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.67	25,316.052	0.86	47,699,492.400	4.84
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	42.67	18,987.039	0.65	28,634,816.718	2.90
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	100.00	405.865	0.01	10,606,610.365	1.08
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.00	177,212.364	6.02	7,258,618.409	0.74
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.00	608.798	0.02	194,815.293	0.02
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	12,658.026	0.43	5,497,302.196	0.56
4272	*Diatoma*	*vulgaris*	.	.	.	distorta	Vegetative	70.67	25,316.052	0.86	275,068,693.912	27.90
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	14.40	31,645.065	1.08	4,644,710.731	0.47
9395	*Fragilaria*	*capucina*	.	gracilis	.	.	Vegetative	19.20	6,329.013	0.22	977,298.337	0.10
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	10.40	12,658.026	0.43	1,547,389.245	0.16
1152	*Fragilaria*	*crotonensis*	.	.	.	.	Vegetative	64.00	6,329.013	0.22	5,497,301.563	0.56
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	70.00	2,232.259	0.08	52,761,790.159	5.35
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	28.00	1,217.596	0.04	513,200.343	0.05
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	14.40	12,658.026	0.43	1,649,190.153	0.17

9102	*Navicula*	*tripunctata*	.	.	.	.	Vegetative	52.00	6,329.013	0.22	11,910,820.793	1.21
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	60.00	202.933	0.01	1,224,060.586	0.12
9114	*Nitzschia*	*fonticola*	.	.	.	.	Vegetative	17.60	12,658.026	0.43	671,891.816	0.07
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	30.93	18,987.039	0.65	3,817,570.126	0.39
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	31,645.065	1.08	1,679,729.539	0.17
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	20.00	6,329.013	0.22	381,757.203	0.04
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	28.00	6,329.013	0.22	1,781,532.979	0.18
1752	*Rhopalodia*	*brebissonii*	.	.	.	.	Vegetative	20.00	6,329.013	0.22	2,673,375.084	0.27
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	60.00	12,658.026	0.43	3,240,454.647	0.33
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	38.97	82,277.169	2.80	147,579,101.308	14.97
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	45.26	56,961.117	1.94	25,814,385.119	2.62
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	142.40	44,303.091	1.51	237,810,485.616	24.12
Summary for Division ~ Bacillariophyta (29 detail records)							**Sum Total**	**Bacillariophyta**	1,751,475.033	59.54	966,159,043.031	98.00

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	11.20	6,329.013	0.22	855,135.728	0.09
10170	*Geminella*	*spp*	.	.	.	.	Vegetative	400.00	4.281	0.00	57,380.000	0.01
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	46.67	231.162	0.01	1,574,523.168	0.16
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	11.20	6,329.013	0.22	380,060.394	0.04
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	900.00	25.685	0.00	8,656,490.162	0.88
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	1,013.33	12.842	0.00	960,218.428	0.10
Summary for Division ~ Chlorophyta (6 detail records)							**Sum Total**	**Chlorophyta**	12,931.995	0.44	12,483,807.881	1.27

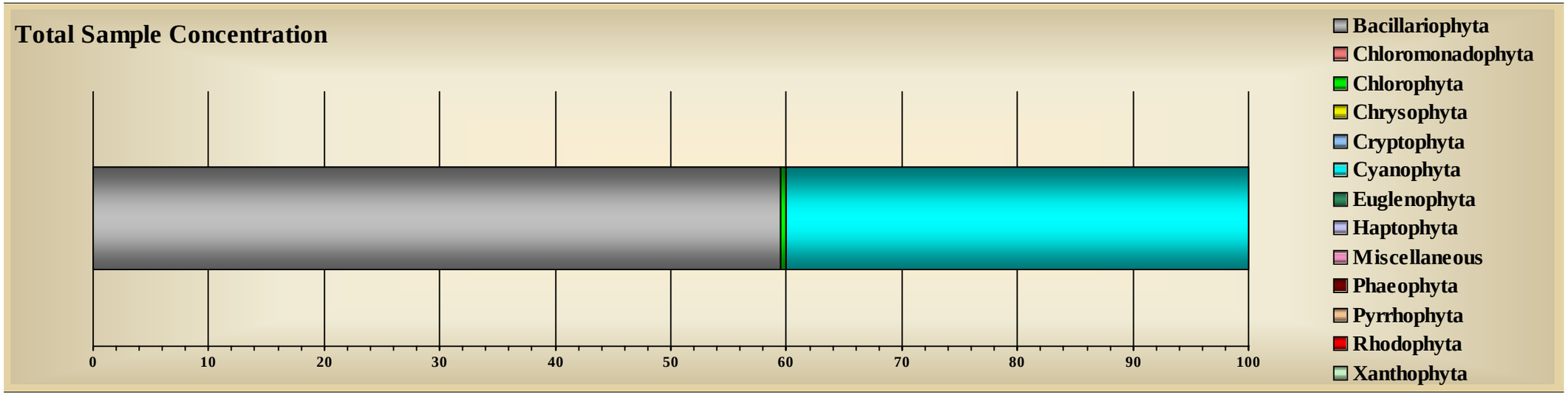
Division: Cyanophyta

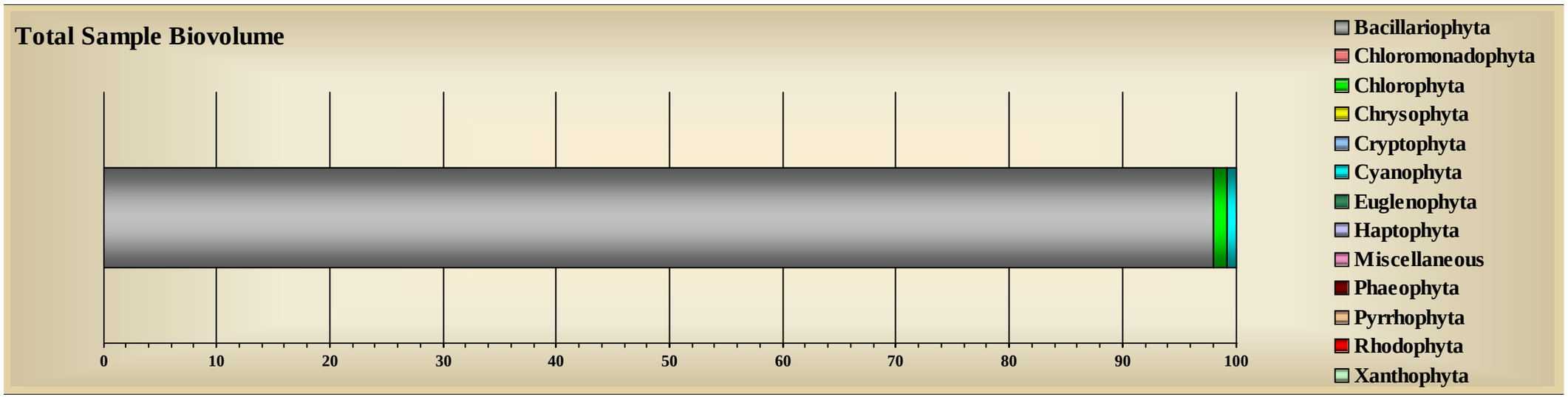
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	5.60	12,658.026	0.43	251,854.211	0.03

4080	*Chroococcus*	*spp*	.	.	.	.	Vegetative	32.00	6,329.013	0.22	1,832,434.065	0.19
☑ 4512	*Chroococcus*	*cohaerens*	.	.	.	.	Vegetative	9.60	6,329.013	0.22	217,177.549	0.02
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	47.00	107,593.221	3.66	3,964,907.016	0.40
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	48.00	12,658.026	0.43	171,790.931	0.02
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	24.00	6,329.013	0.22	76,351.314	0.01
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	1.80	56,961.117	1.94	110,709.627	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	379,740.779	12.91	152,693.767	0.02
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	132,909.273	4.52	285,050.517	0.03
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	455,688.935	15.49	122,170.203	0.01
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		1,177,196.415	40.02	7,185,139.201	0.73

Total Richness ~ 45 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,941,603.443	985,827,990.112
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060065-222-CJ	**Sample ID:**	EREF-1	**Replicate:**	.
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	EREF	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East Reference Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.68	106,947.403	9.65	7,186,320.053	1.27
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	6.40	1,549.962	0.14	81,441.532	0.01
1347	*Amphora*	*veneta*	.	.	.	.	Vegetative	24.00	1,549.962	0.14	1,234,088.093	0.22
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	28.00	1,549.962	0.14	174,517.547	0.03
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	1,549.962	0.14	2,921,610.236	0.52
9212	*Cocconeis*	*placentula*	.	lineata	.	.	Vegetative	17.60	1,549.962	0.14	493,635.268	0.09
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.29	15,499.624	1.40	43,201,023.718	7.64
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	48.80	7,749.812	0.70	30,386,206.145	5.37
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	28.00	1,549.962	0.14	277,753.255	0.05
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.96	38,749.059	3.50	1,833,171.486	0.32
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.00	1,549.962	0.14	198,395.183	0.04
1096	*Cymbella*	*tumida*	.	.	.	.	Vegetative	120.00	124.244	0.01	2,814,882.188	0.50
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	17.60	3,099.925	0.28	1,480,905.650	0.26
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	352.00	1,549.962	0.14	897,518.726	0.16
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	48.57	17,049.586	1.54	193,152,427.322	34.14
1354	*Epithemia*	*turgida*	.	.	.	.	Vegetative	96.00	1,549.962	0.14	9,919,759.123	1.75
9395	*Fragilaria*	*capucina*	.	gracilis	.	.	Vegetative	16.00	3,099.925	0.28	155,819.266	0.03

9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	30.60	4,649.887	0.42	8,304,852.252	1.47
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	4.80	1,549.962	0.14	119,669.184	0.02
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	84.00	1,549.962	0.14	30,085,836.458	5.32
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	20.00	24,799.398	2.24	4,623,274.855	0.82
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	16.80	3,099.925	0.28	568,428.547	0.10
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	40.00	1,549.962	0.14	1,558,192.043	0.28
9113	*Nitzschia*	*dissipata*	.	.	.	.	Vegetative	17.60	1,549.962	0.14	274,241.816	0.05
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.00	3,099.925	0.28	149,586.558	0.03
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	46.31	15,499.624	1.40	31,025,478.822	5.48
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	40.27	4,649.887	0.42	2,350,586.277	0.42
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	172.67	10,849.737	0.98	115,276,859.086	20.38
Summary for Division ~ Bacillariophyta (28 detail records)							**Sum Total Bacillariophyta**		279,117.470	25.18	490,746,480.688	86.75

Division: Chlorophyta

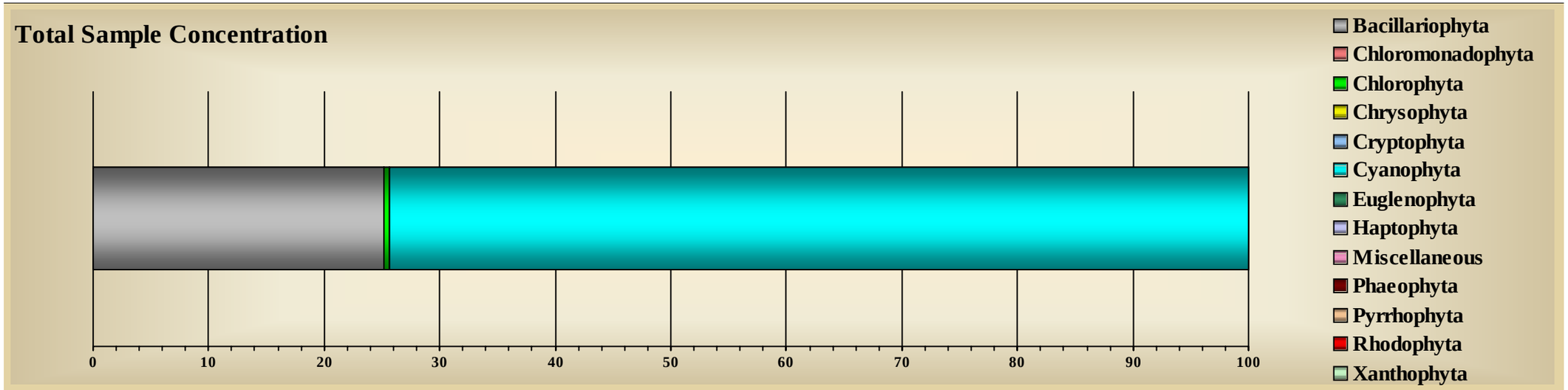
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	5.87	4,649.887	0.42	834,359.930	0.15
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,360.00	10.484	0.00	21,563,169.577	3.81
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	56.00	124.244	0.01	2,448,121.166	0.43
10170	*Geminella*	*spp*	.	.	.	.	Vegetative	192.00	2.621	0.00	9,485.265	0.00
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	560.00	5.242	0.00	405,758.567	0.07
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	826.67	18.346	0.00	3,015,523.897	0.53
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	41.33	70.764	0.01	307,256.019	0.05
2471	*Rhizoclonium*	*hieroglyphicum*	.	.	.	.	Vegetative	560.00	2.621	0.00	426,836.935	0.08
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,264.00	76.006	0.01	39,809,131.125	7.04
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total Chlorophyta**		4,960.214	0.45	68,819,642.481	12.17

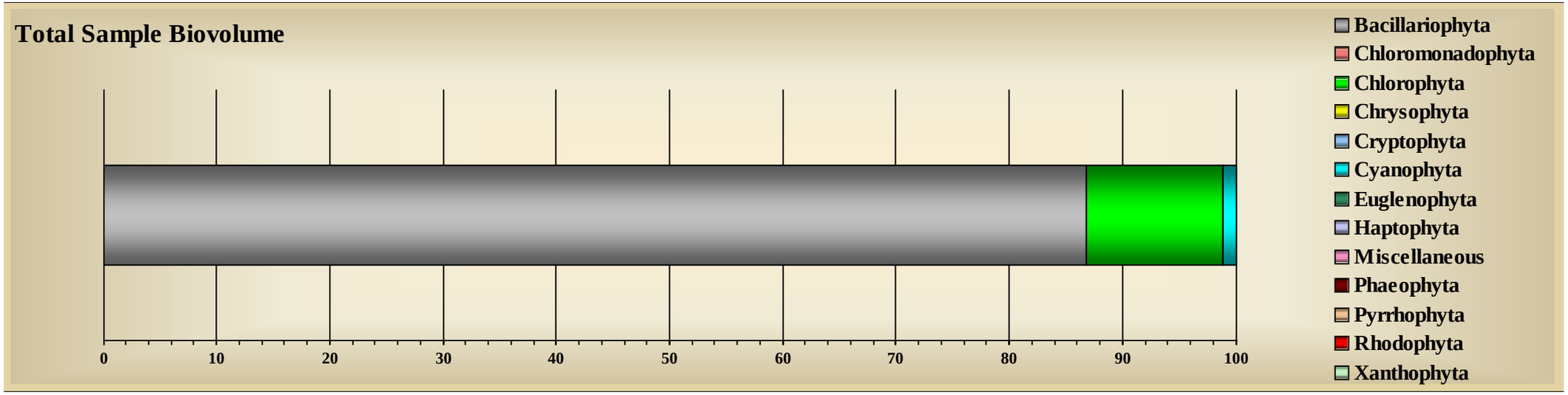
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	9.60	4,649.887	0.42	56,809.066	0.01
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	1,549.962	0.14	49,862.134	0.01
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	540.00	5.242	0.00	188,387.907	0.03
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	9.33	4,649.887	0.42	104,035.179	0.02
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	9.60	1,549.962	0.14	103,879.408	0.02
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	81.00	30,999.247	2.80	2,083,887.198	0.37
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.40	10,849.737	0.98	93,939.189	0.02
4252	*Oscillatoria*	*hamelii*	.	.	.	.	Vegetative	160.00	3,099.925	0.28	2,854,607.843	0.50
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.20	102,297.516	9.23	301,665.145	0.05
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	139,496.613	12.58	56,091.588	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	464,988.709	41.94	124,663.473	0.02
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	60,448.532	5.45	129,643.967	0.02
Summary for Division ~ Cyanophyta (12 detail records)							**Sum Total Cyanophyta**		824,585.219	74.38	6,147,472.095	1.09

Total Richness ~ 49 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,108,662.903	565,713,595.263
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060066-222-CJ	**Sample ID:**	ECKD-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	14.40	804,817.957	35.01	50,722,685.955	4.71
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	4,004.069	0.17	603,799.257	0.06
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	46.40	4,004.069	0.17	15,061,280.362	1.40
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	24.00	4,004.069	0.17	4,050,965.099	0.38
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	40.77	36,036.625	1.57	54,075,708.918	5.02
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.00	8,008.139	0.35	628,692.556	0.06
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.00	188,191.264	8.19	6,976,024.311	0.65
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	27.20	8,008.139	0.35	5,002,203.867	0.46
1096	*Cymbella*	*tumida*	.	.	.	.	Vegetative	70.00	385.158	0.02	7,189,612.004	0.67
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	51.20	4,004.069	0.17	3,709,743.907	0.34
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	143.00	12,012.208	0.52	212,990,254.210	19.76
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	48.00	20,020.347	0.87	44,439,639.135	4.12
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	11.20	4,004.069	0.17	360,669.357	0.03
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	18.40	20,020.347	0.87	9,375,382.440	0.87
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	20.00	4,004.069	0.17	724,559.188	0.07
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	32.00	4,004.069	0.17	772,863.481	0.07
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	24.00	4,004.069	0.17	579,647.511	0.05

1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	64.00	8,008.139	0.35	2,557,479.231	0.24
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	59.20	120,122.083	5.23	155,150,319.213	14.40
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	55.91	120,122.083	5.23	79,228,898.343	7.35
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	128.00	96,097.667	4.18	419,529,094.883	38.93
Summary for Division ~ Bacillariophyta (21 detail records)							**Sum Total**	**Bacillariophyta**	1,473,882.711	64.11	1,073,729,523.227	99.63

Division: Chlorophyta

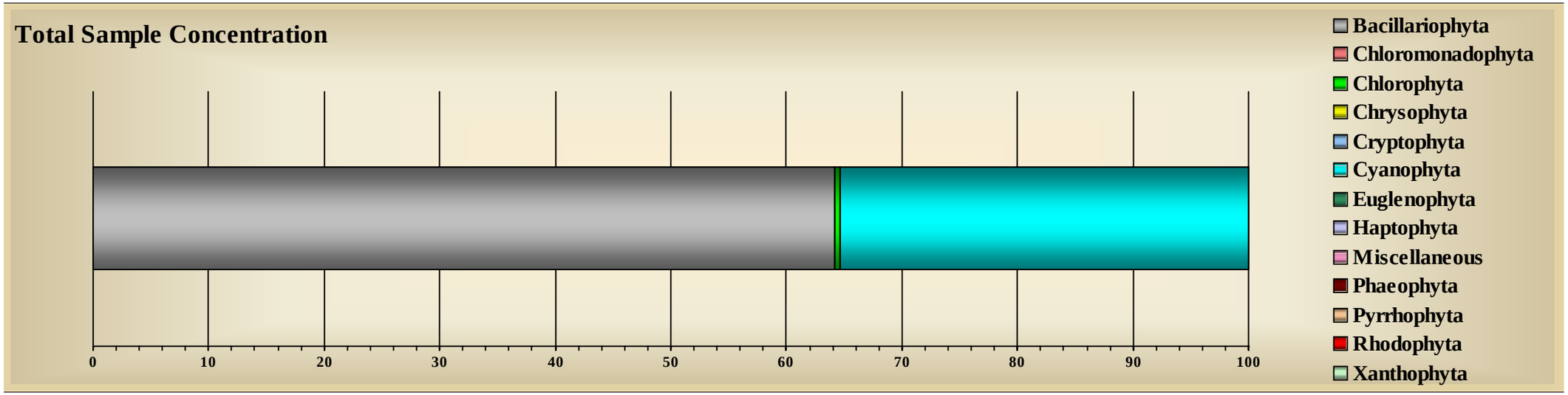
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	360.00	2.708	0.00	196,028.814	0.02
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	16.00	4,004.069	0.17	1,717,473.912	0.16
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	800.00	2.708	0.00	245,036.018	0.02
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	33.60	121.871	0.01	332,713.125	0.03
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	9.60	8,008.139	0.35	309,145.392	0.03
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	240.00	2.708	0.00	130,685.876	0.01
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	240.00	5.417	0.00	154,372.692	0.01
Summary for Division ~ Chlorophyta (7 detail records)							**Sum Total**	**Chlorophyta**	12,147.620	0.53	3,085,455.829	0.29

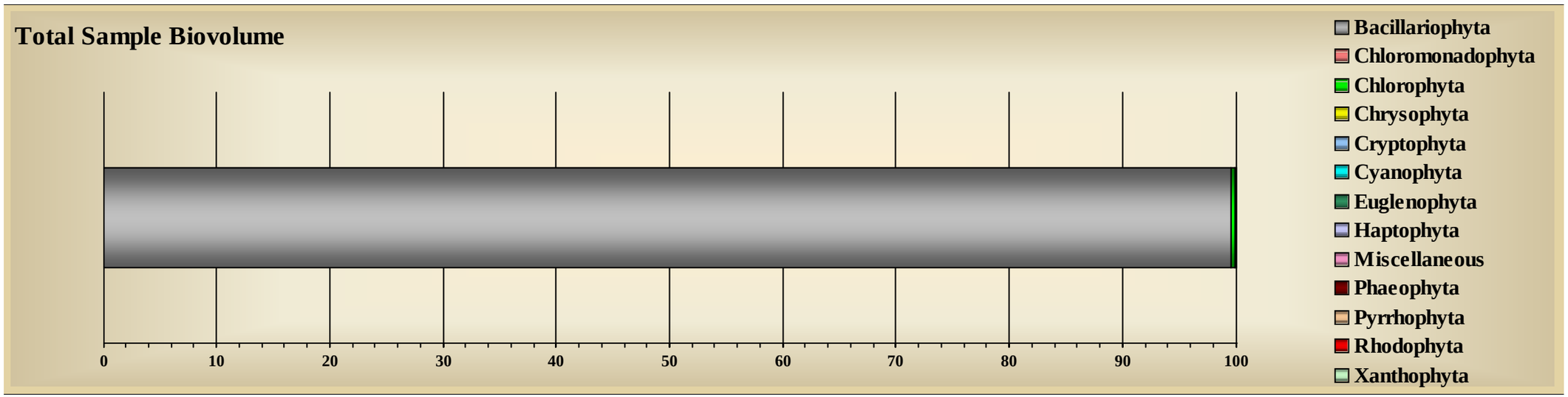
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	64.00	4,004.069	0.17	253,595.736	0.02
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	14.00	40,040.694	1.74	200,764.042	0.02
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	48,048.833	2.09	128,809.312	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	48,048.833	2.09	19,320.436	0.00
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	624,634.832	27.17	167,464.599	0.02
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	48,048.833	2.09	103,050.333	0.01
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total**	**Cyanophyta**	812,826.096	35.36	873,004.457	0.08

Total Richness ~ 34 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,298,856.427	1,077,687,983.51
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060067-222-CJ	**Sample ID:**	ECKD-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.20	695,158.120	36.55	47,996,983.832	6.22
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	32.00	5,037.378	0.26	4,910,677.556	0.64
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	44.00	484.553	0.03	2,439,564.579	0.32
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.00	30,224.266	1.59	58,952,201.279	7.64
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	28.00	5,037.378	0.26	1,805,396.160	0.23
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	160.00	161.518	0.01	4,961,826.230	0.64
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.77	166,233.463	8.74	7,360,119.580	0.95
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.00	646.071	0.03	381,371.456	0.05
☑ 10400	*Cymbellonitzschia*	*spp*	.	.	.	.	Vegetative	24.00	10,074.755	0.53	4,861,559.094	0.63
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	14.40	5,037.378	0.26	1,312,621.237	0.17
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	48.00	5,037.378	0.26	8,750,807.074	1.13
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	100.00	484.553	0.03	20,556,723.574	2.66
9395	*Fragilaria*	*capucina*	.	gracilis	.	.	Vegetative	19.20	5,037.378	0.26	437,540.580	0.06
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	17.60	10,074.755	0.53	1,604,314.118	0.21
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	9.60	5,037.378	0.26	875,080.657	0.11
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	32.00	5,037.378	0.26	2,788,815.699	0.36
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	19.84	35,261.644	1.85	8,561,312.008	1.11

9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	48.00	323.036	0.02	639,591.289	0.08
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	24.00	5,037.378	0.26	1,701,545.582	0.22
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	34.00	15,112.133	0.79	1,549,622.301	0.20
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	19.60	15,112.133	0.79	893,311.431	0.12
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	40.00	5,037.378	0.26	3,038,474.686	0.39
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	60.80	40,299.021	2.12	18,035,907.642	2.34
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	34.67	65,485.910	3.44	36,166,381.471	4.68
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	48.80	70,523.288	3.71	32,099,943.731	4.16
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	156.89	75,560.665	3.97	490,465,955.211	63.53
Summary for Division ~ Bacillariophyta (26 detail records)							**Sum Total**	**Bacillariophyta**	1,276,556.284	67.11	763,147,648.056	98.85

Division: Chlorophyta

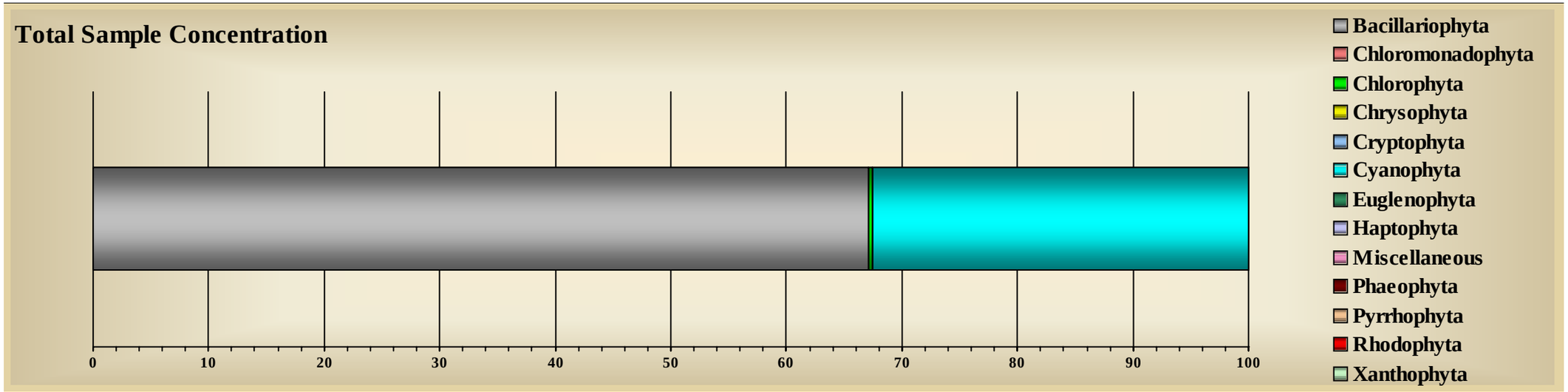
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	272.00	3.407	0.00	411,028.159	0.05
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	240.00	3.407	0.00	92,481.336	0.01
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	32.00	161.518	0.01	519,601.231	0.07
2246	*Euastrum*	*spp*	.	.	.	.	Vegetative	16.00	161.518	0.01	124,045.656	0.02
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	324.80	20.443	0.00	944,542.710	0.12
2380	*Pediastrum*	*spp*	.	.	.	.	Vegetative	32.00	3.407	0.00	4,147.695	0.00
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	32.00	337.307	0.02	647,709.555	0.08
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	14.40	5,037.378	0.26	765,695.512	0.10
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,360.00	6.814	0.00	3,665,001.085	0.47
2540	*Stigeoclonium*	*spp*	.	.	.	.	Vegetative	240.00	3.407	0.00	64,223.150	0.01
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	80.00	3.407	0.00	64,223.150	0.01
Summary for Division ~ Chlorophyta (11 detail records)							**Sum Total**	**Chlorophyta**	5,742.013	0.30	7,302,699.238	0.95

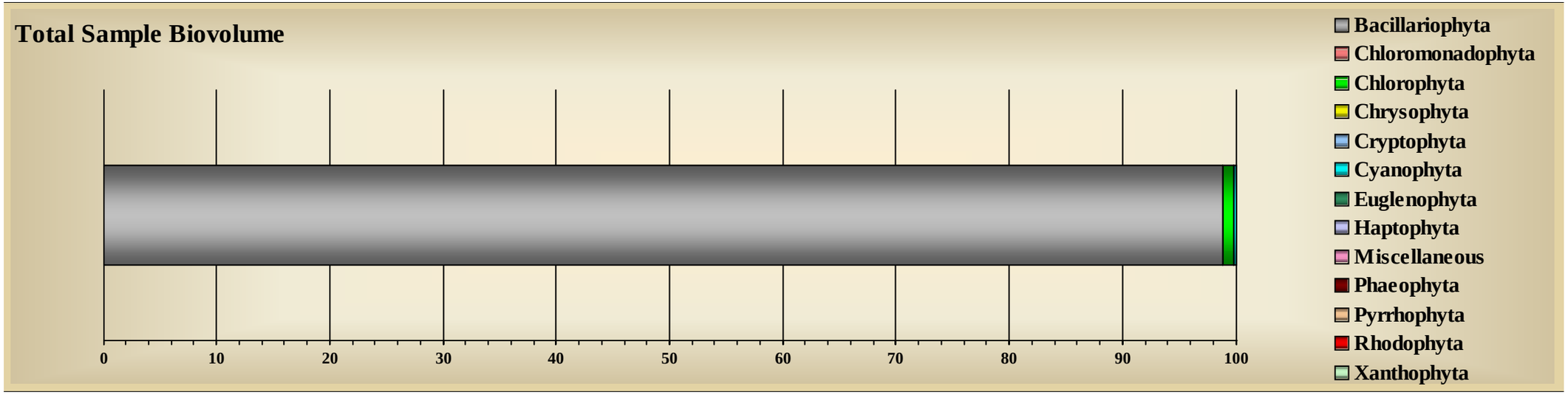
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	80.00	161.518	0.01	21,932.806	0.00
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	23.60	35,261.644	1.85	797,600.751	0.10
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	32.00	25,186.888	1.32	227,885.929	0.03
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	75,560.665	3.97	136,734.580	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	423,139.725	22.25	113,443.760	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	60,448.532	3.18	253,206.812	0.03
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total Cyanophyta**		619,758.973	32.58	1,550,804.638	0.20

Total Richness ~ 43 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,902,057.270	772,001,151.931
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060068-222-CJ	**Sample ID:**	ECKD-NS-7-1	**Replicate:**	7
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Near Shore Replicate 7 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.44	1,074,123.918	40.63	69,238,564.784	6.03
1085	*Cyclotella*	*meneghiniana*	.	.	.	.	Vegetative	16.00	4,649.887	0.18	7,479,321.993	0.65
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	26.00	9,299.774	0.35	8,680,186.023	0.76
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	36.00	149.093	0.01	343,511.047	0.03
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	55.40	37,199.097	1.41	86,759,959.165	7.56
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.00	4,649.887	0.18	714,222.657	0.06
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.67	167,395.935	6.33	5,828,056.880	0.51
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	14.40	9,299.774	0.35	2,423,300.746	0.21
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	50.00	9,299.774	0.35	3,851,851.147	0.34
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	72.44	1,341.840	0.05	32,839,796.820	2.86
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	16.00	4,649.887	0.18	1,196,691.686	0.10
9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	80.00	596.373	0.02	11,607,429.404	1.01
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	33.60	23,249.435	0.88	13,379,347.965	1.17
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	22.20	74,398.193	2.81	14,373,039.066	1.25
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	26.40	4,649.887	0.18	1,511,757.806	0.13
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	4,649.887	0.18	246,817.402	0.02
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	24.00	4,649.887	0.18	673,139.045	0.06

1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	54.67	41,848.984	1.58	10,374,082.696	0.90
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	44.20	41,848.984	1.58	38,353,756.672	3.34
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	54.67	79,048.081	2.99	43,935,270.959	3.83
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	156.44	106,947.403	4.05	578,827,868.134	50.44
Summary for Division ~ Bacillariophyta (21 detail records)							**Sum Total Bacillariophyta**		1,703,945.981	64.45	932,637,972.094	81.27

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	3.145	0.00	113,823.183	0.01
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.20	4,649.887	0.18	79,779.508	0.01
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	4,800.00	3.145	0.00	203,971,143.066	17.77
10170	*Geminella*	*spp*	.	.	.	.	Vegetative	240.00	3.145	0.00	16,862.694	0.00
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	44.00	679.332	0.03	4,297,742.572	0.37
2387	*Pediastrum*	*tetras*	.	tetraodon	.	.	Vegetative	20.00	3.145	0.00	2,105.729	0.00
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	208.00	6.290	0.00	263,058.022	0.02
Summary for Division ~ Chlorophyta (7 detail records)							**Sum Total Chlorophyta**		5,348.090	0.20	208,744,514.772	18.19

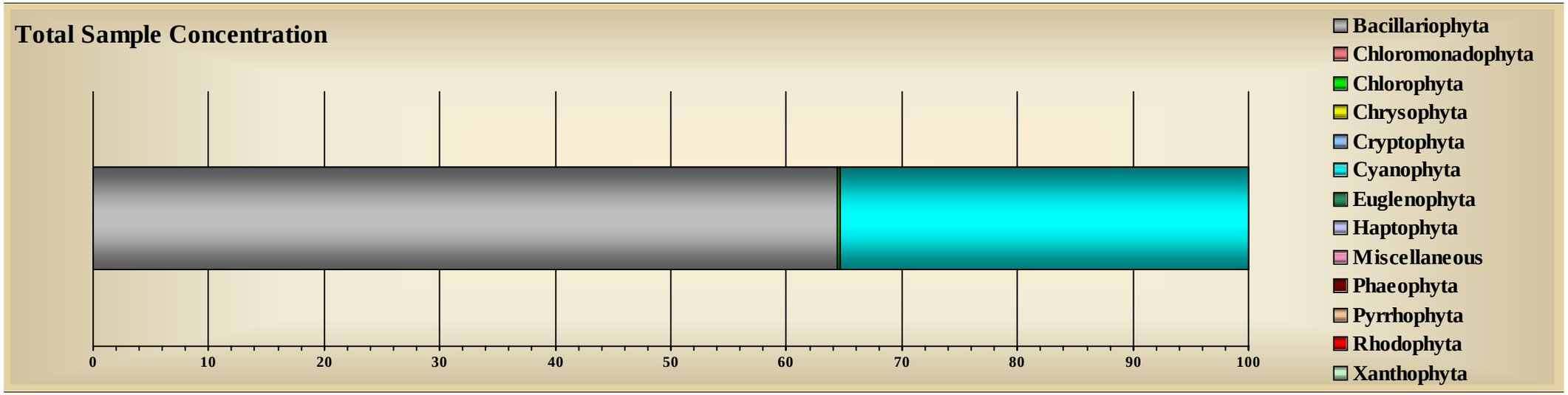
Division: Cyanophyta

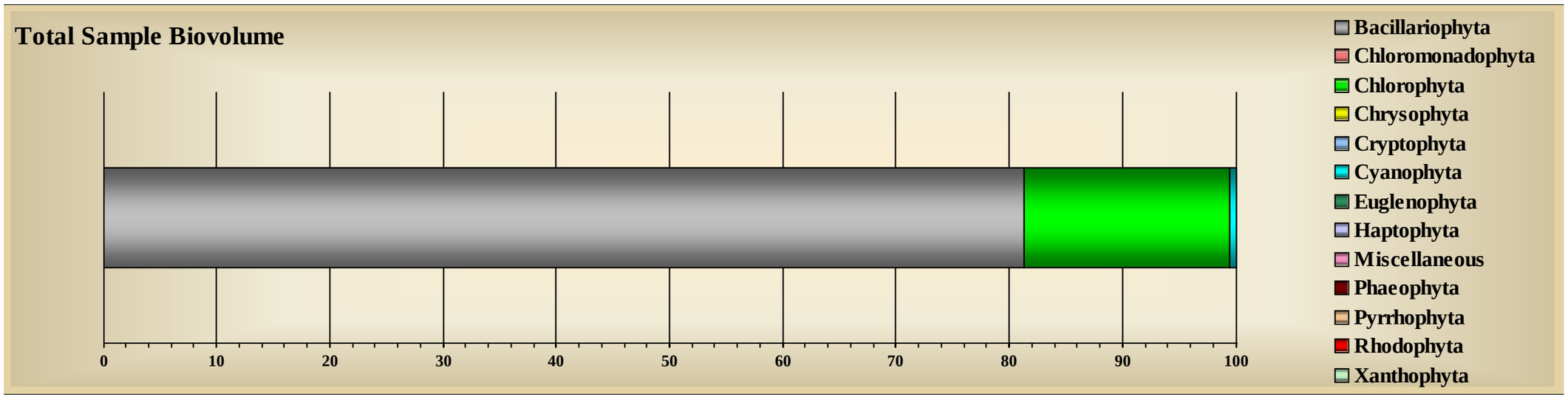
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	40.00	4,649.887	0.18	365,201.202	0.03
☑ 4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	32.00	4,649.887	0.18	2,337,288.065	0.20
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	12.00	4,649.887	0.18	311,638.223	0.03
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	16.00	4,649.887	0.18	1,276,471.194	0.11
4157	*Lyngbya*	*diguetii*	.	.	.	.	Vegetative	80.00	4,649.887	0.18	448,759.208	0.04
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	38.40	23,249.435	0.88	773,350.621	0.07
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	18.67	23,249.435	0.88	122,708.195	0.01
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	55,798.645	2.11	179,504.241	0.02

4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	167,395.935	6.33	67,309.906	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	27,899.323	1.06	116,864.682	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	613,785.096	23.21	164,555.784	0.01
Summary for Division ~ Cyanophyta (11 detail records)						**Sum Total Cyanophyta**			934,627.305	35.35	6,163,651.321	0.54

Total Richness ~ 39 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,643,921.376	1,147,546,138.18
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060069-222-CJ	**Sample ID:**	ECKD-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	14.08	939,858.428	32.36	94,409,249.004	6.19
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	14.40	4,972.796	0.17	849,463.938	0.06
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	4,972.796	0.17	1,079,827.217	0.07
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	36.00	660.300	0.02	950,831.457	0.06
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	36.00	3,961.798	0.14	6,218,437.728	0.41
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	47.60	29,836.776	1.03	74,842,152.899	4.90
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	26.00	660.300	0.02	199,146.366	0.01
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	17.07	223,775.816	7.71	11,202,709.663	0.73
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.80	9,945.592	0.34	4,053,345.841	0.27
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	80.00	4,972.796	0.17	7,198,847.617	0.47
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	48.00	4,972.796	0.17	26,995,678.439	1.77
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	20.80	24,863.980	0.86	6,591,445.957	0.43
9395	*Fragilaria*	*capucina*	.	gracilis	.	.	Vegetative	24.00	4,972.796	0.17	959,846.581	0.06
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	10.40	9,945.592	0.34	1,727,723.349	0.11
1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	40.00	4,972.796	0.17	5,150,349.095	0.34
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	27.20	19,891.184	0.68	27,362,739.900	1.79
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	21.60	9,945.592	0.34	1,647,972.631	0.11

9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	40.00	660.300	0.02	713,980.530	0.05
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	27.20	4,972.796	0.17	1,665,733.469	0.11
9114	*Nitzschia*	*fonticola*	.	.	.	.	Vegetative	24.00	4,972.796	0.17	719,884.811	0.05
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	64.40	24,863.980	0.86	13,277,762.915	0.87
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.04	79,564.735	2.74	43,975,747.089	2.88
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	55.90	104,428.714	3.60	81,230,501.914	5.32
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	150.40	124,319.898	4.28	1,085,740,368.762	71.15
Summary for Division ~ Bacillariophyta (24 detail records)							**Sum Total**	**Bacillariophyta**	1,646,965.348	56.71	1,498,763,747.172	98.22

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	200.00	3.364	0.00	259,685.483	0.02
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	6.00	2,641.199	0.09	298,712.418	0.02
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	700.00	6.727	0.00	1,810,697.607	0.12
2380	*Pediastrum*	*spp*	.	.	.	.	Vegetative	56.00	30.271	0.00	147,402.687	0.01
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	45.33	756.779	0.03	3,914,701.573	0.26
102560	*Pediastrum*	*integrum*	.	.	.	.	Vegetative	40.00	30.271	0.00	197,807.301	0.01
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	8.00	660.300	0.02	22,126.838	0.00
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,100.00	13.454	0.00	10,657,925.034	0.70
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	960.00	6.727	0.00	595,112.565	0.04
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	1,560.00	6.727	0.00	5,406,732.909	0.35
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total**	**Chlorophyta**	4,155.818	0.14	23,310,904.416	1.53

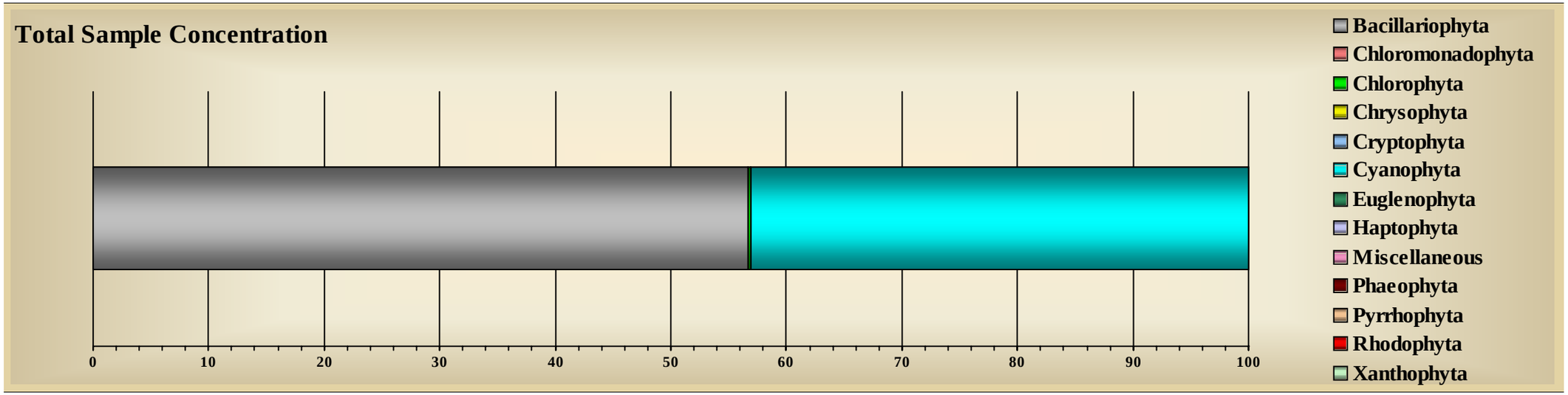
Division: Cyanophyta

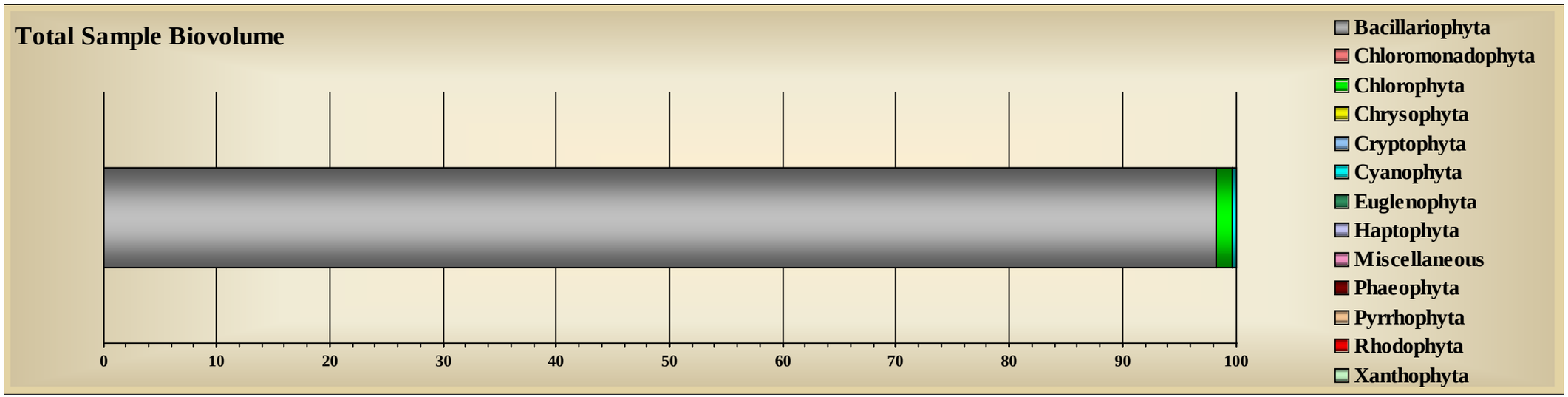
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	3.20	4,972.796	0.17	31,245.071	0.00
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	16.00	4,972.796	0.17	1,458,099.846	0.10

107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	54.40	24,863.980	0.86	1,130,443.318	0.07
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	12.00	69,619.143	2.40	236,210.790	0.02
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	44,755.163	1.54	119,979.642	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	537,061.959	18.49	215,952.614	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.87	149,183.877	5.14	523,247.532	0.03
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	417,714.857	14.38	111,989.353	0.01
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		1,253,144.570	43.15	3,827,168.164	0.25

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,904,265.736	1,525,901,819.75
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060070-222-CJ	**Sample ID:**	ECKD-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.44	773,043.729	32.40	50,328,161.596	3.76
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	25.60	4,520.724	0.19	930,760.020	0.07
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	1,200.545	0.05	1,536,697.304	0.11
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	53.12	36,165.789	1.52	116,488,482.076	8.71
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	170.00	1,200.545	0.05	61,227,783.204	4.58
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.54	189,870.390	7.96	7,980,784.106	0.60
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.00	4,520.724	0.19	2,291,464.357	0.17
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	4,520.724	0.19	1,308,881.475	0.10
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	64.00	4,520.724	0.19	3,635,781.524	0.27
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	81.60	13,562.171	0.57	203,331,086.617	15.20
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	35.20	9,041.447	0.38	5,837,853.546	0.44
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	24.00	9,041.447	0.38	2,062,256.440	0.15
9305	*Navicula*	*decussis*	.	decussis	.	.	Vegetative	36.00	600.272	0.03	848,615.094	0.06
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	20.00	4,520.724	0.19	545,367.432	0.04
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	64.80	45,207.236	1.89	21,224,977.936	1.59
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	47.85	85,893.748	3.60	127,974,812.442	9.56
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	51.40	76,852.301	3.22	29,845,744.602	2.23

1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	140.40	90,414.471	3.79	687,601,329.936	51.39

Summary for Division ~ Bacillariophyta (18 detail records) **Sum Total Bacillariophyta** 1,354,697.706 56.78 1,325,000,839.708 99.02

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.20	4,520.724	0.19	77,563.410	0.01
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	440.00	6.115	0.00	719,299.279	0.05
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	120.00	3.058	0.00	73,774.285	0.01
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	40.00	467.827	0.02	1,038,637.659	0.08
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	842.67	9.173	0.00	3,307,547.109	0.25
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	760.00	3.058	0.00	1,868,948.552	0.14

Summary for Division ~ Chlorophyta (6 detail records) **Sum Total Chlorophyta** 5,009.955 0.21 7,085,770.295 0.53

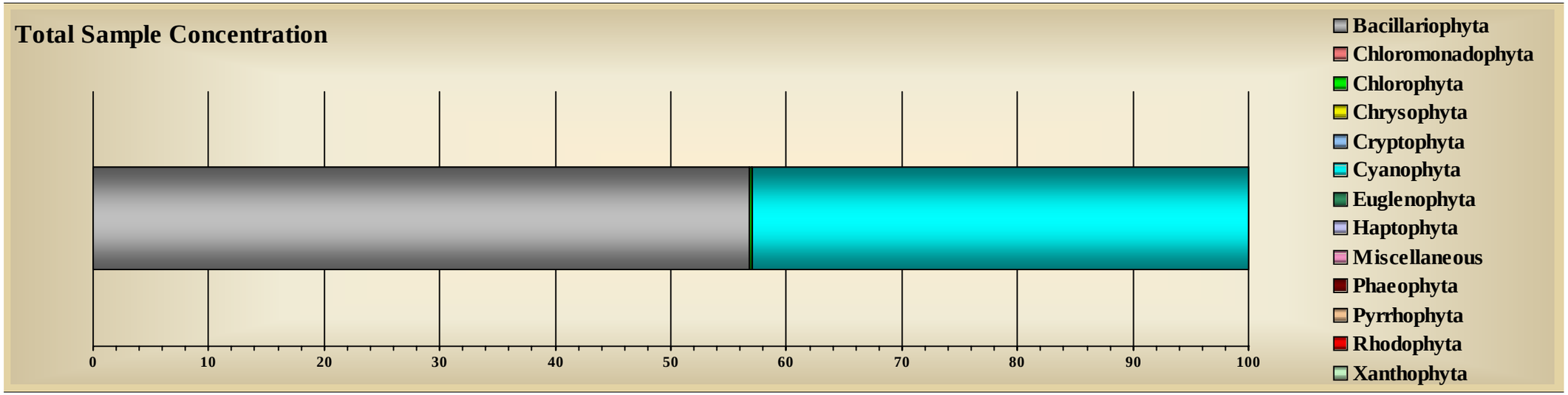
Division: Cyanophyta

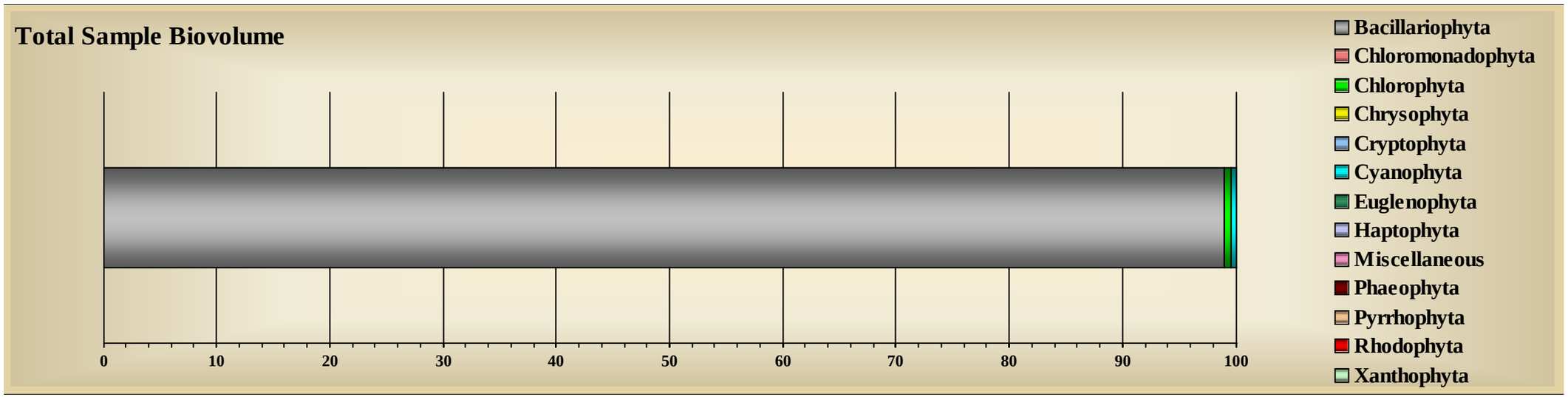
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	16.00	4,520.724	0.19	387,816.600	0.03
4720	*Cyanosarcina*	*spp*	.	.	.	.	Vegetative	24.00	4,520.724	0.19	2,654,411.552	0.20
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	54.00	31,645.065	1.33	1,465,786.749	0.11
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	29.33	85,893.748	3.60	1,014,611.304	0.08
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	9.60	4,520.724	0.19	21,814.752	0.00
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	40,686.512	1.71	109,072.401	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	54,248.683	2.27	21,813.395	0.00
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	40,686.512	1.71	170,427.662	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	759,481.558	31.83	203,617.006	0.02

Summary for Division ~ Cyanophyta (9 detail records) **Sum Total Cyanophyta** 1,026,204.248 43.01 6,049,371.420 0.45

Total Richness ~ 33 Taxa	Total Sample Concentration	Total Sample Biovolume
	2,385,911.909	1,338,135,981.42
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060071-222-CJ	**Sample ID:**	ECKD-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.40	680,691.804	14.82	43,775,085.732	2.20
1341	*Amphora*	*ovalis*	.	.	.	.	Vegetative	16.00	1,457.804	0.03	1,729,342.875	0.09
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	25.60	7,319.267	0.16	1,883,681.358	0.09
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	28.00	4,373.413	0.10	4,000,215.315	0.20
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	30.00	4,373.413	0.10	6,192,752.930	0.31
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	49.26	51,234.867	1.12	107,812,055.057	5.42
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	28.00	1,457.804	0.03	473,494.857	0.02
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	152.00	7,319.267	0.16	379,743,075.401	19.09
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.60	131,746.801	2.87	5,868,529.497	0.29
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.00	2,915.609	0.06	1,334,182.552	0.07
109032	*Cymbella*	*turgidula*	.	.	.	.	Vegetative	70.00	1,457.804	0.03	19,429,616.537	0.98
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	7,319.267	0.16	2,119,141.436	0.11
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	48.00	7,319.267	0.16	3,178,712.154	0.16
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	48.00	1,457.804	0.03	21,983,171.821	1.10
4272	*Diatoma*	*vulgaris*	.	.	.	distorta	Vegetative	17.60	7,319.267	0.16	1,036,024.637	0.05
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	32.50	65,873.400	1.43	121,718,175.082	6.12
1159	*Fragilaria*	*construens*	.	.	construens	.	Vegetative	40.00	1,457.804	0.03	3,205,879.294	0.16

9321	*Gomphoneis*	*herculeana*	.	.	.	.	Vegetative	80.00	14,638.533	0.32	485,158,431.449	24.38
1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	44.00	1,457.804	0.03	1,634,254.378	0.08
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	25.60	36,596.334	0.80	9,571,979.644	0.48
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	36.00	1,457.804	0.03	2,095,539.832	0.11
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	33.60	7,319.267	0.16	2,225,098.069	0.11
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	20.80	7,319.267	0.16	1,377,442.080	0.07
9101	*Navicula*	*subminuscula*	.	.	.	.	Vegetative	14.40	7,319.267	0.16	1,297,973.874	0.07
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	68.00	2,915.609	0.06	11,211,417.633	0.56
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	40.00	14,638.533	0.32	3,531,901.906	0.18
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	68.00	73,192.667	1.59	28,668,103.865	1.44
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	38.67	161,023.868	3.51	105,712,732.731	5.31
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	49.20	95,150.467	2.07	55,902,802.536	2.81
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	144.67	95,150.467	2.07	543,479,173.506	27.32
Summary for Division ~ Bacillariophyta (30 detail records)							**Sum Total Bacillariophyta**		1,503,274.550	32.73	1,977,349,988.035	99.38

Division: Chlorophyta

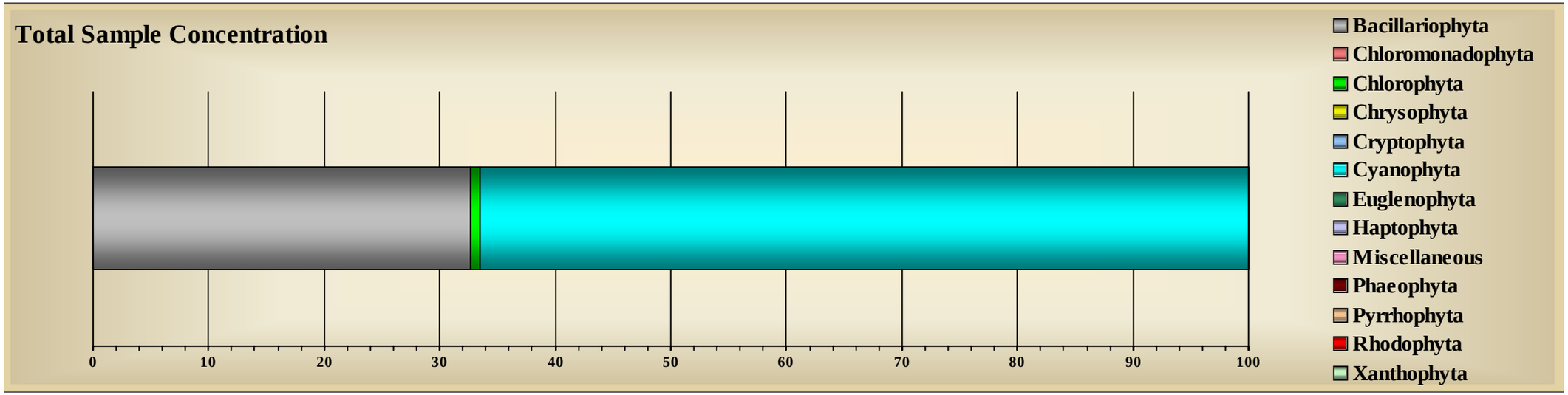
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	8.00	21,957.800	0.48	1,138,303.338	0.06
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	480.00	3.713	0.00	89,583.060	0.00
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	680.00	3.713	0.00	507,637.342	0.03
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	6.40	7,319.267	0.16	251,157.710	0.01
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	40.00	568.076	0.01	1,902,852.188	0.10
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	4.80	7,319.267	0.16	47,092.162	0.00
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,360.00	7.426	0.00	3,426,552.057	0.17
103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	736.00	3.713	0.00	137,360.693	0.01
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	160.00	7.426	0.00	537,498.362	0.03
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total Chlorophyta**		37,190.400	0.81	8,038,036.911	0.40

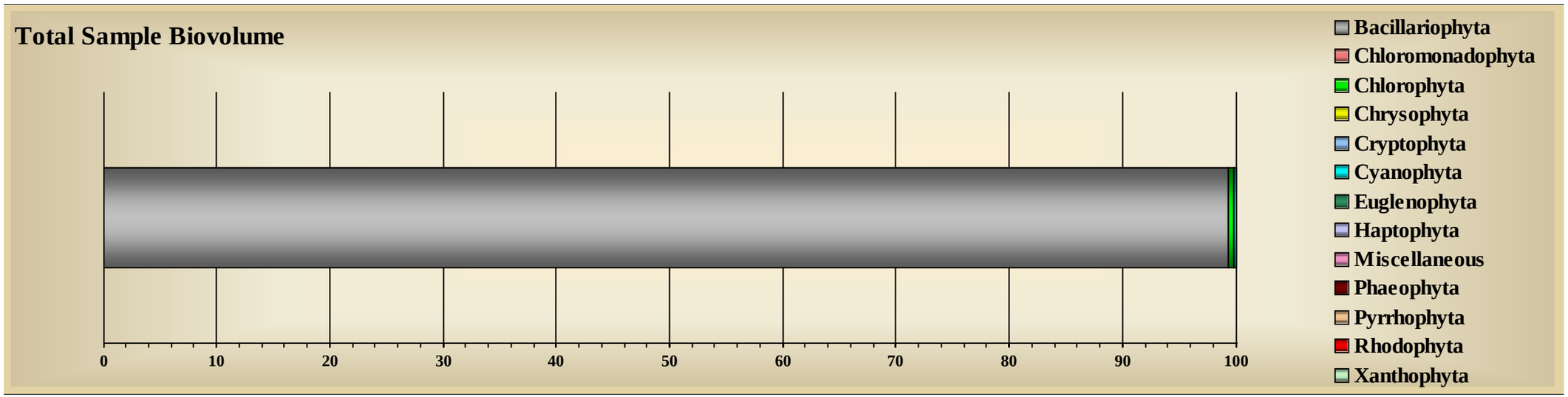
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	4.00	7,319.267	0.16	15,697.631	0.00
4080	*Chroococcus*	*spp*	.	.	.	.	Vegetative	3.20	14,638.533	0.32	105,956.633	0.01
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	49.60	43,915.600	0.96	2,304,567.739	0.12
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	18.40	146,385.334	3.19	838,831.881	0.04
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	21,957.800	0.48	58,864.471	0.00
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	395,240.403	8.61	158,926.166	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.80	51,234.867	1.12	162,245.453	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	2,371,442.415	51.64	635,783.712	0.03
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		3,052,134.220	66.46	4,280,873.686	0.22

Total Richness ~ 47 Taxa	Total Sample Concentration	Total Sample Biovolume
	4,592,599.170	1,989,668,898.63
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060072-222-CJ	**Sample ID:**	ECKD-1	**Replicate:**	.
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	ECKD	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	East CKD Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.94	13,079.960	9.54	1,382,566.177	2.39
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	7.20	632.901	0.46	48,508.593	0.08
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	1,265.803	0.92	274,865.110	0.47
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	22.40	210.967	0.15	237,537.731	0.41
1000073	*Cyclotella*	*hakanssoniae*	.	.	.	.	Vegetative	4.00	210.967	0.15	5,302.173	0.01
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	210.967	0.15	517,176.562	0.89
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	43.60	421.934	0.31	781,424.837	1.35
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	25.87	1,054.836	0.77	238,953.573	0.41
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.73	15,189.631	11.08	566,863.364	0.98
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.20	1,054.836	0.77	251,495.251	0.43
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	1,476.770	1.08	617,598.082	1.07
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	56.00	632.901	0.46	285,045.264	0.49
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	52.00	420.191	0.31	6,758,747.751	11.66
109195	*Eucocconeis*	*flexella*	.	.	.	.	Vegetative	28.00	140.064	0.10	154,007.920	0.27
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	16.00	632.901	0.46	45,810.852	0.08
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	17.60	210.967	0.15	34,056.313	0.06
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	48.00	210.967	0.15	866,147.620	1.49

9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	20.00	843.868	0.62	152,702.797	0.26
9114	*Nitzschia*	*fonticola*	.	.	.	.	Vegetative	24.00	210.967	0.15	30,540.568	0.05
1271	*Rhoicosphenia*	*curvata*	.	.	.	.	Vegetative	33.60	210.967	0.15	273,161.698	0.47
1314	*Synedra*	*delicatissima*	.	.	.	.	Vegetative	64.00	421.934	0.31	138,259.398	0.24
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	60.00	632.901	0.46	218,730.689	0.38
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	42.56	4,219.342	3.08	3,367,480.469	5.81
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	71.20	2,320.638	1.69	2,535,547.746	4.38
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	125.60	3,164.507	2.31	25,050,874.828	43.22
Summary for Division ~ Bacillariophyta (25 detail records)							**Sum Total**	**Bacillariophyta**	49,082.687	35.81	44,833,405.364	77.36

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	128.00	2.140	0.00	123,940.799	0.21
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	5.44	1,054.836	0.77	165,145.256	0.28
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	616.80	57.790	0.04	4,999,268.311	8.63
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	208.00	4.281	0.00	265,095.597	0.46
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	58.67	49.229	0.04	417,187.240	0.72
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	17.60	210.967	0.15	57,009.049	0.10
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	9.07	632.901	0.46	28,165.184	0.05
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	631.00	21.404	0.02	3,495,517.839	6.03
2554	*Tetraedron*	*minimum*	.	.	.	.	Vegetative	4.00	140.064	0.10	2,241.017	0.00
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	730.67	14.983	0.01	1,990,225.280	3.43
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total**	**Chlorophyta**	2,188.595	1.60	11,543,795.572	19.92

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1653	*.	*spp*	.	.	.	.	Cyst	3.20	210.967	0.15	3,440.895	0.01

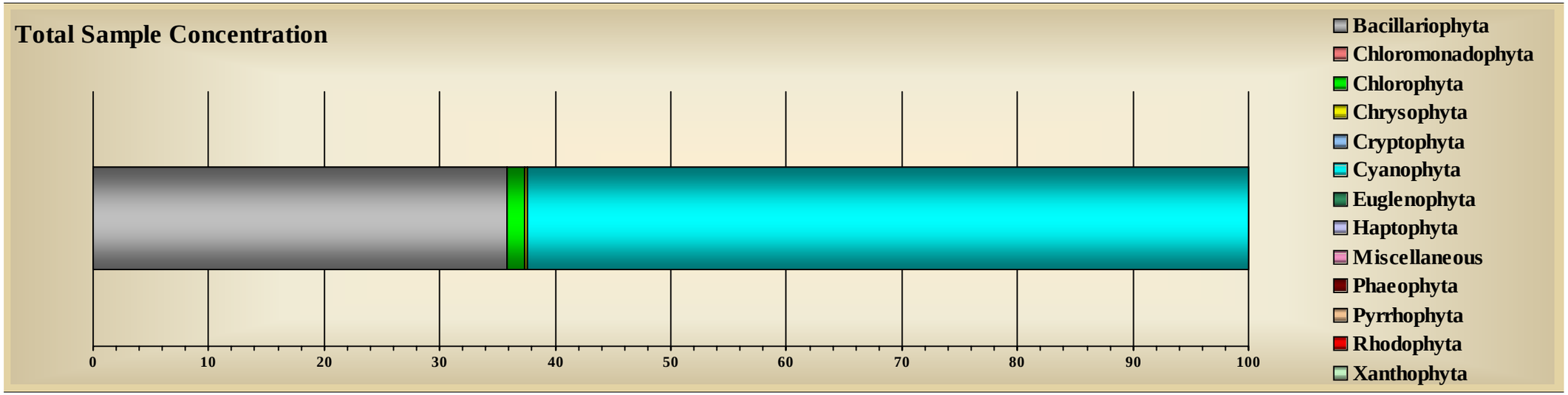
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total Chrysophyta**		210.967	0.15	3,440.895	0.01

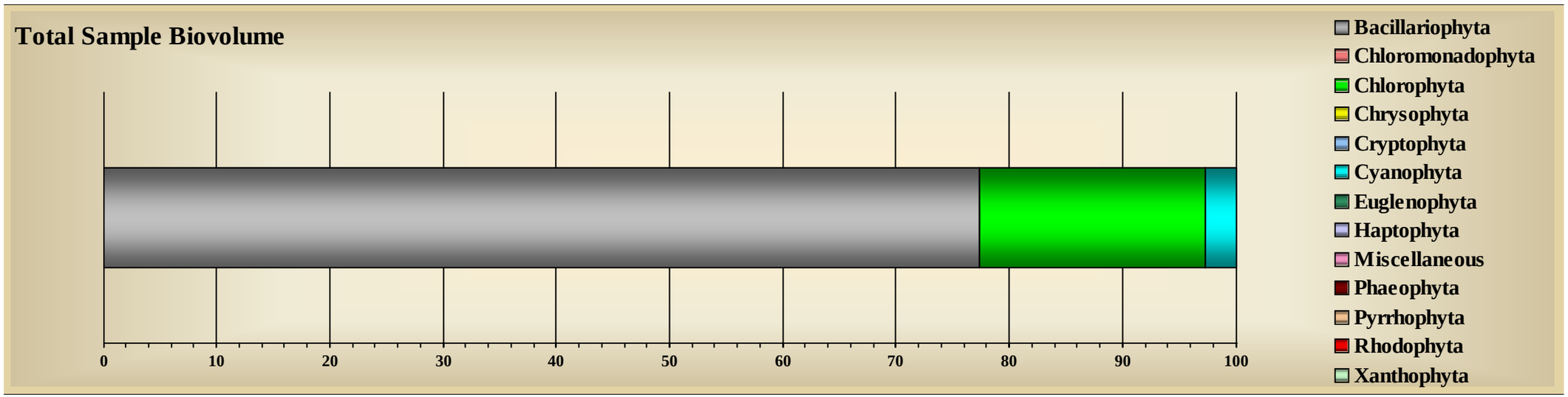
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4050	*Aphanocapsa*	*spp*	.	.	.	.	Vegetative	16.00	210.967	0.15	57,913.971	0.10
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	10.08	1,265.803	0.92	19,087.797	0.03
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	4.80	210.967	0.15	678.681	0.00
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	490.00	19.264	0.01	1,316,870.986	2.27
4512	*Chroococcus*	*cohaerens*	.	.	.	.	Vegetative	4.00	210.967	0.15	904.901	0.00
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	6.40	210.967	0.15	1,809.802	0.00
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	8.00	210.967	0.15	12,216.219	0.02
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	30.67	2,320.638	1.69	56,204.926	0.10
4168	*Merismopedia*	*punctata*	.	.	.	.	Vegetative	24.00	140.064	0.10	28,161.445	0.05
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	28.00	3,375.474	2.46	26,722.949	0.05
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	4.80	210.967	0.15	509.000	0.00
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	8.00	210.967	0.15	848.341	0.00
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	6,961.914	5.08	18,663.500	0.03
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	21,096.710	15.39	8,482.987	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.13	2,531.605	1.85	13,177.765	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	46,412.762	33.86	12,443.262	0.02
Summary for Division ~ Cyanophyta (16 detail records)							**Sum Total Cyanophyta**		85,601.002	62.44	1,574,696.532	2.72

Total Richness ~ 52 Taxa	Total Sample Concentration	Total Sample Biovolume
	137,083.251	57,955,338.362
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060073-222-CJ	**Sample ID:**	SEEP1-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 1 Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.08	171,193.343	36.91	13,269,093.299	10.83
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	1,214.137	0.26	183,087.517	0.15
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.00	201.520	0.04	443,165.667	0.36
9361	*Cyclotella*	*pseudostelligera*	.	.	.	.	Vegetative	4.80	1,214.137	0.26	70,305.585	0.06
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	34.00	1,209.120	0.26	1,973,283.984	1.61
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	40.00	2,428.274	0.52	2,983,863.544	2.43
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	25.20	2,428.274	0.52	377,127.279	0.31
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.47	19,426.195	4.19	649,819.819	0.53
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.00	1,214.137	0.26	745,965.886	0.61
109032	*Cymbella*	*turgidula*	.	.	.	.	Vegetative	76.00	201.520	0.04	2,916,075.221	2.38
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	12.80	1,214.137	0.26	562,445.044	0.46
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	46.67	806.080	0.17	17,044,573.326	13.91
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	21.20	3,642.412	0.79	1,133,678.377	0.92
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	5.60	2,428.274	0.52	144,517.049	0.12
1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	32.00	1,214.137	0.26	672,176.092	0.55
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	60.00	201.520	0.04	718,195.851	0.59
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	23.20	9,713.098	2.09	3,655,511.607	2.98

1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	28.80	1,214.137	0.26	562,445.044	0.46
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	20.80	1,214.137	0.26	228,493.333	0.19
9102	*Navicula*	*tripunctata*	.	.	.	.	Vegetative	44.00	201.520	0.04	501,410.292	0.41
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	57.60	2,428.274	0.52	1,127,651.764	0.92
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	29.33	3,642.412	0.79	1,064,244.543	0.87
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	56.67	14,569.646	3.14	12,706,286.078	10.37
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	128.00	14,569.646	3.14	49,468,194.483	40.36
Summary for Division ~ Bacillariophyta (24 detail records)							**Sum Total**	**Bacillariophyta**	257,790.089	55.58	113,201,610.685	92.36

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	600.00	2.053	0.00	594,409.953	0.48
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.20	6,070.686	1.31	129,544.795	0.11
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	272.00	2.053	0.00	252,624.230	0.21
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	235.20	73.909	0.02	619,115.120	0.51
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	228.00	4.106	0.00	234,255.311	0.19
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	38.00	351.067	0.08	1,190,572.156	0.97
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	7.20	2,428.274	0.52	130,195.573	0.11
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,060.00	10.265	0.00	3,689,263.164	3.01
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	1,520.00	2.053	0.00	627,432.728	0.51
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total**	**Chlorophyta**	8,944.466	1.93	7,467,413.032	6.09

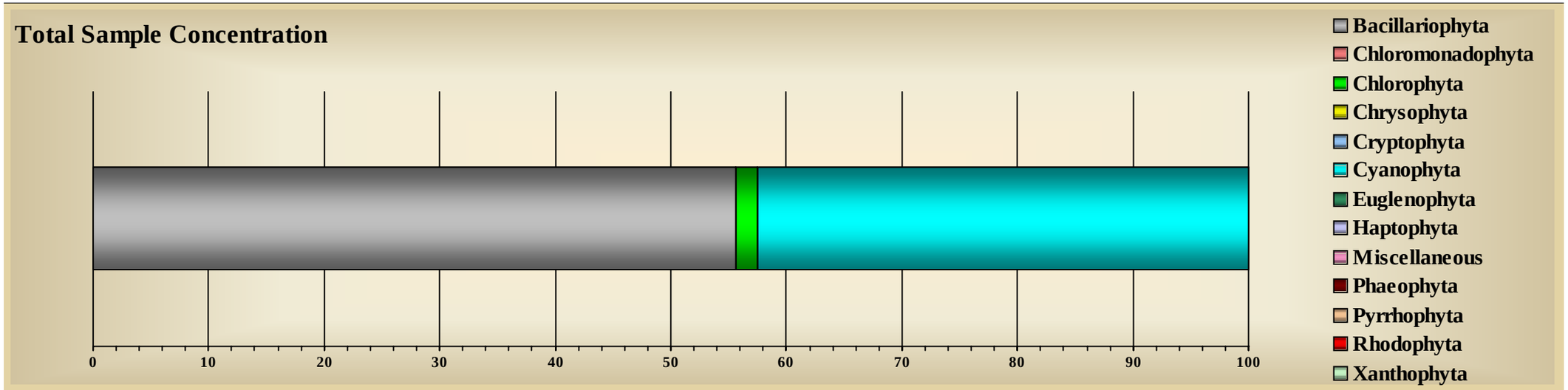
Division: Cyanophyta

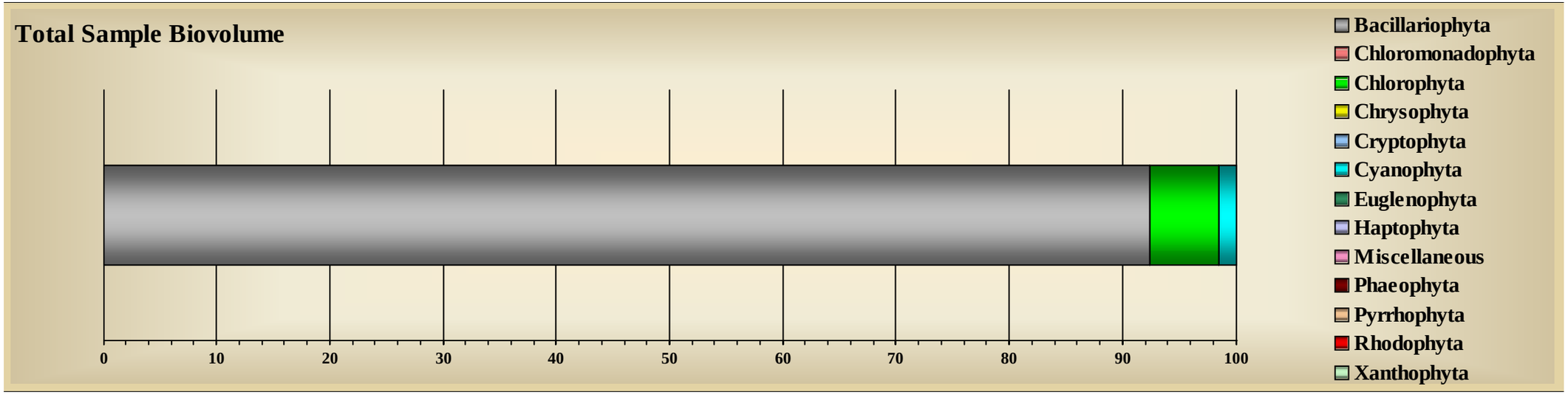
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	4.00	1,214.137	0.26	2,542.889	0.00
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	8.00	1,214.137	0.26	10,415.597	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	8.00	2,428.274	0.52	333,300.812	0.27

107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	50.00	8,498.960	1.83	271,701.562	0.22
4252	*Oscillatoria*	*hamelii*	.	.	.	.	Vegetative	177.00	403.040	0.09	1,138,619.198	0.93
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	6.40	1,214.137	0.26	15,623.517	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	18,212.058	3.93	7,323.068	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	127,484.404	27.49	34,178.569	0.03
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	36,424.116	7.85	78,118.801	0.06
Summary for Division ~ Cyanophyta (9 detail records)						**Sum Total Cyanophyta**			197,093.264	42.49	1,891,824.013	1.54

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	463,827.819	122,560,847.729
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060074-222-CJ	**Sample ID:**	SEEP1-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 1 Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	10.90	142,596.537	10.31	7,805,606.120	1.43
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	22.86	16,532.932	1.19	4,091,545.180	0.75
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	2,066.617	0.15	2,493,107.434	0.46
9212	*Cocconeis*	*placentula*	.	lineata	.	.	Vegetative	16.00	480.218	0.03	217,245.443	0.04
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	30.00	480.218	0.03	679,988.557	0.12
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	69.60	8,266.466	0.60	46,805,038.467	8.59
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	22.40	10,333.082	0.75	1,216,823.786	0.22
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	17.14	136,396.688	9.86	5,546,898.667	1.02
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	41.60	4,133.233	0.30	49,782,368.196	9.13
1140	*Eunotia*	*spp*	.	.	.	.	Vegetative	40.00	2,066.617	0.15	648,207.900	0.12
☑ 9407	*Fragilaria*	*berolinensis*	.	.	.	.	Vegetative	19.20	2,066.617	0.15	319,117.824	0.06
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	14.72	12,399.699	0.90	2,800,258.723	0.51
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	8.80	6,199.850	0.45	685,604.772	0.13
1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	36.00	2,066.617	0.15	1,297,196.154	0.24
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	40.00	4,133.233	0.30	5,565,052.653	1.02
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	32.00	8,266.466	0.60	4,576,518.070	0.84
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	15.60	10,333.082	0.75	1,458,468.085	0.27

1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	32.00	2,066.617	0.15	398,897.280	0.07
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	56.00	6,199.850	0.45	3,555,241.670	0.65
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	38.93	26,866.014	1.94	15,043,820.824	2.76
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	71.60	57,865.262	4.18	45,788,550.003	8.40
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	135.00	53,732.029	3.88	314,929,867.359	57.79
Summary for Division ~ Bacillariophyta (22 detail records)							**Sum Total**	**Bacillariophyta**	515,547.940	37.26	515,705,423.165	94.63

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	200.00	2.446	0.00	265,587.426	0.05
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.60	10,333.082	0.75	282,551.939	0.05
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	20.00	2,066.617	0.15	1,350,433.228	0.25
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	248.80	469.662	0.03	5,910,205.501	1.08
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	335.20	34.246	0.00	2,823,440.250	0.52
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	6.40	4,133.233	0.30	221,609.485	0.04
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	52.57	682.477	0.05	5,204,526.278	0.95
102560	*Pediastrum*	*integrum*	.	.	.	.	Vegetative	32.00	4.892	0.00	19,919.057	0.00
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	9.60	6,199.850	0.45	190,583.992	0.03
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	16.00	2,066.617	0.15	387,816.703	0.07
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	886.67	14.677	0.00	6,450,331.649	1.18
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	140.00	4.892	0.00	110,661.427	0.02
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	1,280.00	2.446	0.00	354,116.568	0.06
Summary for Division ~ Chlorophyta (13 detail records)							**Sum Total**	**Chlorophyta**	26,015.137	1.88	23,571,783.504	4.33

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1653	*.	*spp*	.	.	.	.	Cyst	4.00	960.436	0.07	29,046.556	0.01

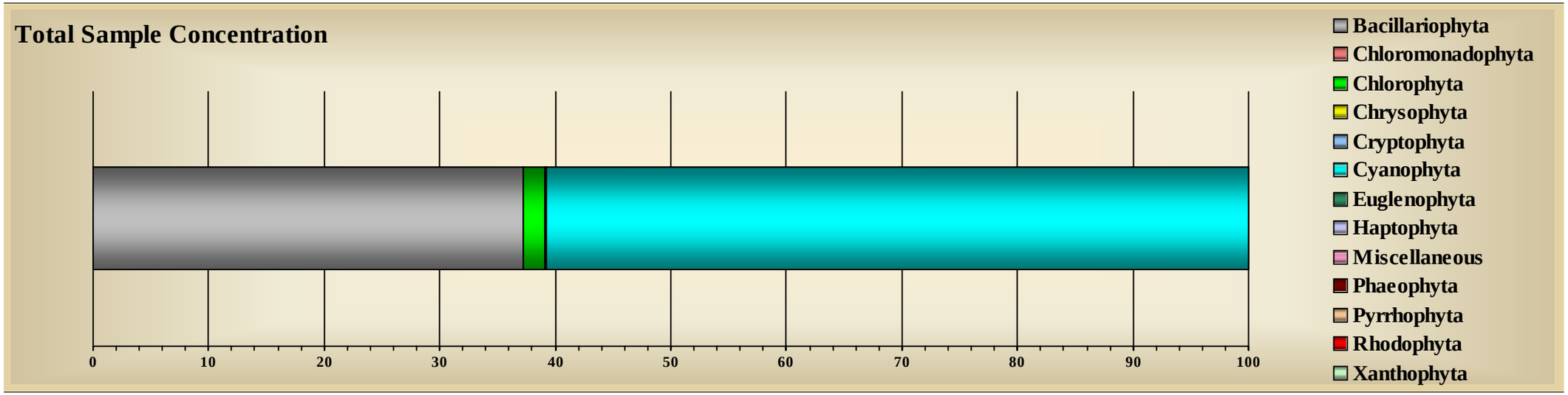
Summary for Division ~ Chrysophyta (1 detail record)								**Sum Total Chrysophyta**		960.436	0.07	29,046.556	0.01

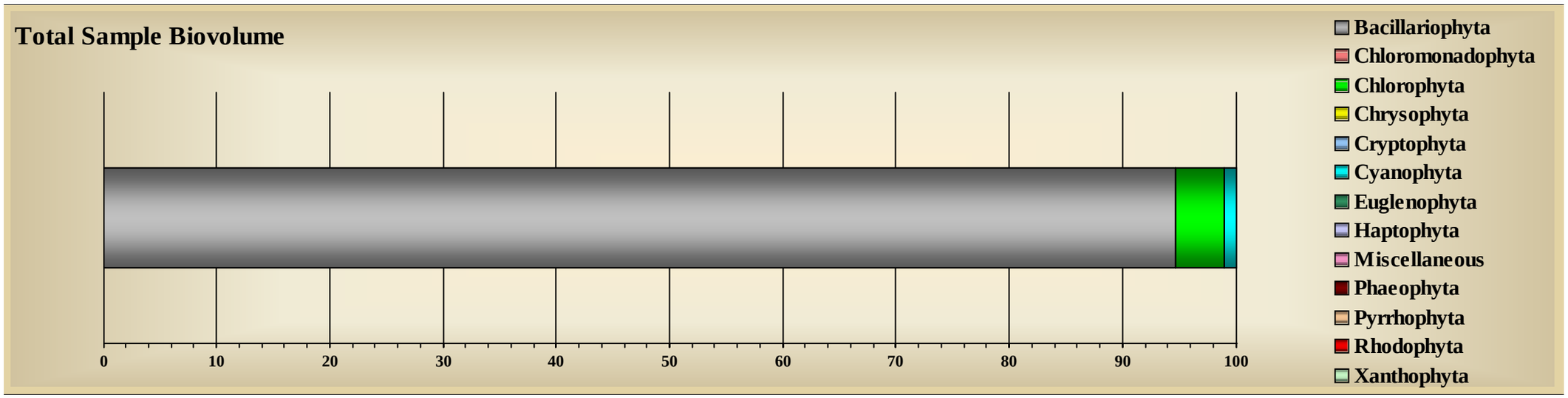
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4050	*Aphanocapsa*	*spp*	.	.	.	.	Vegetative	72.00	6,199.850	0.45	2,596,986.739	0.48
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	3.60	12,399.699	0.90	48,693.618	0.01
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	18.00	4,133.233	0.30	122,058.503	0.02
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	3.20	2,066.617	0.15	17,313.286	0.00
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	32.00	2,066.617	0.15	257,898.031	0.05
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	6.40	2,066.617	0.15	103,879.511	0.02
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	62.72	35,132.480	2.54	1,452,671.845	0.27
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	32.00	2,066.617	0.15	18,698.333	0.00
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	12,399.699	0.90	33,241.113	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	86,797.892	6.27	34,901.433	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.80	68,198.344	4.93	831,869.760	0.15
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	607,585.246	43.91	162,893.605	0.03
Summary for Division ~ Cyanophyta (12 detail records)								**Sum Total Cyanophyta**		841,112.909	60.79	5,681,105.775	1.04

Total Richness ~ 48 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,383,636.422	544,987,359.001
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060075-222-CJ	**Sample ID:**	SEEP1-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 1 Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	10.51	66,493.385	13.64	5,068,870.559	2.60
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	18.40	1,704.959	0.35	394,908.137	0.20
1000073	*Cyclotella*	*hakanssoniae*	.	.	.	.	Vegetative	4.80	852.479	0.17	37,022.665	0.02
1090	*Cymbella*	*spp*	.	.	.	.	Vegetative	22.40	852.479	0.17	122,211.432	0.06
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	28.00	282.986	0.06	264,119.840	0.14
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	1,704.959	0.35	2,618,816.408	1.34
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	68.27	5,967.355	1.22	26,552,945.944	13.62
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.80	1,704.959	0.35	180,989.369	0.09
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.00	28,131.817	5.77	1,185,888.301	0.61
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.00	2,557.438	0.52	1,225,024.006	0.63
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	282.986	0.06	128,019.636	0.07
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	82.00	1,704.959	0.35	41,177,408.202	21.12
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	13.60	3,409.917	0.70	548,483.476	0.28
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	7.20	3,409.917	0.70	244,760.788	0.13
☑ 1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	36.00	565.971	0.12	292,882.520	0.15
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	23.87	11,934.710	2.45	4,233,006.592	2.17
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.87	4,262.397	0.87	1,108,965.173	0.57

9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	64.00	282.986	0.06	1,024,157.173	0.53
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	852.479	0.17	90,499.799	0.05
1314	*Synedra*	*delicatissima*	.	.	.	.	Vegetative	48.00	852.479	0.17	104,752.656	0.05
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	50.00	3,409.917	0.70	1,165,373.302	0.60
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	49.07	13,639.669	2.80	12,796,895.482	6.56
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	57.60	15,344.627	3.15	11,957,515.721	6.13
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	129.90	12,787.190	2.62	65,378,751.636	33.53
Summary for Division ~ Bacillariophyta (24 detail records)							**Sum Total Bacillariophyta**		182,993.019	37.53	177,902,268.816	91.24

Division: Chlorophyta

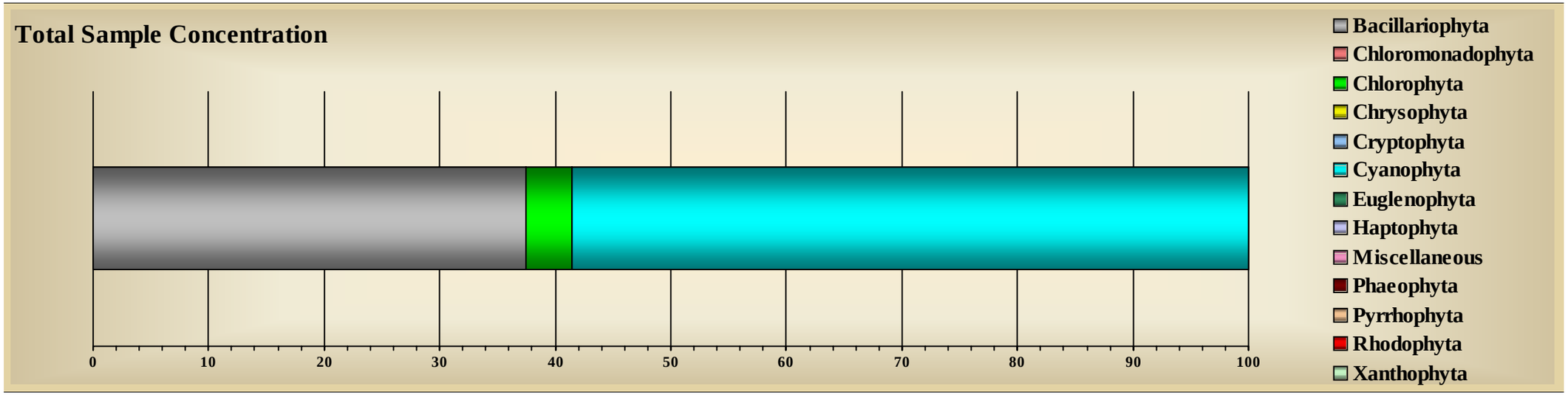
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	346.29	8.649	0.00	1,640,341.114	0.84
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.80	6,819.834	1.40	247,274.920	0.13
☑ 10170	*Geminella*	*spp*	.	.	.	.	Vegetative	320.00	1.442	0.00	3,864.367	0.00
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	1,704.959	0.35	15,007.557	0.01
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	278.40	255.143	0.05	7,071,632.761	3.63
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	185.60	7.207	0.00	137,668.085	0.07
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	8.00	2,557.438	0.52	239,504.571	0.12
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	36.00	544.881	0.11	1,981,550.967	1.02
102560	*Pediastrum*	*integrum*	.	.	.	.	Vegetative	40.00	2.883	0.00	35,648.789	0.02
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	10.00	3,409.917	0.70	282,240.552	0.14
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	11.73	3,409.917	0.70	446,100.031	0.23
8303	*Scenedesmus*	*opoliensis*	.	carinatus	.	.	Vegetative	48.00	282.986	0.06	75,863.503	0.04
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	736.00	7.207	0.00	2,460,635.884	1.26
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	112.00	2.883	0.00	20,867.584	0.01
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	160.00	1.442	0.00	46,372.408	0.02
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	440.00	1.442	0.00	65,211.198	0.03
Summary for Division ~ Chlorophyta (16 detail records)							**Sum Total Chlorophyta**		19,018.229	3.90	14,769,784.288	7.58

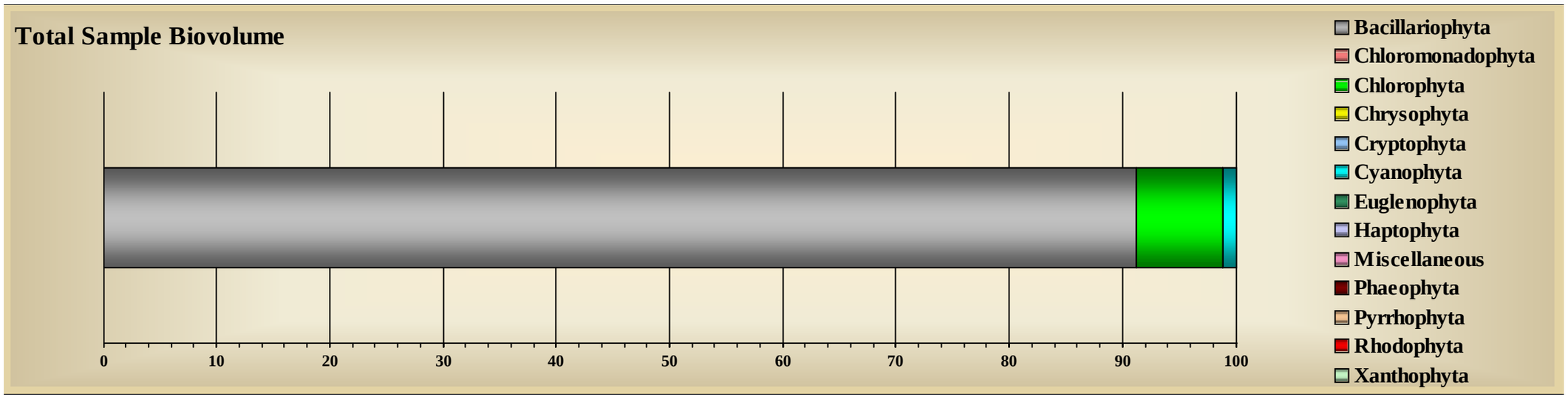
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4050	*Aphanocapsa*	*spp*	.	.	.	.	Vegetative	18.67	2,557.438	0.52	258,072.849	0.13
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	5.33	2,557.438	0.52	19,639.589	0.01
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	16.00	852.479	0.17	36,565.565	0.02
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	1,704.959	0.35	14,626.158	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	9.60	2,557.438	0.52	490,892.788	0.25
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	72.00	17,049.586	3.50	1,098,037.667	0.56
4168	*Merismopedia*	*punctata*	.	.	.	.	Vegetative	24.00	852.479	0.17	117,009.859	0.06
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	9,377.272	1.92	63,632.294	0.03
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	23,016.941	4.72	61,703.816	0.03
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	25,574.379	5.25	10,283.458	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	20,459.503	4.20	85,700.767	0.04
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	179,020.653	36.72	47,995.437	0.02
Summary for Division ~ Cyanophyta (12 detail records)							**Sum Total Cyanophyta**		285,580.565	58.57	2,304,160.246	1.18

Total Richness ~ 52 Taxa	Total Sample Concentration	Total Sample Biovolume
	487,591.813	194,976,213.350
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060076-222-CJ	**Sample ID:**	SEEP1-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 1 Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	14.06	136,706.680	10.22	9,993,313.021	1.35
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	3,254.921	0.24	370,675.282	0.05
9351	*Bacillaria*	*paradoxa*	.	.	.	.	Vegetative	80.00	1,627.461	0.12	2,999,735.159	0.40
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	20.00	3,254.921	0.24	3,272,203.291	0.44
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	36.00	1,080.490	0.08	1,037,270.680	0.14
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	2,160.981	0.16	1,844,036.693	0.25
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	45.33	8,137.302	0.61	14,427,800.088	1.94
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	29.07	6,509.842	0.49	2,367,790.952	0.32
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.47	78,118.103	5.84	2,968,628.530	0.40
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	27.60	3,254.921	0.24	2,206,138.557	0.30
109032	*Cymbella*	*turgidula*	.	.	.	.	Vegetative	96.00	540.245	0.04	12,585,550.919	1.69
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	44.00	1,627.461	0.12	899,855.937	0.12
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	120.00	1,627.461	0.12	48,690,387.410	6.56
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	21.44	19,529.526	1.46	4,906,734.762	0.66
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	8.00	3,254.921	0.24	471,197.331	0.06
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	56.00	1,627.461	0.12	4,586,418.641	0.62
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	21.87	24,411.907	1.83	8,104,660.431	1.09

9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	36.00	1,620.735	0.12	4,659,494.449	0.63
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	27.73	4,882.381	0.37	1,225,113.028	0.16
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	36.00	540.245	0.04	977,604.602	0.13
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	20.00	1,627.461	0.12	196,332.276	0.03
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	24.00	1,627.461	0.12	235,598.666	0.03
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	60.00	8,137.302	0.61	2,812,251.711	0.38
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	47.73	39,059.052	2.92	38,796,574.719	5.22
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	47.60	39,059.052	2.92	17,604,070.768	2.37
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	107.68	58,588.577	4.38	322,111,561.342	43.37
Summary for Division ~ Bacillariophyta (26 detail records)							**Sum Total Bacillariophyta**		451,866.868	33.78	510,350,999.244	68.71

Division: Chlorophyta

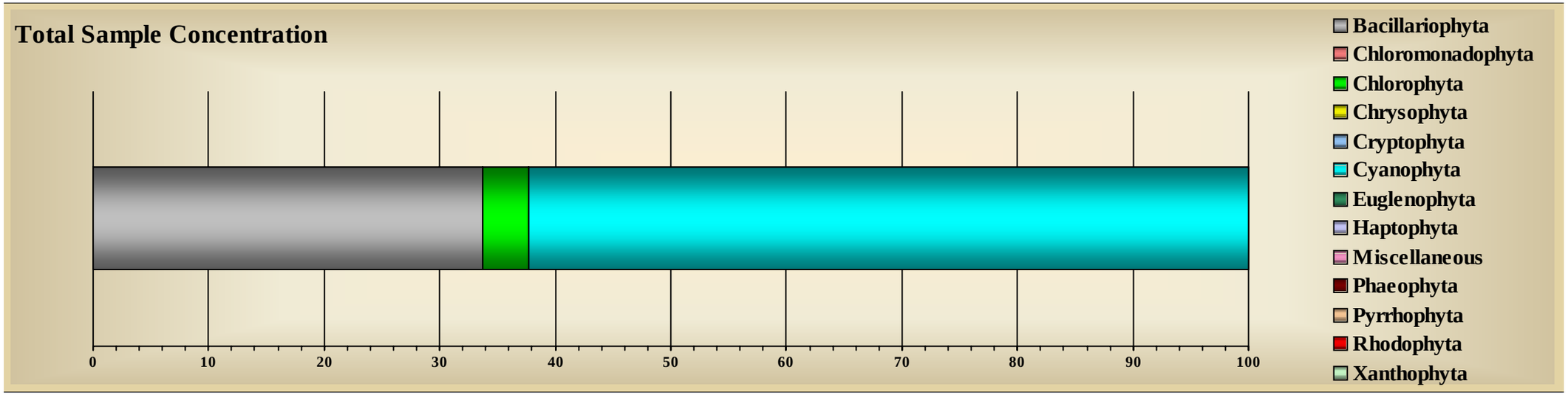
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.00	47,196.354	3.53	1,771,354.678	0.24
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	14.00	540.245	0.04	122,200.589	0.02
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	327.20	668.718	0.05	9,749,569.169	1.31
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	673.14	35.775	0.00	4,733,759.930	0.64
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	6.40	1,627.461	0.12	55,845.655	0.01
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	52.00	1,213.599	0.09	13,222,946.318	1.78
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	8.00	540.245	0.04	36,207.554	0.00
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,200.00	24.767	0.00	12,847,791.727	1.73
103684	*Ulothrix*	*aequalis*	.	.	.	.	Vegetative	480.00	2.752	0.00	414,980.353	0.06
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	320.00	2.752	0.00	99,595.285	0.01
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	320.00	2.752	0.00	99,595.285	0.01
Summary for Division ~ Chlorophyta (11 detail records)							**Sum Total Chlorophyta**		51,855.419	3.88	43,153,846.544	5.81

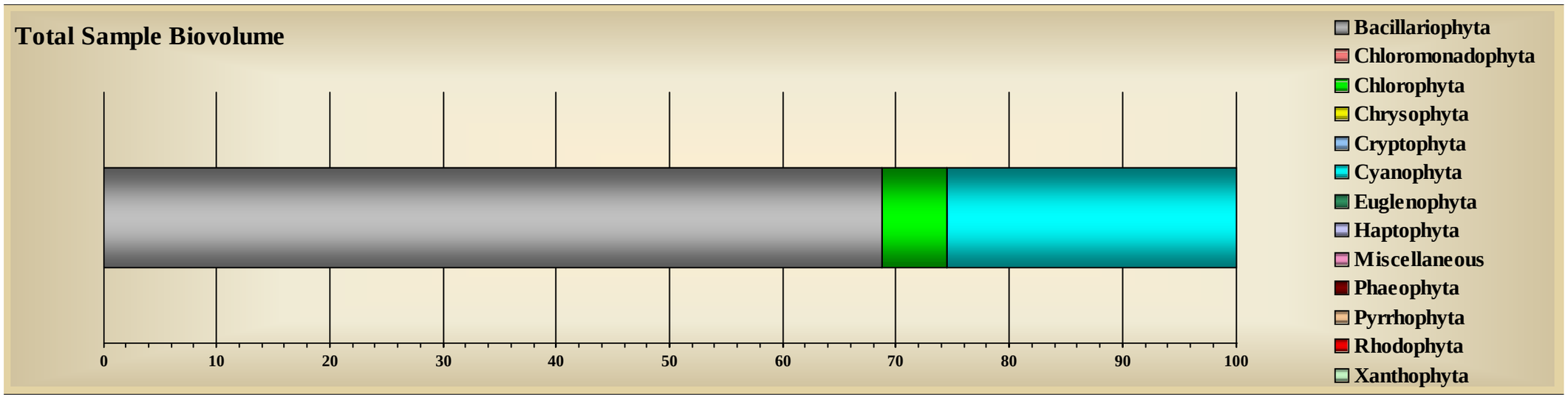
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4050	*Aphanocapsa*	*spp*	.	.	.	.	Vegetative	52.00	1,080.490	0.08	2,138,510.059	0.29
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	20.00	4,882.381	0.37	127,820.258	0.02
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	4.00	1,627.461	0.12	11,779.885	0.00
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	6.80	11,392.223	0.85	111,472.906	0.02
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	32.00	1,627.461	0.12	55,845.655	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	12.00	1,627.461	0.12	446,764.918	0.06
107564	*Lyngbya*	*birgei*	.	.	.	.	Vegetative	1,820.00	540.245	0.04	184,658,643.748	24.86
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	56.00	13,019.684	0.97	689,126.658	0.09
4168	*Merismopedia*	*punctata*	.	.	.	.	Vegetative	20.00	540.245	0.04	325,868.201	0.04
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	20.00	43,941.433	3.29	248,484.409	0.03
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	9.60	1,627.461	0.12	17,669.827	0.00
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	9,764.763	0.73	26,177.376	0.00
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	244,119.072	18.25	98,160.279	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	439,414.330	32.85	117,806.982	0.02
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.73	58,588.577	4.38	165,571.320	0.02
Summary for Division ~ Cyanophyta (15 detail records)							**Sum Total Cyanophyta**		833,793.286	62.34	189,239,702.480	25.48

Total Richness ~ 52 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,337,515.574	742,744,548.267
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060077-222-CJ	**Sample ID:**	SEEP1-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 1 Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.36	238,952.531	17.84	19,829,786.419	6.22
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	20.00	1,991.271	0.15	2,001,843.944	0.63
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	24.00	396.609	0.03	152,297.679	0.05
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	1,991.271	0.15	3,038,201.780	0.95
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	53.11	6,742.345	0.50	12,677,606.685	3.97
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	17.33	89,607.199	6.69	4,088,319.499	1.28
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	28.00	1,991.271	0.15	1,070,507.339	0.34
1096	*Cymbella*	*tumida*	.	.	.	.	Vegetative	90.00	396.609	0.03	11,422,325.942	3.58
109032	*Cymbella*	*turgidula*	.	.	.	.	Vegetative	72.00	1,991.271	0.15	36,397,249.514	11.41
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	46.00	793.217	0.06	8,253,387.936	2.59
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	15.73	11,947.627	0.89	2,322,139.501	0.73
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	8.00	1,991.271	0.15	128,117.984	0.04
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	19.20	31,860.338	2.38	5,674,147.684	1.78
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	28.00	1,991.271	0.15	896,826.085	0.28
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	19.20	1,991.271	0.15	345,918.636	0.11
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	76.00	396.609	0.03	2,320,019.359	0.73
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	41.84	29,869.066	2.23	30,410,054.899	9.53

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	57.20	15,930.169	1.19	8,808,746.101	2.76
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	123.43	25,886.524	1.93	150,658,977.963	47.22
Summary for Division ~ Bacillariophyta (19 detail records)							**Sum Total**	**Bacillariophyta**	466,717.739	34.84	300,496,474.950	94.19

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.80	15,930.169	1.19	1,652,723.145	0.52
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	175.27	351.526	0.03	1,811,937.142	0.57
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	908.00	20.203	0.00	4,262,029.367	1.34
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	37.20	945.482	0.07	3,556,123.963	1.11
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	16.00	396.609	0.03	79,742.867	0.02
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	16.00	396.609	0.03	119,614.320	0.04
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	800.00	16.162	0.00	5,487,730.926	1.72
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	80.00	4.041	0.00	26,656.724	0.01
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	144.00	8.081	0.00	58,492.469	0.02
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total**	**Chlorophyta**	18,068.880	1.35	17,055,050.923	5.35

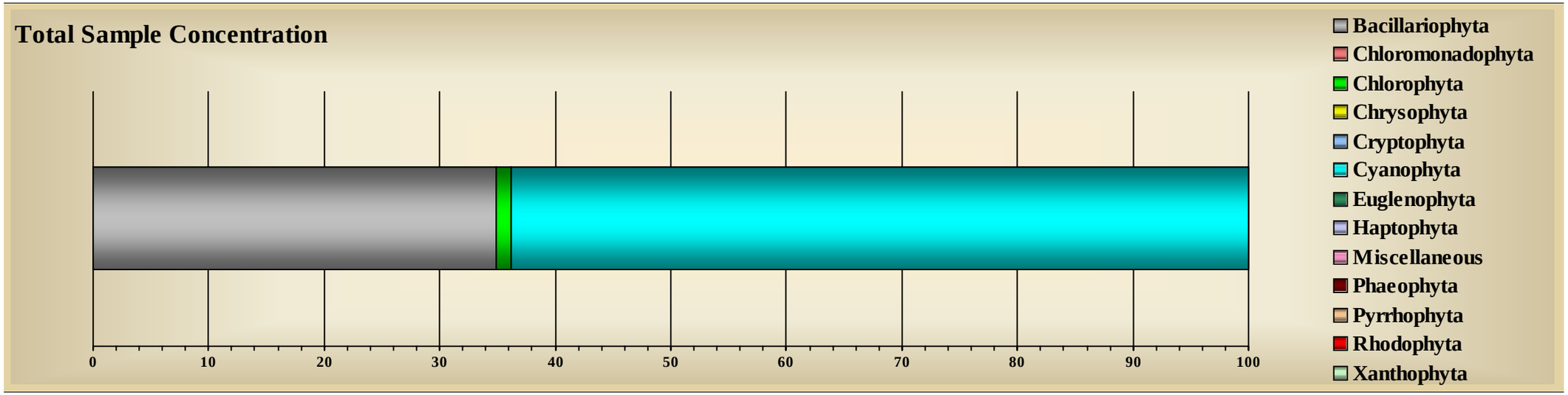
Division: Cyanophyta

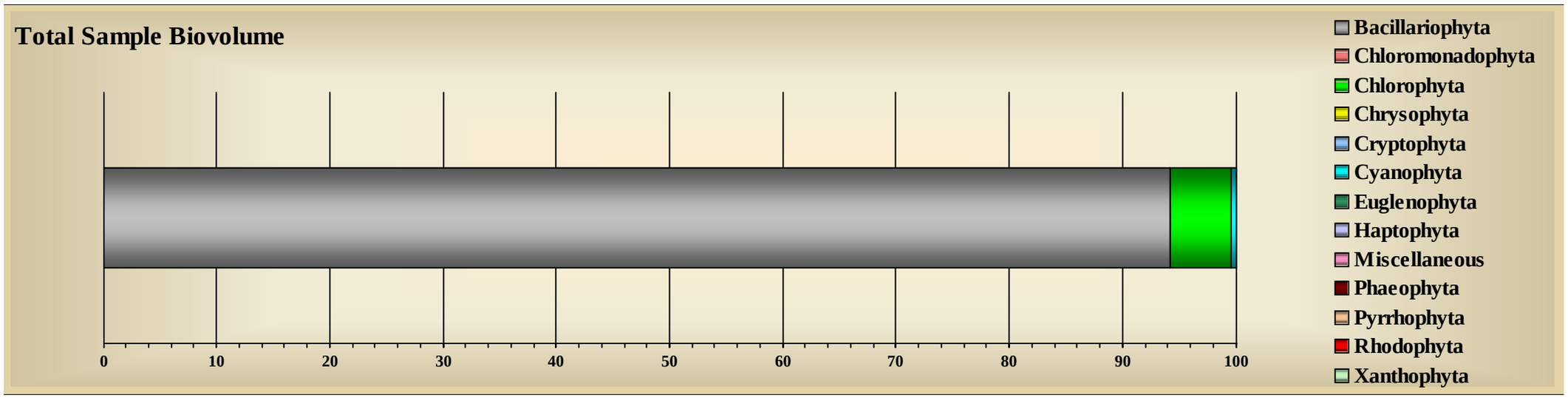
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4050	*Aphanocapsa*	*spp*	.	.	.	.	Vegetative	60.00	396.609	0.03	332,261.977	0.10
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	4.96	9,956.356	0.74	66,728.490	0.02
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.00	1,991.271	0.15	17,082.318	0.01
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	3.20	1,991.271	0.15	16,682.073	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	10.00	3,982.542	0.30	345,918.835	0.11
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	23.31	15,930.169	1.19	325,327.499	0.10
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	20.00	17,921.440	1.34	101,343.950	0.03
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	1,991.271	0.15	5,338.200	0.00

4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	35,842.880	2.68	14,412.422	0.00
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	752,700.473	56.20	201,798.997	0.06
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	11,947.627	0.89	56,051.095	0.02
Summary for Division ~ Cyanophyta (11 detail records)						**Sum Total Cyanophyta**			854,651.907	63.81	1,482,945.855	0.46

Total Richness ~ 39 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,339,438.525	319,034,471.727
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060078-222-CJ	**Sample ID:**	SEEP1-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 1 Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.96	132,521.782	15.35	10,583,428.052	2.94
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	1,227.054	0.14	532,901.744	0.15
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	156.00	2,454.107	0.28	1,239,749.369	0.34
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	30.40	1,227.054	0.14	1,145,930.574	0.32
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	47.33	7,362.321	0.85	13,555,571.362	3.76
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.00	47,855.088	5.54	2,352,173.283	0.65
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.80	2,454.107	0.28	1,432,413.217	0.40
1096	*Cymbella*	*tumida*	.	.	.	.	Vegetative	72.00	1,227.054	0.14	7,162,066.087	1.99
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	100.50	1,466.380	0.17	50,121,631.918	13.91
109195	*Eucocconeis*	*flexella*	.	.	.	.	Vegetative	24.00	244.397	0.03	331,687.263	0.09
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	24.10	9,816.428	1.14	6,757,982.632	1.87
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	9.60	3,681.161	0.43	541,783.280	0.15
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	26.00	244.397	0.03	161,558.406	0.04
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	21.12	17,178.750	1.99	4,310,271.942	1.20
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	48.00	488.793	0.06	944,567.592	0.26
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	28.00	1,227.054	0.14	310,859.289	0.09
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	17.60	1,227.054	0.14	195,397.232	0.05

9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	64.00	244.397	0.03	884,499.377	0.25
9113	*Nitzschia*	*dissipata*	.	.	.	.	Vegetative	32.00	1,227.054	0.14	236,845.260	0.07
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	85.84	24,541.071	2.84	63,267,430.104	17.55
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	55.09	23,314.017	2.70	15,009,643.547	4.16
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	132.00	35,584.553	4.12	166,597,196.191	46.22
Summary for Division ~ Bacillariophyta (22 detail records)							**Sum Total**	**Bacillariophyta**	316,814.068	36.70	347,675,587.722	96.46

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	256.00	4.980	0.00	576,704.125	0.16
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.16	20,859.910	2.42	1,119,553.463	0.31
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	236.57	82.165	0.01	1,003,895.343	0.28
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	307.20	17.429	0.00	1,202,668.393	0.33
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	50.29	380.945	0.04	3,706,916.643	1.03
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	10.00	2,454.107	0.28	169,081.106	0.05
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	584.00	12.449	0.00	2,580,650.837	0.72
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	88.00	4.980	0.00	25,531.172	0.01
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total**	**Chlorophyta**	23,816.964	2.76	10,385,001.081	2.88

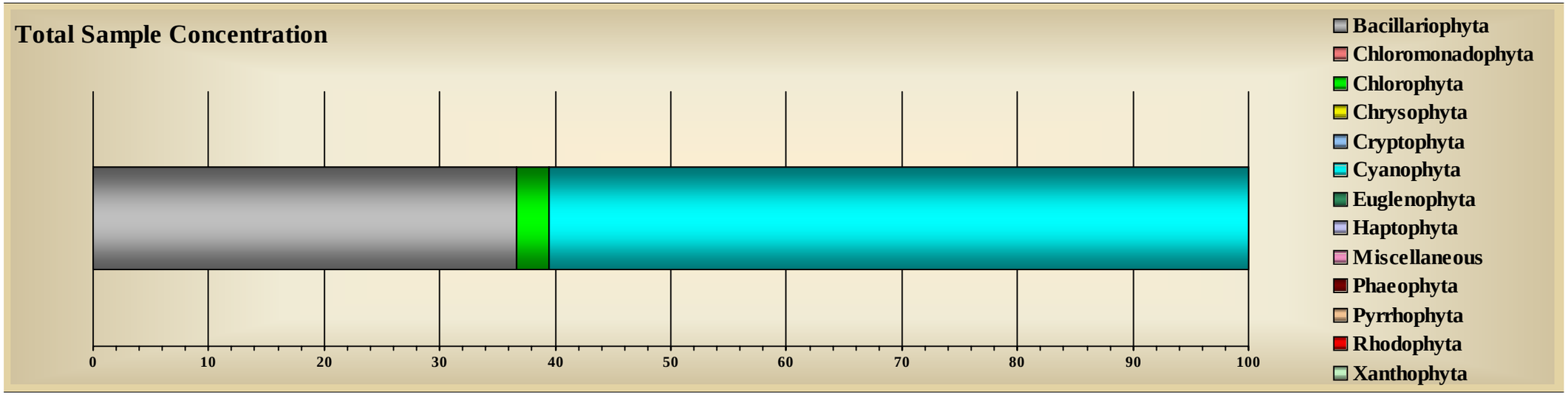
Division: Cyanophyta

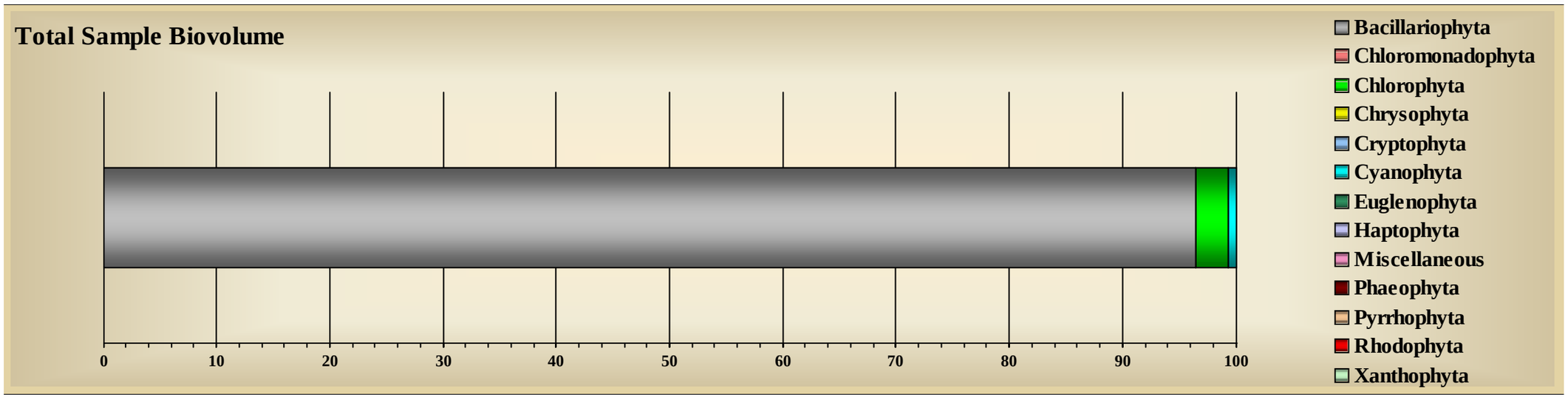
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4050	*Aphanocapsa*	*spp*	.	.	.	.	Vegetative	13.33	4,908.214	0.57	596,224.823	0.17
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	3.20	1,227.054	0.14	5,139.882	0.00
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	8.00	1,227.054	0.14	42,105.851	0.01
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	32.00	1,227.054	0.14	51,398.696	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	16.00	1,227.054	0.14	336,846.565	0.09
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	55.12	20,859.910	2.42	1,090,685.433	0.30

☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	12,270.535	1.42	83,265.399	0.02
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	9.60	1,227.054	0.14	5,921.147	0.00
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	3,681.161	0.43	11,842.294	0.00
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	66,260.891	7.67	26,643.504	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	11,043.482	1.28	23,684.956	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	397,565.346	46.05	106,587.269	0.03
Summary for Division ~ Cyanophyta (12 detail records)							**Sum Total Cyanophyta**		522,724.807	60.55	2,380,345.819	0.66

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	863,355.839	360,440,934.622
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060079-222-CJ	**Sample ID:**	SEEP1-1	**Replicate:**	.
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP1	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.64	25,574.379	13.29	2,171,996.203	4.84
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	1,162.472	0.60	132,384.029	0.30
1090	*Cymbella*	*spp*	.	.	.	.	Vegetative	48.00	387.491	0.20	357,111.328	0.80
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	33.60	387.491	0.20	733,268.594	1.64
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	25.60	387.491	0.20	4,147,781.935	9.25
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	47.68	1,937.453	1.01	4,280,706.785	9.55
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	23.73	1,162.472	0.60	230,965.007	0.52
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.20	10,462.246	5.44	364,253.555	0.81
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	128.630	0.07	103,450.218	0.23
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	48.00	387.491	0.20	1,832,433.936	4.09
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	29.60	774.981	0.40	284,214.274	0.63
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	22.40	387.491	0.20	163,849.815	0.37
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	26.80	774.981	0.40	187,917.979	0.42
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	33.26	2,712.434	1.41	1,127,281.388	2.51
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	44.48	2,712.434	1.41	858,813.066	1.92
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	140.80	3,099.925	1.61	14,525,701.679	32.39
Summary for Division ~ Bacillariophyta (16 detail records)							**Sum Total Bacillariophyta**		52,439.860	27.26	31,502,129.791	70.26

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.60	5,812.359	3.02	147,249.137	0.33
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	280.73	51.107	0.03	1,177,035.181	2.62
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	400.00	3.931	0.00	592,829.076	1.32
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	10.40	774.981	0.40	28,047.421	0.06
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	44.00	229.982	0.12	1,422,466.008	3.17
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	9.60	387.491	0.20	33,241.423	0.07
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	11.20	387.491	0.20	13,088.812	0.03
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	992.00	25.554	0.01	7,799,259.319	17.39
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total Chlorophyta**		7,672.896	3.99	11,213,216.377	25.01

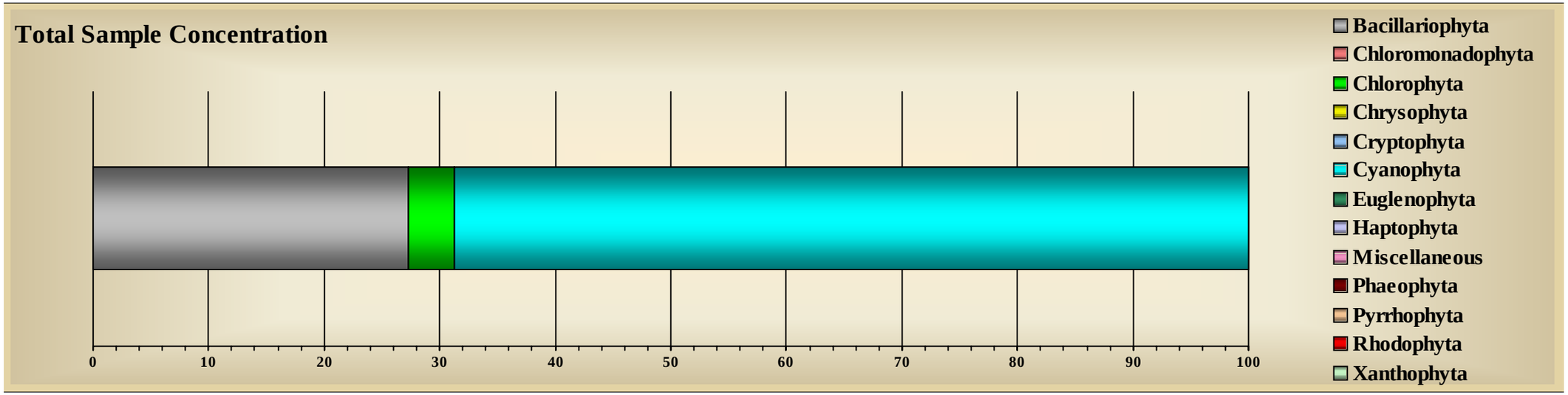
Division: Cyanophyta

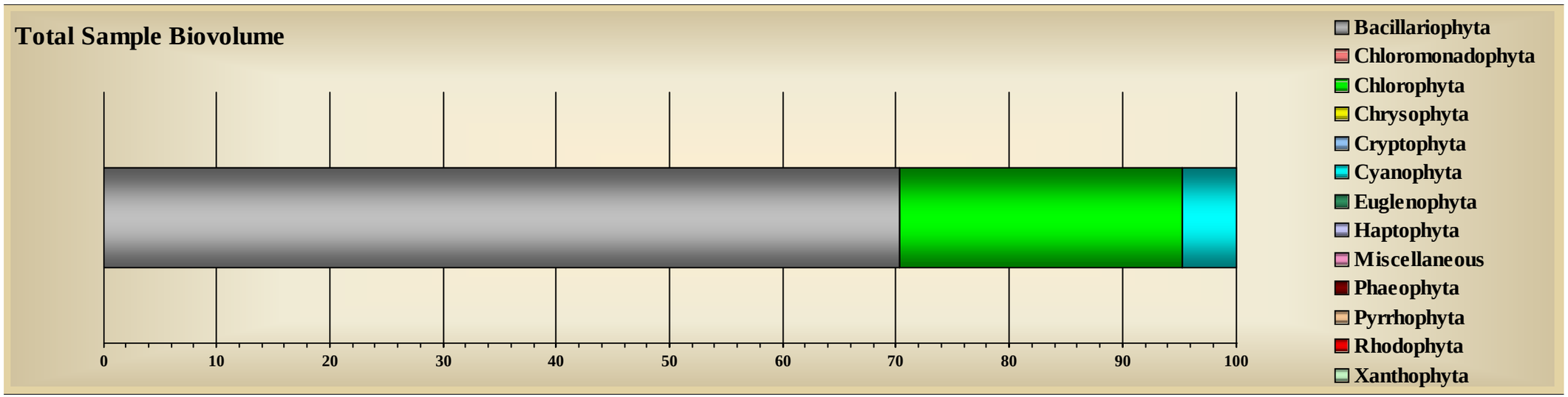
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4050	*Aphanocapsa*	*spp*	.	.	.	.	Vegetative	45.00	385.889	0.20	425,519.844	0.95
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	14.67	1,549.962	0.81	55,185.945	0.12
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	56.00	774.981	0.40	712,613.176	1.59
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.00	774.981	0.40	6,648.254	0.01
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	960.00	1.966	0.00	126,470.203	0.28
4512	*Chroococcus*	*cohaerens*	.	.	.	.	Vegetative	3.20	387.491	0.20	1,662.063	0.00
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	16.00	774.981	0.40	38,850.892	0.09
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	14.00	774.981	0.40	97,231.154	0.22
4150	*Lyngbya*	*spp*	.	.	.	.	Vegetative	40.00	128.630	0.07	145,476.879	0.32
4157	*Lyngbya*	*diguetii*	.	.	.	.	Vegetative	64.00	774.981	0.40	116,864.372	0.26
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	21.51	8,524.793	4.43	180,209.009	0.40
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	16.00	2,712.434	1.41	12,270.781	0.03

4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	20.00	774.981	0.40	17,529.687	0.04
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	25,574.379	13.29	68,559.795	0.15
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	11,624.718	6.04	4,674.299	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.84	30,224.266	15.71	101,889.023	0.23
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	46,498.871	24.17	12,466.347	0.03
Summary for Division ~ Cyanophyta (17 detail records)							**Sum Total Cyanophyta**		132,263.286	68.75	2,124,121.723	4.74

Total Richness ~ 41 Taxa	Total Sample Concentration	Total Sample Biovolume
	192,376.041	44,839,467.891
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060080-222-CJ	**Sample ID:**	SEEP2-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 2 Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.08	441,739.273	36.49	45,722,974.454	18.64
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	16.00	1,549.962	0.13	155,819.266	0.06
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	24.00	1,549.962	0.13	1,142,756.251	0.47
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	3,099.925	0.26	3,021,955.419	1.23
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	63.20	3,099.925	0.26	14,563,793.554	5.94
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	32.00	1,549.962	0.13	374,570.105	0.15
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.63	108,497.365	8.96	4,063,128.687	1.66
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.00	1,029.038	0.09	395,150.735	0.16
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	16.00	1,549.962	0.13	448,759.363	0.18
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	34.60	6,199.850	0.51	3,173,102.169	1.29
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	23.80	21,699.473	1.79	8,108,863.076	3.31
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	84.00	4,649.887	0.38	14,237,679.923	5.80
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	21.60	1,549.962	0.13	302,912.555	0.12
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	47.20	15,499.624	1.28	12,617,437.616	5.14
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	60.80	10,849.737	0.90	6,954,941.516	2.84
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	128.57	30,999.247	2.56	114,162,257.747	46.54
Summary for Division ~ Bacillariophyta (16 detail records)							**Sum Total Bacillariophyta**		655,113.156	54.12	229,446,102.434	93.54

☑ = Identification is Uncertain

✱ = Family Level Identification

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	160.00	5.242	0.00	379,410.608	0.15
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.00	1,549.962	0.13	51,939.704	0.02
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	168.00	165.115	0.01	2,033,749.547	0.83
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	561.14	41.934	0.00	4,390,924.991	1.79
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	32.00	353.819	0.03	679,353.628	0.28
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	18.40	1,549.962	0.13	316,624.607	0.13
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	6.40	1,549.962	0.13	53,186.339	0.02
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,240.00	10.484	0.00	4,924,433.522	2.01
103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	520.00	5.242	0.00	137,009.387	0.06
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	800.00	2.621	0.00	1,349,015.497	0.55
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total Chlorophyta**		5,234.344	0.43	14,315,647.828	5.84

Division: Cyanophyta

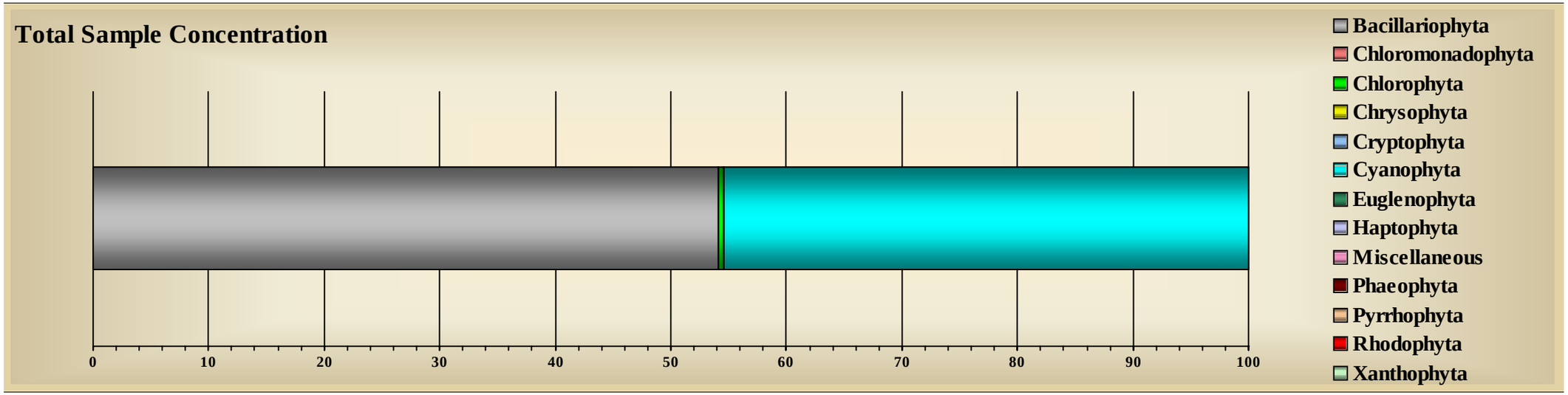
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	1,549.962	0.13	24,931.145	0.01
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	16.00	1,549.962	0.13	33,241.423	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	16.00	1,549.962	0.13	179,503.776	0.07
4157	*Lyngbya*	*diguetii*	.	.	.	.	Vegetative	48.00	1,549.962	0.13	194,774.005	0.08
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	44.00	13,949.661	1.15	593,203.766	0.24
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	19.20	26,349.360	2.18	143,042.772	0.06
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	7,749.812	0.64	20,775.696	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	46,498.871	3.84	18,697.196	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.73	77,498.118	6.40	219,009.682	0.09
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	371,990.967	30.73	99,730.778	0.04

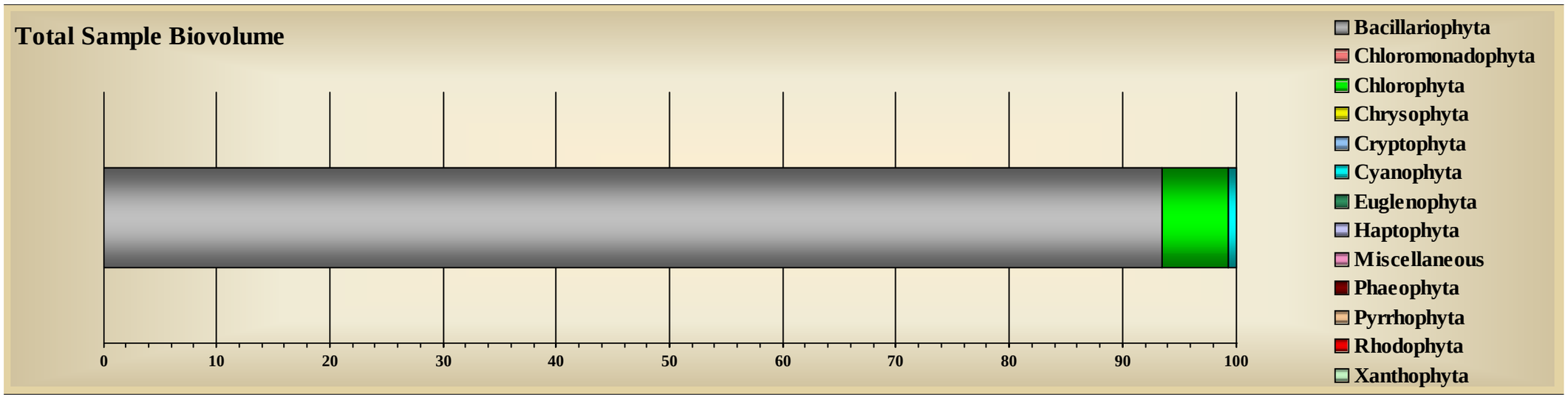
Summary for Division ~ Cyanophyta (10 detail records)

Sum Total Cyanophyta	550,236.639	45.45	1,526,910.238	0.62

Total Richness ~ 36 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,210,584.138	245,288,660.499
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060081-222-CJ	**Sample ID:**	SEEP2-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 2 Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.28	124,675.098	33.02	13,897,371.048	10.57
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	19.20	1,259.344	0.33	194,462.424	0.15
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	32.00	1,259.344	0.33	253,206.182	0.19
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	629.672	0.17	919,138.570	0.70
9212	*Cocconeis*	*placentula*	.	lineata	.	.	Vegetative	12.00	167.219	0.04	25,215.983	0.02
☑ 1000073	*Cyclotella*	*hakanssoniae*	.	.	.	.	Vegetative	4.80	629.672	0.17	27,346.286	0.02
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	55.73	3,148.361	0.83	11,373,279.243	8.65
1111	*Cymbella*	*delicatula*	.	.	.	.	Vegetative	16.00	629.672	0.17	18,698.746	0.01
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	32.00	1,259.344	0.33	214,928.156	0.16
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	160.00	629.672	0.17	42,985,622.886	32.69
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.72	11,334.100	3.00	427,105.149	0.32
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.00	1,259.344	0.33	300,899.318	0.23
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	40.00	629.672	0.17	455,771.165	0.35
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	36.00	334.438	0.09	2,420,735.171	1.84
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	10.00	2,518.689	0.67	205,603.341	0.16
1161	*Gomphonema*	*parvulum*	.	.	.	.	Vegetative	25.60	629.672	0.17	107,024.189	0.08
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	21.87	15,741.805	4.17	5,679,396.187	4.32

9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	30.00	167.219	0.04	132,433.276	0.10
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	28.80	1,889.017	0.50	590,983.386	0.45
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	12.80	629.672	0.17	32,410.425	0.02
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	40.00	629.672	0.17	151,923.722	0.12
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	20.00	629.672	0.17	50,641.262	0.04
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	26.40	629.672	0.17	167,116.075	0.13
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	56.00	629.672	0.17	203,107.068	0.15
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	45.30	11,334.100	3.00	7,065,224.438	5.37
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	47.87	4,407.706	1.17	1,945,314.363	1.48
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	132.32	5,037.378	1.33	33,091,364.137	25.17
Summary for Division ~ Bacillariophyta (27 detail records)							**Sum Total Bacillariophyta**		192,718.899	51.03	122,936,322.195	93.49

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.53	3,778.033	1.00	217,419.769	0.17
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	1,600.00	1.704	0.00	5,480,375.454	4.17
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	240.80	81.772	0.02	900,151.672	0.68
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	247.33	13.629	0.00	126,847.856	0.10
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	37.50	137.989	0.04	788,020.586	0.60
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	80.00	3.407	0.00	20,551.408	0.02
103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	326.00	10.221	0.00	335,758.628	0.26
Summary for Division ~ Chlorophyta (7 detail records)							**Sum Total Chlorophyta**		4,026.755	1.07	7,869,125.373	5.98

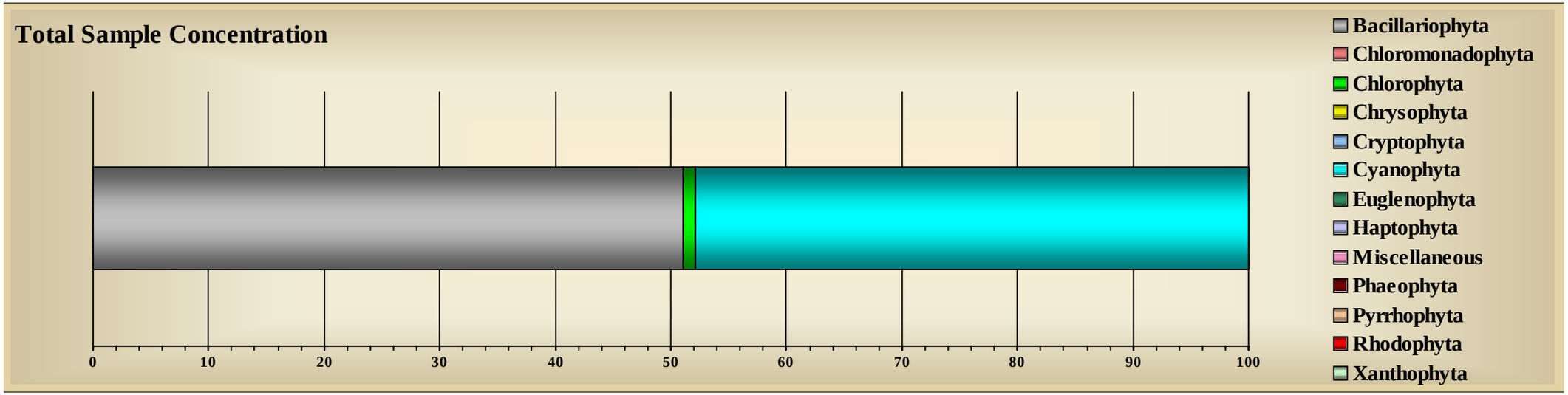
Division: Cyanophyta

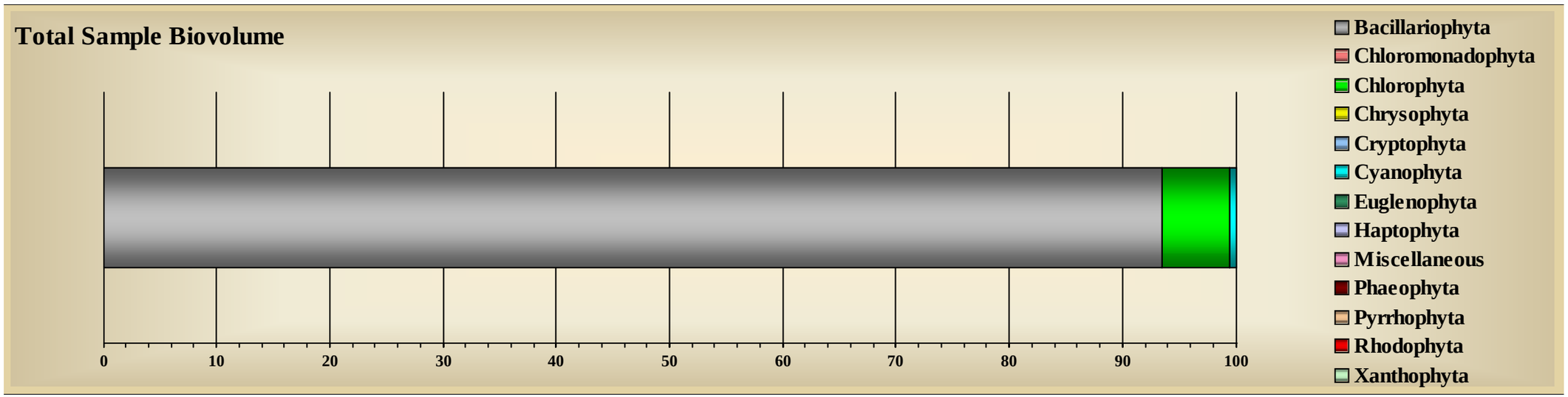
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	3.20	629.672	0.17	2,637.571	0.00
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	80.00	629.672	0.17	364,616.982	0.28

4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	4.80	629.672	0.17	1,350.458	0.00
4069	*Aphanothece*	*stagnina*	.	.	.	.	Vegetative	24.00	629.672	0.17	37,812.131	0.03
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	4.00	1,259.344	0.33	19,665.671	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	11.20	629.672	0.17	86,427.737	0.07
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	16.00	1,259.344	0.33	9,210.341	0.01
4168	*Merismopedia*	*punctata*	.	.	.	.	Vegetative	30.00	167.219	0.04	25,215.983	0.02
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	8,185.739	2.17	55,546.786	0.04
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	4.80	629.672	0.17	1,519.210	0.00
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	5,667.050	1.50	15,192.227	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	15,112.133	4.00	6,076.589	0.00
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	136,009.197	36.02	36,464.066	0.03
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.73	9,445.083	2.50	26,691.805	0.02
Summary for Division ~ Cyanophyta (14 detail records)						**Sum Total Cyanophyta**			180,883.143	47.90	688,427.558	0.52

Total Richness ~ 48 Taxa	Total Sample Concentration	Total Sample Biovolume
	377,628.796	131,493,875.126
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060082-222-CJ	**Sample ID:**	SEEP2-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 2 Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.64	380,774.087	27.45	51,845,857.011	6.14
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	22.40	2,884.652	0.21	292,316.805	0.03
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	22.40	8,653.957	0.62	2,561,252.666	0.30
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	41.60	2,884.652	0.21	6,144,078.362	0.73
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	28.00	2,884.652	0.21	3,618,507.689	0.43
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	70.40	17,307.913	1.25	75,418,561.311	8.93
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	28.80	5,769.304	0.42	1,985,009.932	0.24
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.32	138,463.304	9.98	6,616,704.389	0.78
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	21.60	5,769.304	0.42	2,593,510.001	0.31
9952	*Cymbella*	*tumidula*	.	.	.	.	Vegetative	70.00	1,149.093	0.08	15,443,807.905	1.83
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	46.00	574.546	0.04	5,313,893.014	0.63
1354	*Epithemia*	*turgida*	.	.	.	.	Vegetative	96.00	2,884.652	0.21	70,302,435.098	8.32
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	16.57	20,192.565	1.46	4,138,835.767	0.49
☑ 1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	49.60	2,884.652	0.21	5,405,449.903	0.64
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	20.40	37,500.478	2.70	12,706,369.557	1.50
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	28.00	2,884.652	0.21	3,112,556.717	0.37
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	40.00	2,884.652	0.21	695,992.434	0.08

9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	32.00	2,884.652	0.21	556,794.121	0.07
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	59.00	14,423.261	1.04	6,646,238.612	0.79
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	47.50	31,731.174	2.29	25,060,011.923	2.97
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	53.00	14,423.261	1.04	7,827,792.143	0.93
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	140.67	77,885.609	5.61	507,141,237.305	60.04
Summary for Division ~ Bacillariophyta (22 detail records)							**Sum Total**	**Bacillariophyta**	777,695.075	56.06	815,427,212.664	96.54

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	5.853	0.00	441,328.312	0.05
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.00	31,731.174	2.29	516,773.899	0.06
10170	*Geminella*	*spp*	.	.	.	.	Vegetative	960.00	2.927	0.00	10,984.171	0.00
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	320.00	96.579	0.01	1,851,427.437	0.22
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	608.80	52.680	0.00	12,275,458.729	1.45
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	40.00	737.516	0.05	3,664,868.493	0.43
1000013	*Pediastrum*	*duplex*	.	.	.	.	Vegetative	32.00	2.927	0.00	6,112.274	0.00
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	12.00	1,723.639	0.12	119,129.329	0.01
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	744.00	20.487	0.00	5,179,723.287	0.61
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	64.00	2.927	0.00	21,183.759	0.00
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	508.00	26.340	0.00	1,575,376.574	0.19
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	360.00	5.853	0.00	165,498.117	0.02
Summary for Division ~ Chlorophyta (12 detail records)							**Sum Total**	**Chlorophyta**	34,408.901	2.48	25,827,864.380	3.06

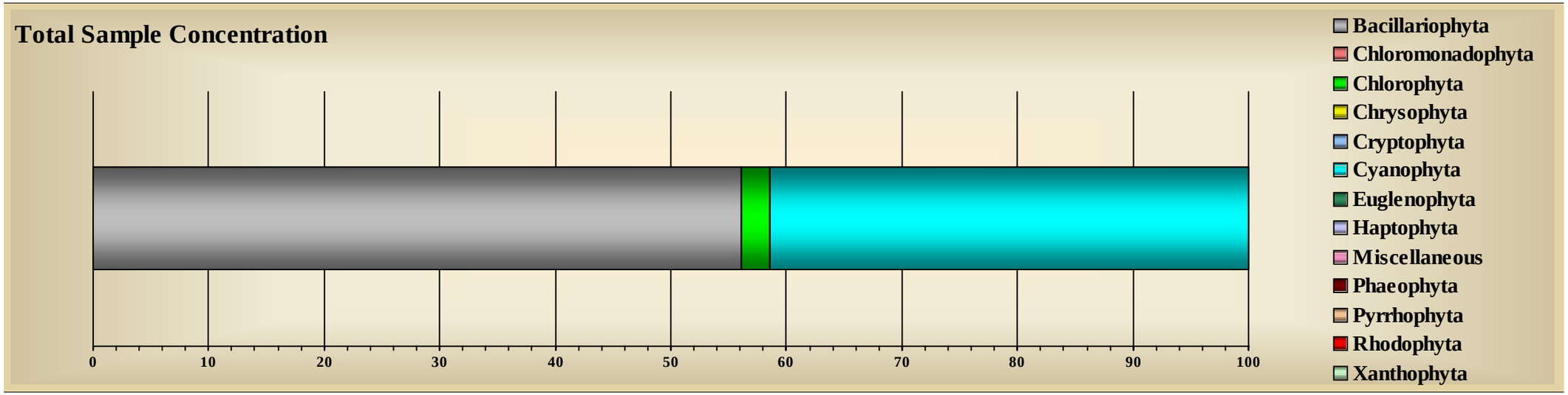
Division: Cyanophyta

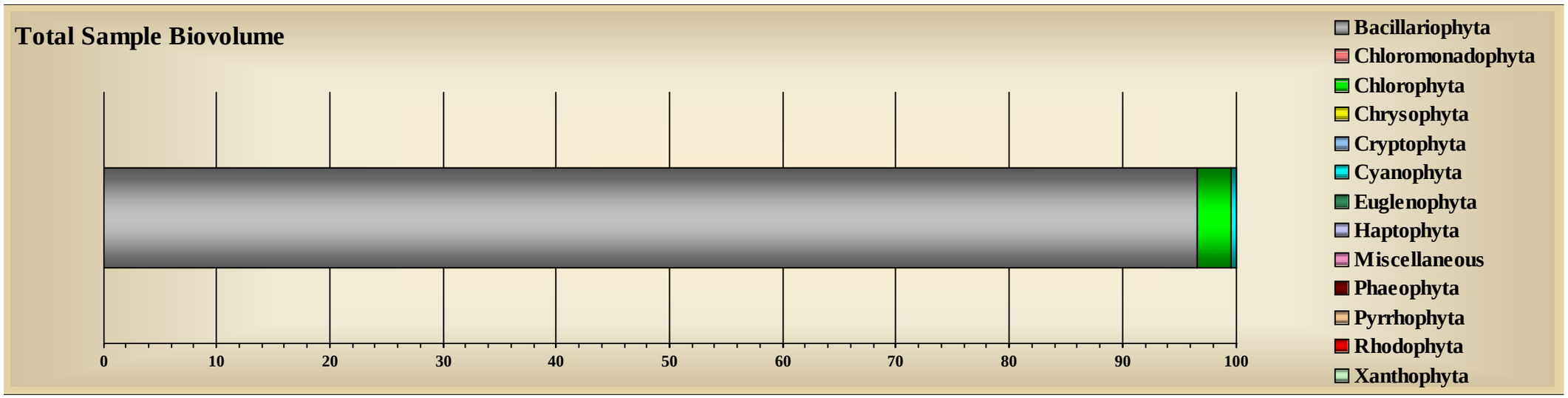
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	3.60	5,769.304	0.42	24,166.462	0.00
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	30.00	1,149.093	0.08	731,021.271	0.09

4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	3.20	2,884.652	0.21	7,733.176	0.00
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	224.00	5.853	0.00	65,905.028	0.01
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	16.00	2,884.652	0.21	120,832.022	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	7.60	8,653.957	0.62	1,676,182.243	0.20
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	30.67	8,653.957	0.62	294,926.838	0.03
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	17,307.913	1.25	117,448.036	0.01
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	17,307.913	1.25	46,399.053	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	155,771.218	11.23	62,635.607	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	311,542.435	22.46	83,524.527	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	43,269.783	3.12	181,248.466	0.02
Summary for Division ~ Cyanophyta (12 detail records)						**Sum Total Cyanophyta**			575,200.729	41.46	3,412,022.729	0.40

Total Richness ~ 46 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,387,304.705	844,667,099.773
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060083-222-CJ	**Sample ID:**	SEEP2-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 2 Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.64	133,628.898	40.42	12,907,241.984	26.42
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	24.00	627.366	0.19	121,093.817	0.25
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	20.00	1,254.731	0.38	270,442.806	0.55
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.00	627.366	0.19	1,413,329.490	2.89
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.00	627.366	0.19	64,242.250	0.13
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	14.24	13,174.680	3.98	480,275.058	0.98
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	80.00	145.780	0.04	4,030,248.184	8.25
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	23.60	1,254.731	0.38	661,979.367	1.35
1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	32.00	627.366	0.19	347,325.032	0.71
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	25.60	6,273.657	1.90	1,777,202.862	3.64
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	52.16	6,901.023	2.09	4,551,627.623	9.32
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	68.00	1,254.731	0.38	953,997.406	1.95
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	145.33	5,646.292	1.71	19,494,310.816	39.90
Summary for Division ~ Bacillariophyta (13 detail records)							**Sum Total Bacillariophyta**		172,043.987	52.04	47,073,316.695	96.35

Division: Chlorophyta

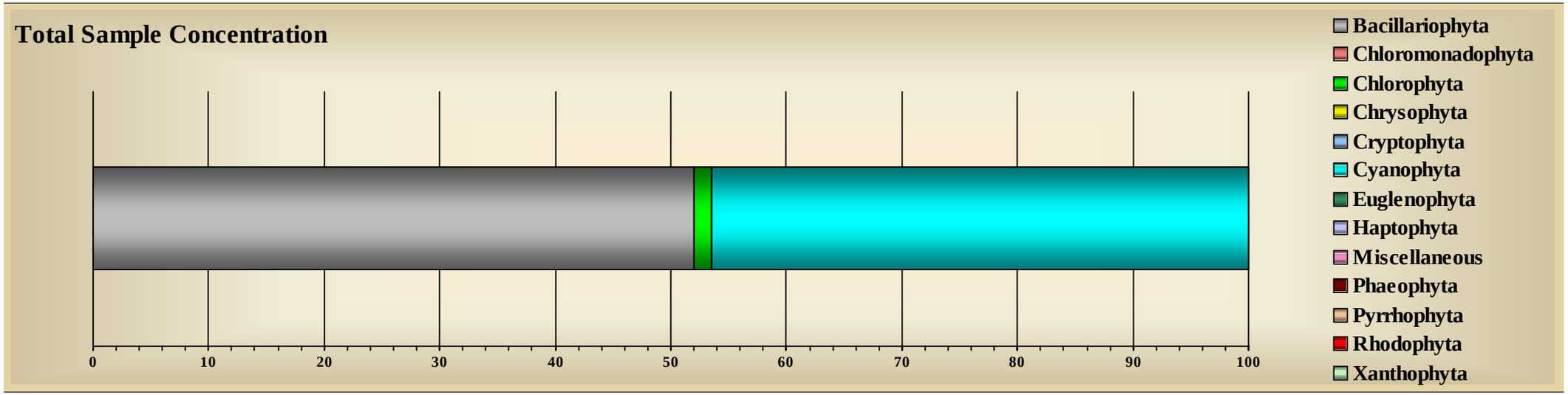
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.00	4,391.560	1.33	147,162.494	0.30
☑ 10170	*Geminella*	*spp*	.	.	.	.	Vegetative	80.00	1.485	0.00	3,981.469	0.01
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	533.33	11.881	0.00	931,663.827	1.91
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	216.00	7.426	0.00	156,770.355	0.32
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	40.00	8.911	0.00	69,003.218	0.14
8451	*Protoderma*	*viride*	.	.	.	.	Vegetative	36.00	145.780	0.04	65,949.510	0.13
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	8.00	145.780	0.04	2,442.580	0.00
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	160.00	1.485	0.00	26,874.918	0.06
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total Chlorophyta**		4,714.309	1.43	1,403,848.371	2.87

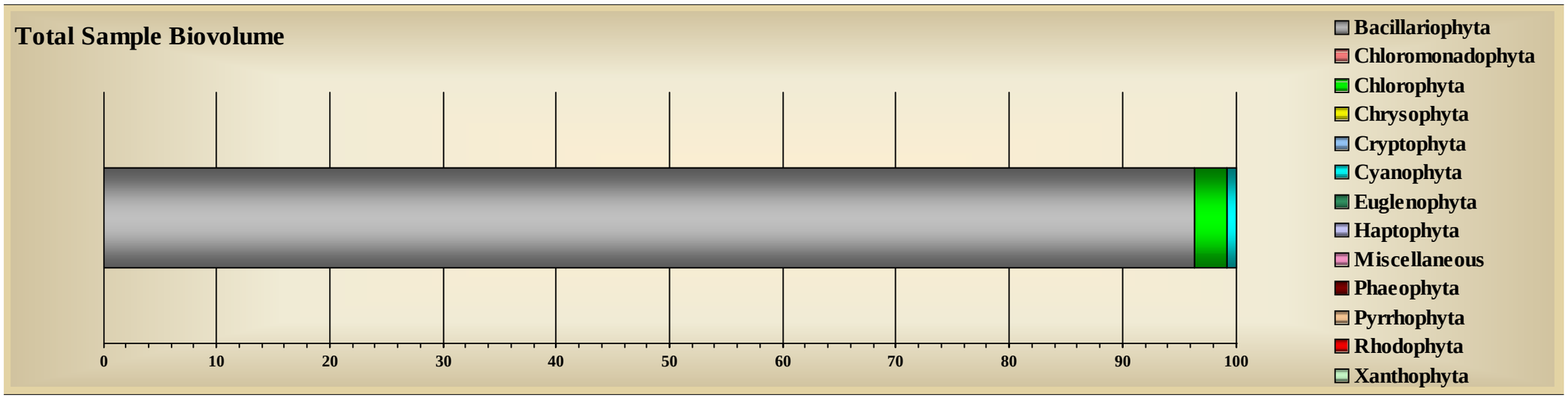
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	40.00	145.780	0.04	15,456.925	0.03
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	4.80	627.366	0.19	2,018.236	0.00
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	8.00	1,882.097	0.57	63,069.640	0.13
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	85.33	1,882.097	0.57	123,238.216	0.25
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	20.00	20,703.069	6.26	117,073.783	0.24
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	4.80	627.366	0.19	3,405.780	0.01
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	3,764.194	1.14	5,676.405	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	13,174.680	3.98	5,297.539	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.80	5,646.292	1.71	17,880.111	0.04
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	105,397.441	31.88	28,257.054	0.06
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		153,850.382	46.54	381,373.689	0.78

Total Richness ~ 31 Taxa	Total Sample Concentration	Total Sample Biovolume
	330,608.678	48,858,538.755
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060084-222-CJ	**Sample ID:**	SEEP2-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 2 Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.36	68,087.632	21.10	6,666,950.316	19.31
1347	*Amphora*	*veneta*	.	.	.	.	Vegetative	12.80	504.353	0.16	33,747.963	0.10
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	25.60	504.353	0.16	934,559.091	2.71
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	44.00	234.392	0.07	412,530.050	1.20
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	25.60	504.353	0.16	174,080.558	0.50
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.60	3,026.117	0.94	96,061.058	0.28
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	40.00	504.353	0.16	4,056,246.155	11.75
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	44.00	1,008.706	0.31	557,733.839	1.62
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	19.20	1,513.059	0.47	269,467.245	0.78
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	19.20	504.353	0.16	87,614.913	0.25
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	40.00	504.353	0.16	116,202.893	0.34
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.83	4,034.823	1.25	3,677,175.979	10.65
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	64.00	1,008.706	0.31	846,989.973	2.45
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	120.00	4,034.823	1.25	15,745,061.429	45.61
Summary for Division ~ Bacillariophyta (14 detail records)							**Sum Total Bacillariophyta**		85,974.374	26.65	33,674,421.460	97.55

Division: Chlorophyta

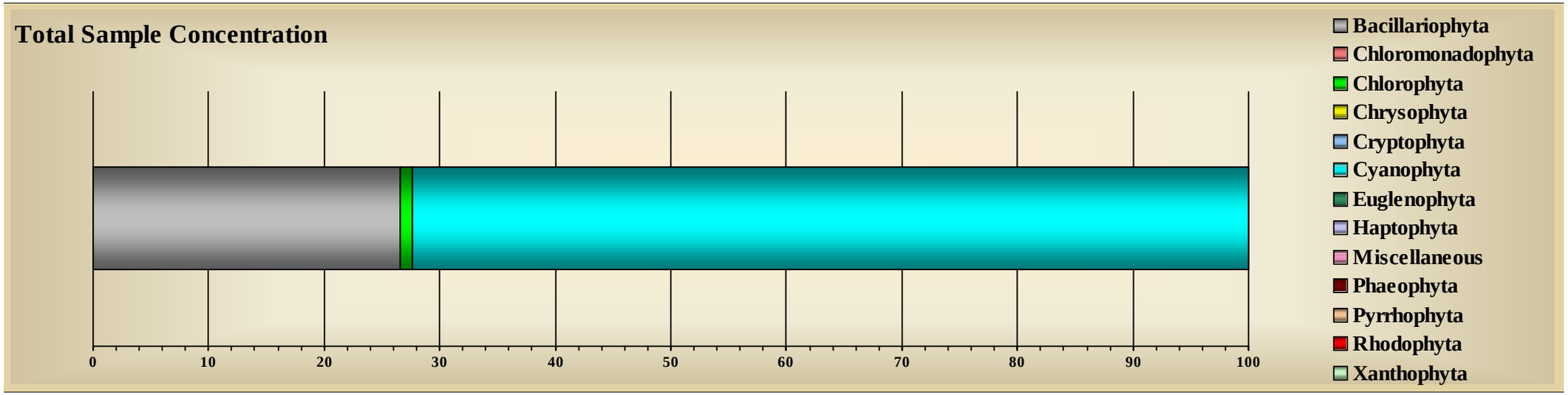
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.00	2,521.764	0.78	164,818.723	0.48
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	480.00	1.791	0.00	97,223.969	0.28
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	172.00	3.582	0.00	30,967.634	0.09
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	5.60	504.353	0.16	8,518.116	0.02
2884	*Scenedesmus*	*quadricauda*	.	.	.	.	Vegetative	36.00	117.196	0.04	117,818.301	0.34
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	240.00	3.582	0.00	108,026.632	0.31
Summary for Division ~ Chlorophyta (6 detail records)							**Sum Total Chlorophyta**		3,152.268	0.98	527,373.374	1.53

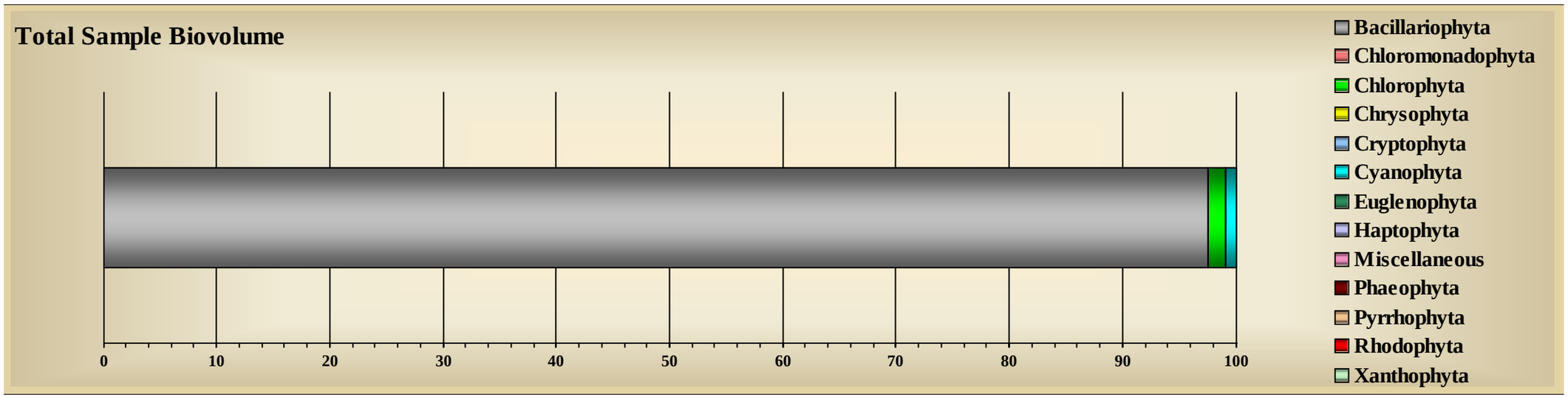
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	14.00	63,548.457	19.70	251,550.212	0.73
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	14.40	504.353	0.16	8,213.890	0.02
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	95,322.685	29.54	38,329.252	0.11
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	74,139.866	22.98	19,876.898	0.06
Summary for Division ~ Cyanophyta (4 detail records)							**Sum Total Cyanophyta**		233,515.361	72.38	317,970.252	0.92

Total Richness ~ 24 Taxa	Total Sample Concentration	Total Sample Biovolume
	322,642.003	34,519,765.087
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060085-222-CJ	**Sample ID:**	SEEP2-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 2 Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.32	35,132.480	16.89	3,156,108.795	7.45
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	17.60	292.771	0.14	23,310.547	0.06
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	28.00	97.187	0.05	130,619.271	0.31
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	51.00	194.374	0.09	893,601.672	2.11
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	34.00	878.312	0.42	274,314.406	0.65
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.20	2,634.936	1.27	72,850.711	0.17
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	56.00	292.771	0.14	206,027.638	0.49
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	48.00	292.771	0.14	1,412,760.850	3.33
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	20.80	1,756.624	0.84	421,002.699	0.99
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	9.60	292.771	0.14	22,604.179	0.05
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	26.88	4,977.101	2.39	1,595,584.539	3.77
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	24.80	292.771	0.14	89,415.998	0.21
9102	*Navicula*	*tripunctata*	.	.	.	.	Vegetative	42.00	97.187	0.05	102,588.132	0.24
9114	*Nitzschia*	*fonticola*	.	.	.	.	Vegetative	25.60	292.771	0.14	90,416.688	0.21
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	292.771	0.14	31,080.739	0.07
1223	*Nitzschia*	*perminuta*	.	.	.	.	Vegetative	24.00	292.771	0.14	70,638.038	0.17
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	46.40	5,269.872	2.53	4,417,181.444	10.42

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	49.40	1,463.853	0.70	898,642.001	2.12
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	254.67	7,904.808	3.80	28,040,778.561	66.17
Summary for Division ~ Bacillariophyta (19 detail records)							**Sum Total**	**Bacillariophyta**	62,748.901	30.17	41,949,526.907	98.99

Division: Chlorophyta

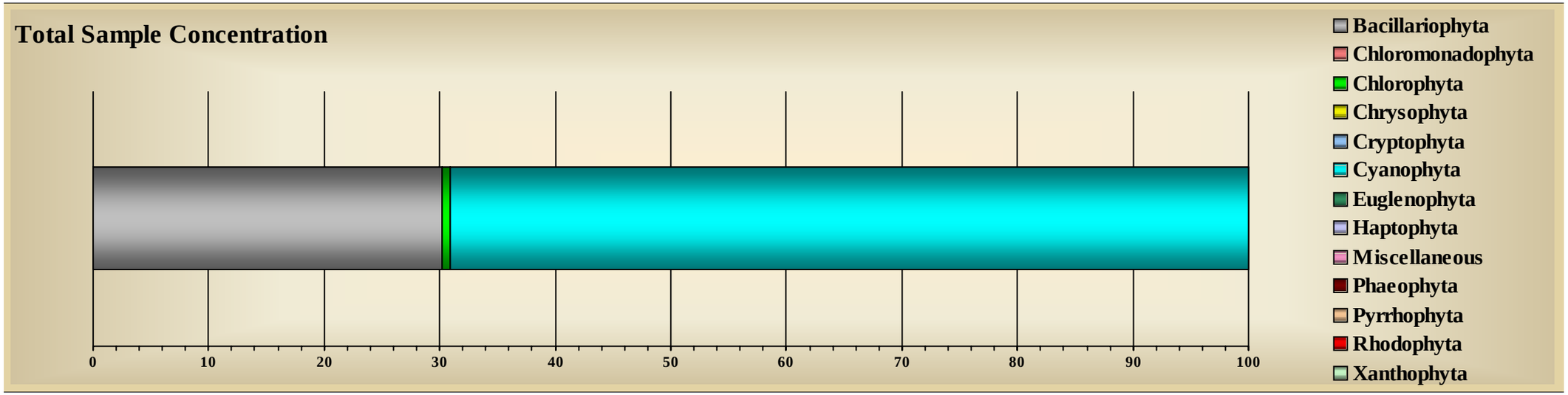
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.47	1,463.853	0.70	36,627.075	0.09
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	160.00	1.485	0.00	26,874.918	0.06
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	32.00	1.485	0.00	4,566.445	0.01
Summary for Division ~ Chlorophyta (3 detail records)							**Sum Total**	**Chlorophyta**	1,466.824	0.71	68,068.437	0.16

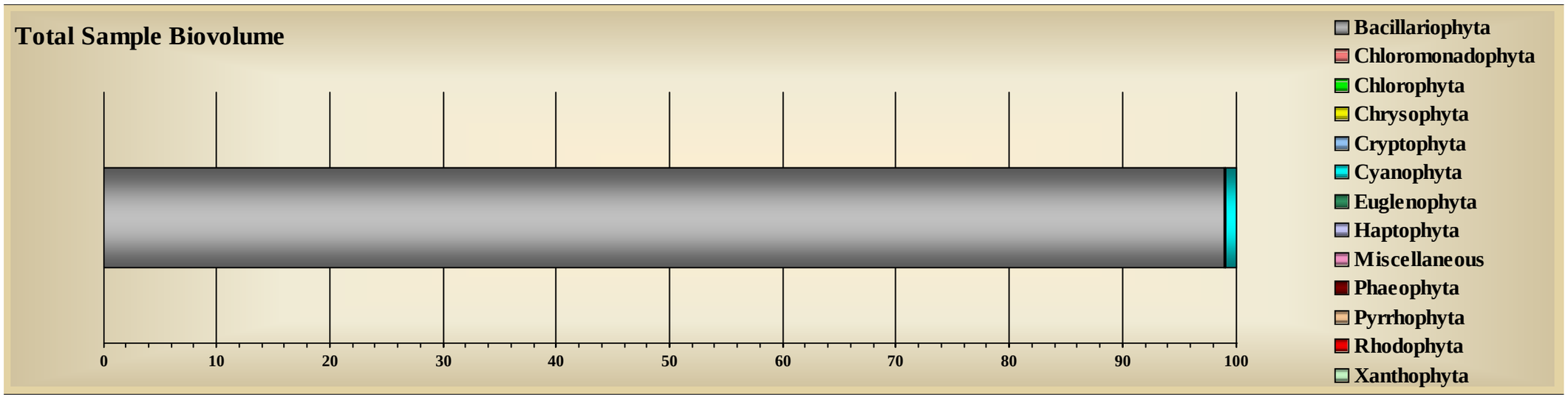
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	34.00	1,171.083	0.56	22,147.984	0.05
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	43,915.600	21.12	298,002.480	0.70
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	9.60	292.771	0.14	3,178.699	0.01
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	878.312	0.42	2,825.530	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	17,566.240	8.45	7,063.385	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	79,048.081	38.01	21,192.790	0.05
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.40	878.312	0.42	6,357.398	0.02
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total**	**Cyanophyta**	143,750.398	69.12	360,768.267	0.85

Total Richness ~ 29 Taxa	Total Sample Concentration	Total Sample Biovolume
	207,966.123	42,378,363.610
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060086-222-CJ	**Sample ID:**	SEEP2-1	**Replicate:**	.
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	SEEP2	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	SEEP 2 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.20	30,689.255	5.85	2,912,447.106	6.56
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	22.40	1,136.639	0.22	230,363.094	0.52
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	24.00	1,704.959	0.32	1,183,802.029	2.67
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	64.00	568.320	0.11	1,986,420.723	4.47
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	26.97	6,819.834	1.30	1,528,058.915	3.44
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	12.48	13,639.669	2.60	396,663.392	0.89
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.00	568.320	0.11	87,293.880	0.20
109046	*Denticula*	*tenuis*	.	.	.	.	Vegetative	19.20	1,136.639	0.22	738,624.665	1.66
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	24.00	568.320	0.11	123,408.825	0.28
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	23.20	3,409.917	0.65	1,192,614.448	2.69
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	27.20	568.320	0.11	594,278.153	1.34
1221	*Nitzschia*	*acicularis*	.	.	.	.	Vegetative	32.00	568.320	0.11	36,565.565	0.08
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	16.00	1,136.639	0.22	54,848.405	0.12
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	40.00	3,978.237	0.76	1,629,485.765	3.67
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	48.00	568.320	0.11	157,128.985	0.35
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	160.00	568.320	0.11	2,886,517.641	6.50
Summary for Division ~ Bacillariophyta (16 detail records)							**Sum Total Bacillariophyta**		67,630.024	12.89	15,738,521.591	35.45

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	80.00	2.883	0.00	97,382.056	0.22
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.56	6,251.515	1.19	272,244.095	0.61
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	232.00	57.659	0.01	2,392,043.364	5.39
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	460.00	8.649	0.00	1,025,989.520	2.31
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	22.67	103.787	0.02	155,461.506	0.35
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	9.60	568.320	0.11	22,853.492	0.05
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	977.78	51.893	0.01	21,800,828.167	49.10
Summary for Division ~ Chlorophyta (7 detail records)							**Sum Total Chlorophyta**		7,044.706	1.34	25,766,802.201	58.03

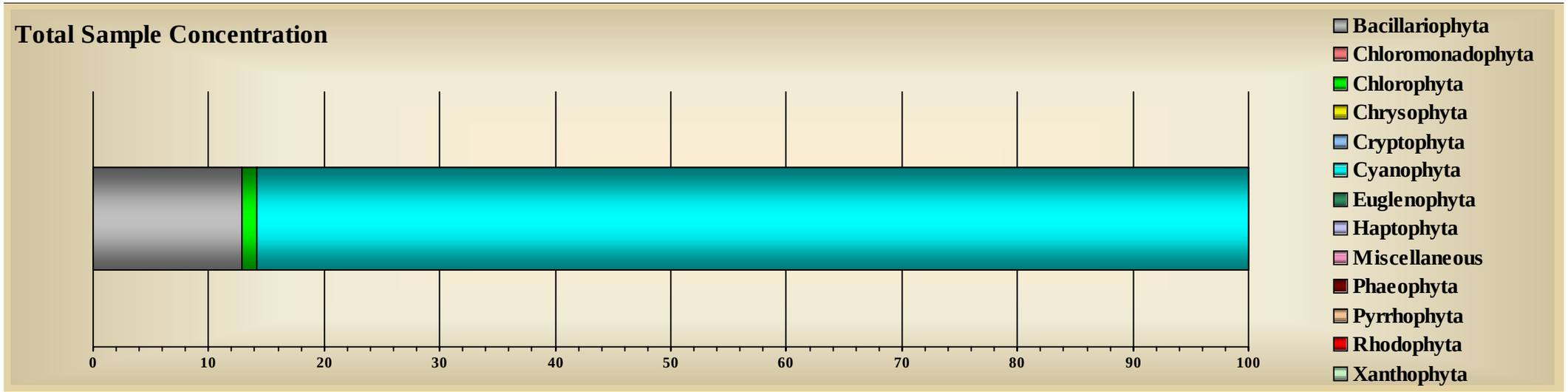
Division: Cyanophyta

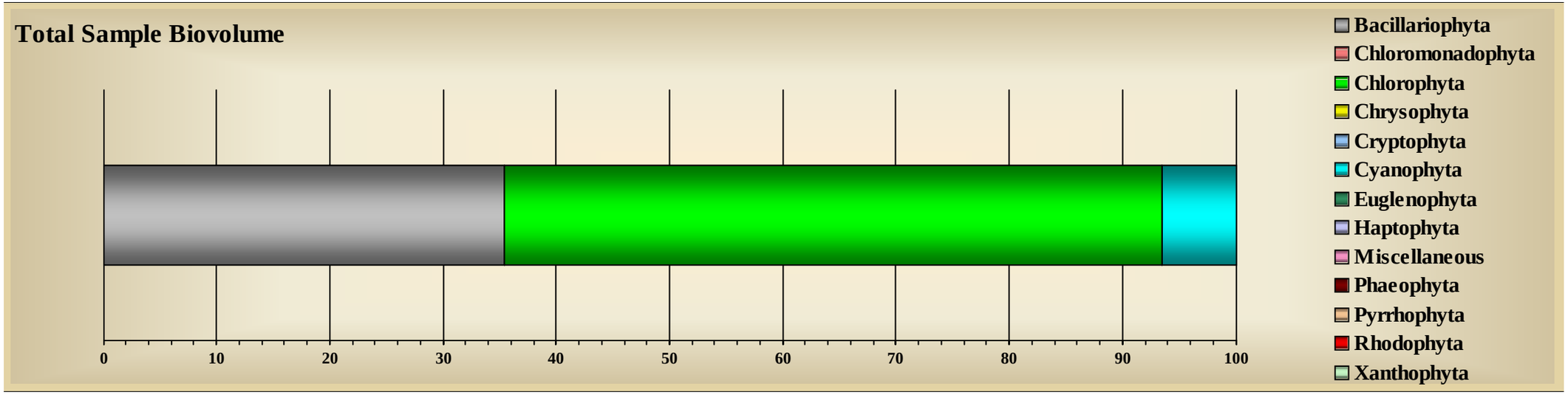
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	5.00	2,273.278	0.43	14,878.605	0.03
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	11.20	1,136.639	0.22	246,817.650	0.56
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	4.80	1,136.639	0.22	2,437.750	0.01
4069	*Aphanothece*	*stagnina*	.	.	.	.	Vegetative	8.00	568.320	0.11	24,377.043	0.05
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	640.00	5.766	0.00	185,489.631	0.42
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	8.00	568.320	0.11	19,501.657	0.04
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	9.40	3,409.917	0.65	665,493.421	1.50
4150	*Lyngbya*	*spp*	.	.	.	.	Vegetative	304.00	568.320	0.11	699,316.617	1.58
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	76.80	7,388.154	1.41	602,732.247	1.36
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	12.80	15,344.627	2.92	55,533.741	0.13
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	17.60	1,704.959	0.32	23,567.643	0.05
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	69,903.303	13.32	187,396.774	0.42
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	230,169.411	43.86	92,551.120	0.21

4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	102,297.516	19.49	27,425.964	0.06
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.87	13,639.669	2.60	47,839.774	0.11
Summary for Division ~ Cyanophyta (15 detail records)						**Sum Total**	**Cyanophyta**		450,114.836	85.77	2,895,359.637	6.52

Total Richness ~ 38 Taxa	Total Sample Concentration	Total Sample Biovolume
	524,789.566	44,400,683.430
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060087-222-CJ	**Sample ID:**	WCKD-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Near Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.76	297,786.519	33.92	21,434,733.193	6.07
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	20.00	1,872.871	0.21	169,453.452	0.05
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	21.60	16,855.841	1.92	5,856,309.013	1.66
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	24.00	1,872.871	0.21	536,989.627	0.15
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	48.00	3,745.742	0.43	5,523,321.880	1.56
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	20.80	3,745.742	0.43	332,422.275	0.09
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.16	44,948.909	5.12	2,669,605.575	0.76
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	24.00	1,872.871	0.21	863,019.044	0.24
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	48.00	3,745.742	0.43	17,593,027.893	4.98
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	10.80	11,237.227	1.28	1,457,298.677	0.41
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	25.60	28,093.068	3.20	9,226,092.164	2.61
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	26.40	7,491.485	0.85	2,102,728.670	0.60
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	46.56	37,457.424	4.27	61,166,954.176	17.31
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	46.93	11,237.227	1.28	6,029,626.385	1.71
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	130.00	28,093.068	3.20	191,734,064.203	54.27
Summary for Division ~ Bacillariophyta (15 detail records)							**Sum Total Bacillariophyta**		500,056.607	56.96	326,695,646.225	92.47

Division: Chlorophyta

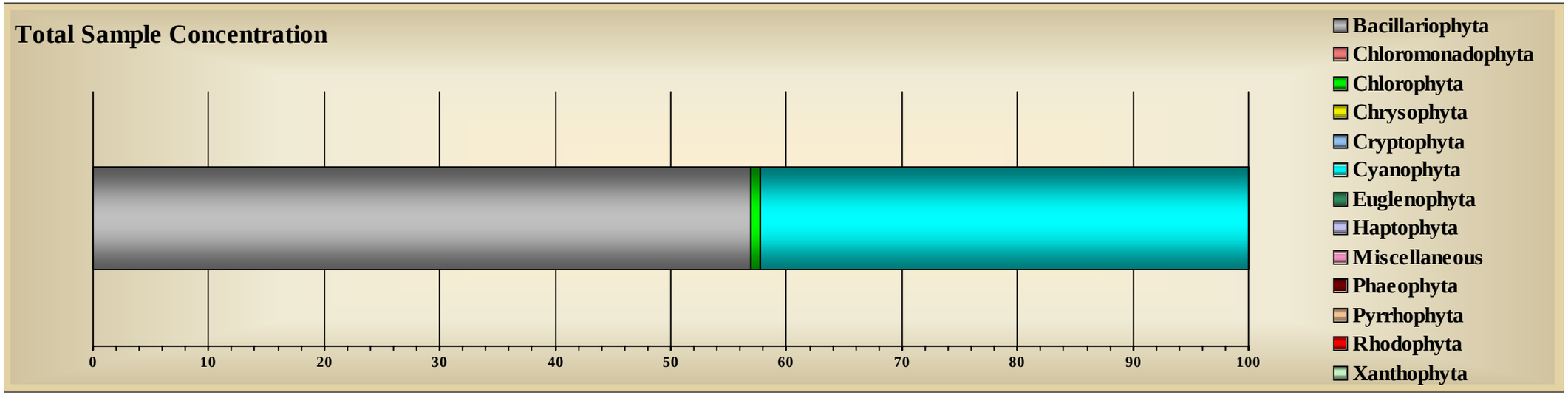
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	5.87	5,618.614	0.64	622,584.523	0.18
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	225.00	342.025	0.04	5,189,848.033	1.47
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	465.60	20.268	0.00	1,667,144.266	0.47
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	40.80	228.017	0.03	860,986.953	0.24
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	8.00	248.684	0.03	16,666.969	0.00
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	12.00	248.684	0.03	50,000.933	0.01
2884	*Scenedesmus*	*quadricauda*	.	.	.	.	Vegetative	40.00	248.684	0.03	104,168.620	0.03
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	748.00	30.402	0.00	6,650,646.399	1.88
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	232.00	12.668	0.00	279,317.640	0.08
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total Chlorophyta**		6,998.046	0.80	15,441,364.335	4.37

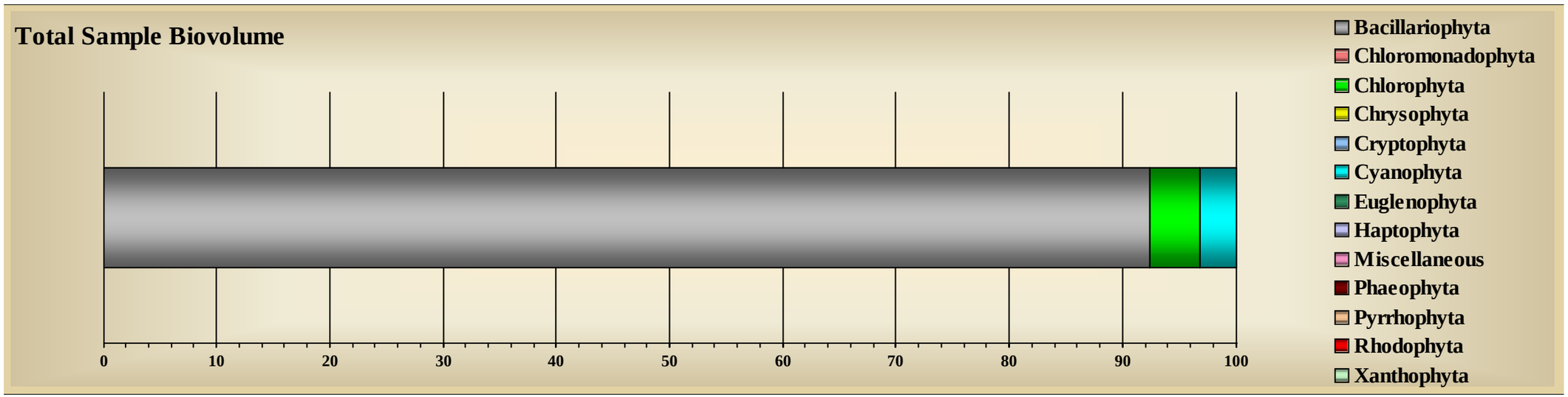
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	4.00	3,745.742	0.43	62,760.663	0.02
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	8.00	1,872.871	0.21	128,533.464	0.04
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	32.00	3,745.742	0.43	3,389.148	0.00
4252	*Oscillatoria*	*hamelii*	.	.	.	.	Vegetative	320.00	1,872.871	0.21	10,845,017.189	3.07
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	67,423.363	7.68	27,110.934	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	292,167.905	33.28	78,330.215	0.02
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total Cyanophyta**		370,828.495	42.24	11,145,141.613	3.15

Total Richness ~ 30 Taxa	Total Sample Concentration	Total Sample Biovolume
	877,883.149	353,282,152.173
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060088-222-CJ	**Sample ID:**	WCKD-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.24	268,530.979	20.29	17,900,839.000	4.99
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	2,131.198	0.16	462,783.093	0.13
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	282.986	0.02	362,221.507	0.10
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	60.80	12,787.190	0.97	93,587,768.622	26.10
1111	*Cymbella*	*delicatula*	.	.	.	.	Vegetative	24.00	4,262.397	0.32	523,763.282	0.15
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	33.60	4,262.397	0.32	1,710,960.054	0.48
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.07	70,329.542	5.31	2,848,691.075	0.79
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	30.00	282.986	0.02	353,165.970	0.10
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	58.67	848.957	0.06	11,948,500.488	3.33
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	15.80	8,524.793	0.64	1,240,087.145	0.35
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	12.80	4,262.397	0.32	411,362.607	0.11
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	40.80	4,262.397	0.32	6,145,900.493	1.71
1161	*Gomphonema*	*parvulum*	.	.	.	.	Vegetative	25.60	2,131.198	0.16	665,544.229	0.19
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	18.80	57,542.353	4.35	10,760,258.841	3.00
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	26.40	4,262.397	0.32	1,018,122.847	0.28
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	19.20	4,262.397	0.32	740,452.864	0.21
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	28.00	282.986	0.02	622,317.745	0.17

1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	52.00	8,524.793	0.64	2,133,244.199	0.60
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	45.26	42,623.965	3.22	26,568,514.773	7.41
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	49.40	8,524.793	0.64	4,933,195.409	1.38
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	141.76	31,967.974	2.42	156,248,407.486	43.58
Summary for Division ~ Bacillariophyta (21 detail records)							**Sum Total Bacillariophyta**		540,891.070	40.87	341,186,101.730	95.16

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	480.00	2.883	0.00	2,967,834.092	0.83
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.27	6,393.595	0.48	365,655.438	0.10
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	300.00	98.021	0.01	1,413,452.726	0.39
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	120.00	2.883	0.00	156,506.876	0.04
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	45.14	363.254	0.03	3,334,621.946	0.93
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	8.00	2,131.198	0.16	91,413.913	0.03
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	760.00	8.649	0.00	6,816,743.930	1.90
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	24.00	2.883	0.00	2,608.448	0.00
103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	280.00	14.415	0.00	456,478.388	0.13
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	220.00	5.766	0.00	478,215.455	0.13
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total Chlorophyta**		9,023.546	0.68	16,083,531.210	4.49

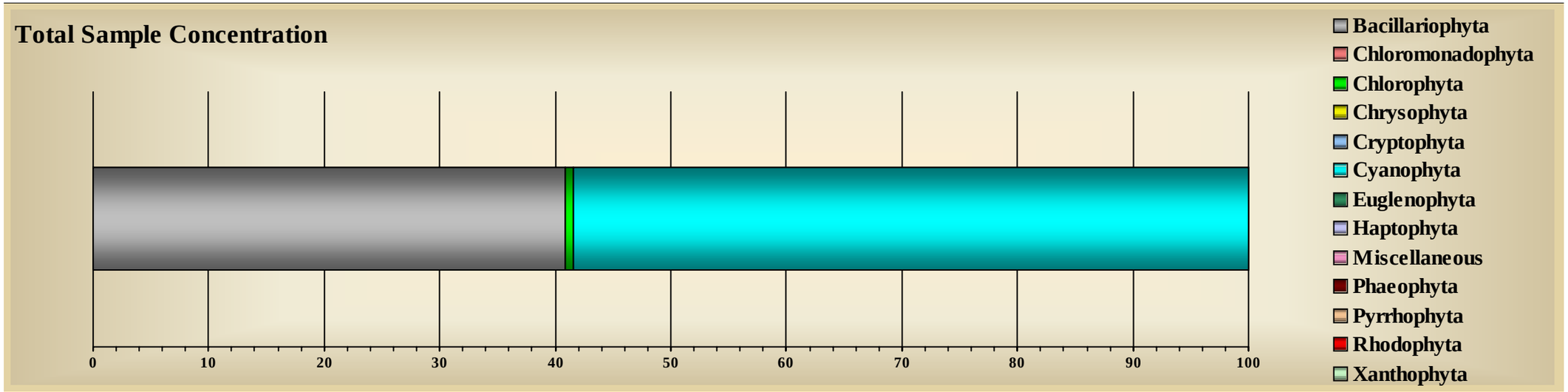
Division: Cyanophyta

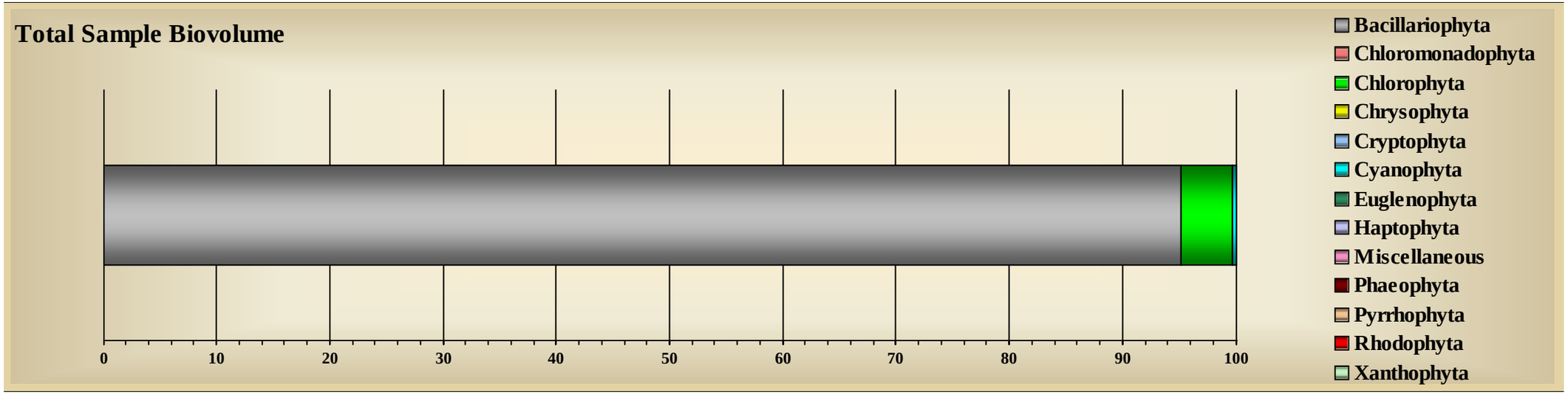
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	12.27	6,393.595	0.48	50,277.950	0.01
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	3.20	2,131.198	0.16	17,854.327	0.00
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	8.00	2,131.198	0.16	61,704.370	0.02
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	28.00	12,787.190	0.97	359,942.761	0.10
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	20.00	95,903.921	7.25	542,327.084	0.15

4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	4.80	2,131.198	0.16	8,034.404	0.00
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	6,393.595	0.48	17,139.949	0.00
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	102,297.516	7.73	41,133.831	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	537,061.959	40.58	143,986.311	0.04
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	6,393.595	0.48	13,712.343	0.00
Summary for Division ~ Cyanophyta (10 detail records)						**Sum Total Cyanophyta**			773,624.964	58.45	1,256,113.330	0.35

Total Richness ~ 41 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,323,539.581	358,525,746.270
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060089-222-CJ	**Sample ID:**	WCKD-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.44	371,990.967	23.26	26,537,984.389	5.53
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	19.20	3,099.925	0.19	478,676.737	0.10
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	3,099.925	0.19	673,139.045	0.14
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	68.00	3,099.925	0.19	12,951,237.511	2.70
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	25.60	3,099.925	0.19	507,891.667	0.11
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	80.00	308.712	0.02	7,409,076.287	1.54
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	17.60	37,199.097	2.33	2,234,724.575	0.47
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	26.00	308.712	0.02	342,463.960	0.07
1109	*Diatoma*	*tenuis*	.	.	.	.	Vegetative	44.00	3,099.925	0.19	1,714,011.309	0.36
4272	*Diatoma*	*vulgaris*	.	.	.	distorta	Vegetative	19.20	3,099.925	0.19	1,077,022.347	0.22
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	36.00	308.712	0.02	1,256,920.187	0.26
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	17.60	3,099.925	0.19	438,786.905	0.09
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	12.00	9,299.774	0.58	1,664,149.020	0.35
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	50.00	308.712	0.02	1,223,981.841	0.25
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	21.37	37,199.097	2.33	9,144,404.710	1.90
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	28.00	308.712	0.02	361,438.296	0.08
1210	*Navicula*	*spp*	.	.	.	.	Vegetative	12.00	308.712	0.02	23,276.292	0.00

1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.60	3,099.925	0.19	718,014.795	0.15
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	33.60	3,099.925	0.19	654,440.609	0.14
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	44.00	12,399.699	0.78	4,475,795.316	0.93
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	47.66	49,598.796	3.10	36,161,886.696	7.53
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	44.27	30,999.247	1.94	19,952,383.405	4.15
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	153.52	43,398.946	2.71	338,951,185.713	70.58
Summary for Division ~ Bacillariophyta (23 detail records)							**Sum Total Bacillariophyta**		621,837.214	38.89	468,952,891.612	97.65

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	3.145	0.00	284,557.956	0.06
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.16	27,899.323	1.74	1,510,823.643	0.31
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	391.00	150.963	0.01	2,867,395.675	0.60
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	370.67	22.015	0.00	346,739.140	0.07
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	42.67	339.666	0.02	2,016,206.868	0.42
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	14.00	308.712	0.02	72,415.169	0.02
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	333.33	15.725	0.00	1,528,181.618	0.32
103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	384.00	9.435	0.00	371,506.221	0.08
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total Chlorophyta**		28,748.984	1.80	8,997,826.290	1.87

Division: Cryptophyta

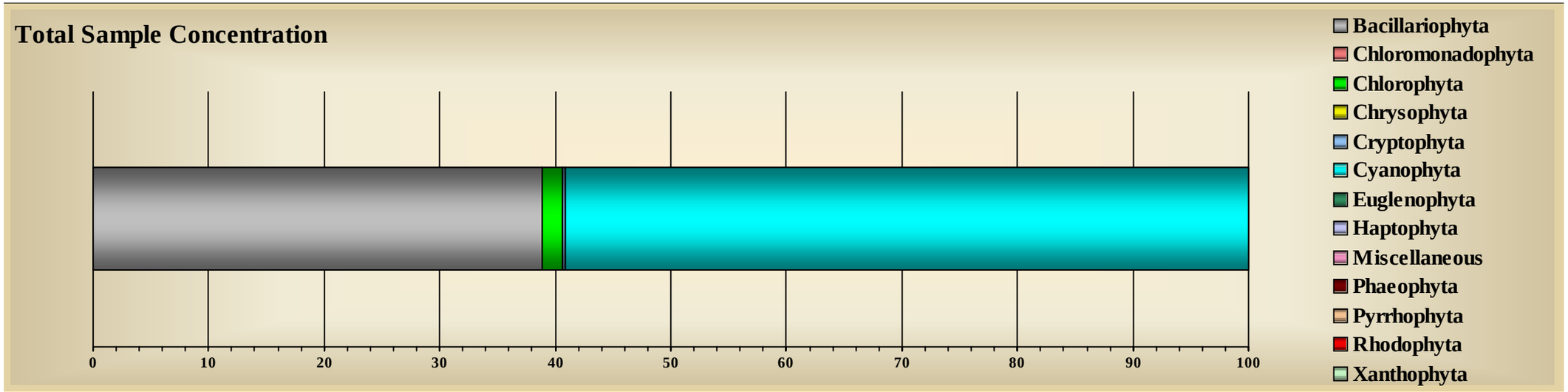
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
3040	*Rhodomonas*	*spp*	.	.	.	.	Vegetative	9.60	3,099.925	0.19	53,186.339	0.01
Summary for Division ~ Cryptophyta (1 detail record)							**Sum Total Cryptophyta**		3,099.925	0.19	53,186.339	0.01

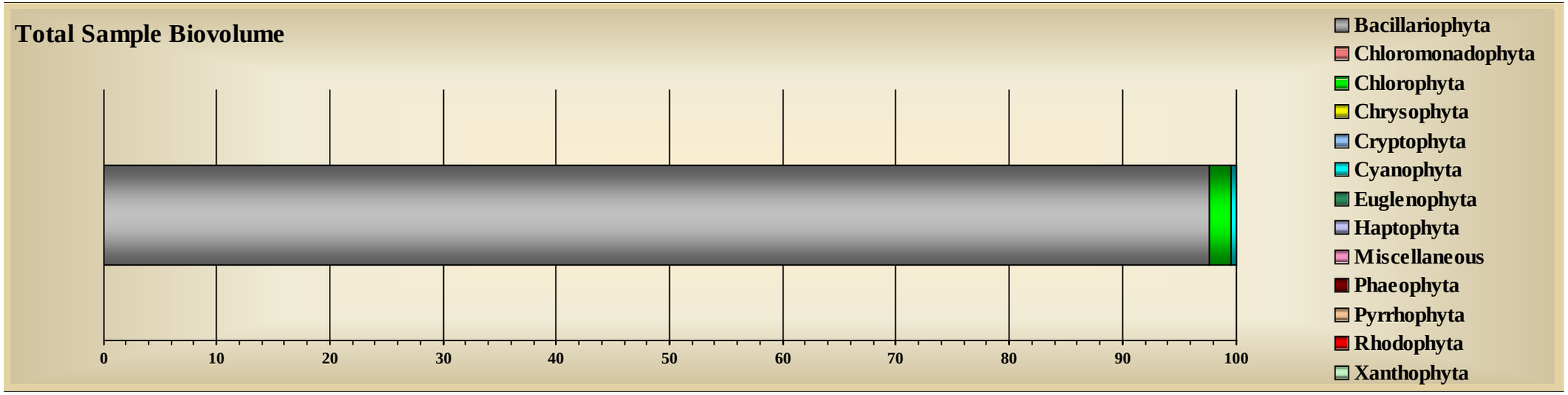
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	4.00	9,299.774	0.58	48,693.618	0.01
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.00	3,099.925	0.19	7,479.188	0.00
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	400.00	3.145	0.00	142,278.978	0.03
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	12.00	3,099.925	0.19	67,313.935	0.01
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	11.20	3,099.925	0.19	425,490.398	0.09
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	52.00	6,199.850	0.39	287,798.252	0.06
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	20.00	167,395.935	10.47	946,607.274	0.20
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.27	27,899.323	1.74	84,766.512	0.02
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	334,791.870	20.94	134,619.811	0.03
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	390,590.516	24.42	104,717.317	0.02
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		945,480.187	59.12	2,249,765.283	0.47

Total Richness ~ 42 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,599,166.309	480,253,669.524
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060090-222-CJ	**Sample ID:**	WCKD-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.09	241,096.646	29.46	22,034,256.411	16.22
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	1,317.468	0.16	286,084.094	0.21
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	218.671	0.03	263,798.067	0.19
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	28.00	218.671	0.03	163,274.096	0.12
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	32.00	218.671	0.03	330,280.156	0.24
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	50.00	1,749.365	0.21	4,273,116.204	3.15
1111	*Cymbella*	*delicatula*	.	.	.	.	Vegetative	20.80	3,952.404	0.48	350,762.814	0.26
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	23.47	5,269.872	0.64	877,806.274	0.65
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.00	23,714.424	2.90	793,264.088	0.58
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.80	2,634.936	0.32	982,135.511	0.72
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	42.00	874.683	0.11	9,364,831.251	6.89
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	11.20	1,317.468	0.16	237,343.838	0.17
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	16.00	1,317.468	0.16	169,531.256	0.12
1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	42.00	218.671	0.03	232,484.932	0.17
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	20.00	218.671	0.03	113,239.145	0.08
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	18.60	17,127.084	2.09	2,819,825.393	2.08
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	24.80	2,634.936	0.32	987,519.740	0.73

9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	14.40	1,317.468	0.16	119,201.739	0.09
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	70.00	437.341	0.05	2,034,817.338	1.50
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	40.00	1,317.468	0.16	847,656.545	0.62
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	32.00	1,317.468	0.16	1,271,484.818	0.94
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	2,634.936	0.32	279,726.652	0.21
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	56.00	2,634.936	0.32	849,924.962	0.63
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	34.74	17,127.084	2.09	17,910,192.628	13.19
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	55.60	9,222.276	1.13	7,060,673.229	5.20
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	134.00	15,809.616	1.93	54,395,197.545	40.05
Summary for Division ~ Bacillariophyta (26 detail records)							**Sum Total**	**Bacillariophyta**	355,918.701	43.49	129,048,428.726	95.00

Division: Chlorophyta

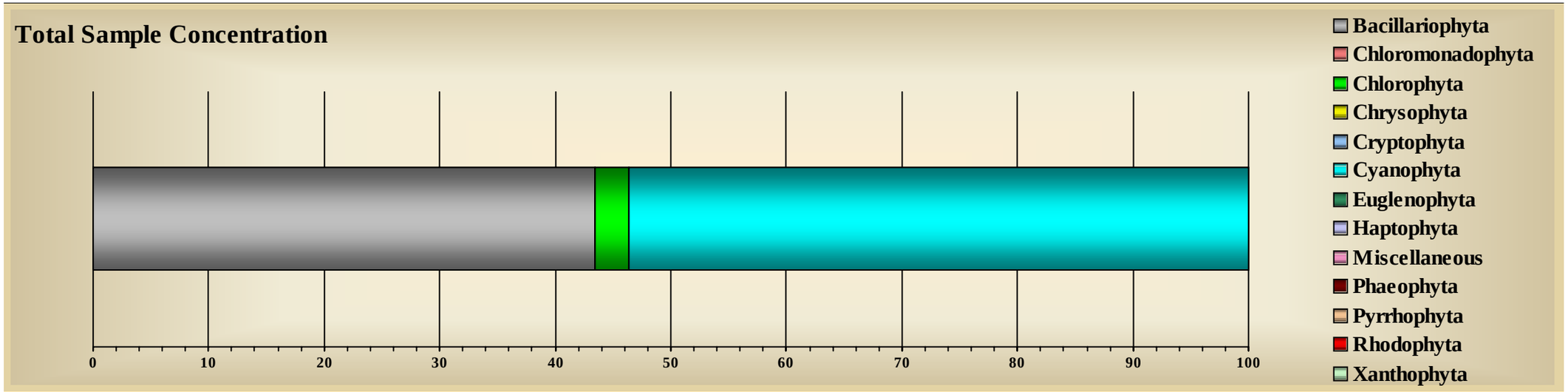
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.36	22,396.956	2.74	489,944.614	0.36
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	194.00	147.031	0.02	1,393,128.560	1.03
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	320.00	6.683	0.00	786,091.355	0.58
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	42.00	340.845	0.04	1,914,142.670	1.41
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	8.00	656.012	0.08	43,966.315	0.03
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	160.00	6.683	0.00	214,999.345	0.16
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	96.00	2.228	0.00	27,994.706	0.02
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	346.67	13.367	0.00	649,477.188	0.48
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	480.00	2.228	0.00	859,997.379	0.63
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	200.00	2.228	0.00	22,395.765	0.02
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total**	**Chlorophyta**	23,574.261	2.88	6,402,137.898	4.71

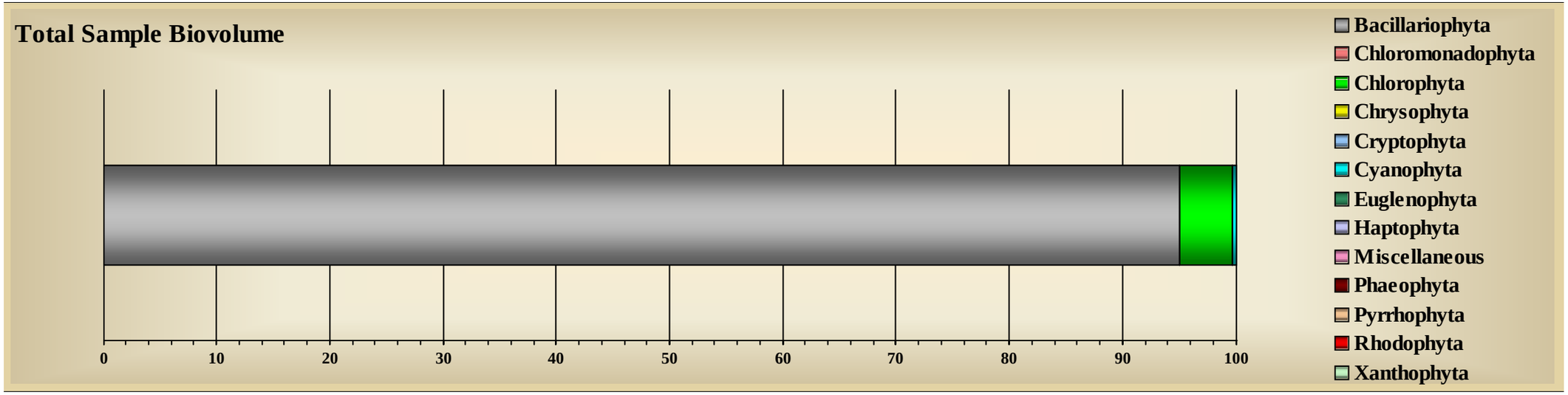
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	3.60	2,634.936	0.32	5,518.610	0.00
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	40.00	218.671	0.03	6,869.735	0.01
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	28.00	5,269.872	0.64	133,505.884	0.10
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	29.60	11,857.212	1.45	99,235.379	0.07
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.27	3,952.404	0.48	16,776.374	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	79,048.081	9.66	31,785.233	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	335,954.342	41.05	90,069.359	0.07
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total Cyanophyta**		438,935.518	53.63	383,760.575	0.28

Total Richness ~ 43 Taxa	Total Sample Concentration	Total Sample Biovolume
	818,428.479	135,834,327.199
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060091-222-CJ	**Sample ID:**	WCKD-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.04	308,132.518	27.11	24,062,838.642	7.60
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	4.80	3,668.244	0.32	144,558.537	0.05
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	24.00	1,834.122	0.16	2,677,285.680	0.85
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	28.00	1,834.122	0.16	1,446,168.617	0.46
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	51.73	5,502.366	0.48	18,934,166.018	5.98
1111	*Cymbella*	*delicatula*	.	.	.	.	Vegetative	16.00	1,834.122	0.16	125,209.465	0.04
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.80	9,170.611	0.81	1,615,201.312	0.51
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	84.00	304.424	0.03	4,364,220.343	1.38
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.00	55,023.664	4.84	2,804,688.205	0.89
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	22.40	3,668.244	0.32	525,879.497	0.17
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	51.67	1,826.543	0.16	21,759,938.885	6.87
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	144.00	304.424	0.03	3,305,234.545	1.04
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	9.60	1,834.122	0.16	318,619.111	0.10
1160	*Gomphonema*	*spp*	.	.	.	.	Vegetative	48.00	2,739.815	0.24	3,388,511.820	1.07
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	20.16	49,521.298	4.36	12,692,957.277	4.01
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	36.00	1,217.695	0.11	1,750,392.095	0.55
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.60	1,834.122	0.16	424,825.420	0.13

1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	36.80	1,834.122	0.16	678,540.818	0.21
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	49.10	22,009.466	1.94	24,211,116.412	7.65
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	59.31	20,175.343	1.78	17,514,134.925	5.53
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	136.98	25,677.710	2.26	153,267,579.389	48.40
Summary for Division ~ Bacillariophyta (21 detail records)							**Sum Total Bacillariophyta**		519,947.097	45.75	296,012,067.012	93.47

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	392.00	6.203	0.00	2,494,273.444	0.79
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.09	18,341.221	1.61	322,412.993	0.10
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	232.80	279.124	0.02	3,532,826.554	1.12
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	261.00	37.217	0.00	1,222,505.772	0.39
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	12.00	304.424	0.03	122,416.107	0.04
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	44.80	641.985	0.06	4,348,173.943	1.37
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	12.00	304.424	0.03	34,429.516	0.01
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,109.33	12.406	0.00	6,478,459.558	2.05
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	488.00	15.507	0.00	731,133.903	0.23
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	240.00	3.101	0.00	336,726.915	0.11
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total Chlorophyta**		19,945.610	1.75	19,623,358.704	6.20

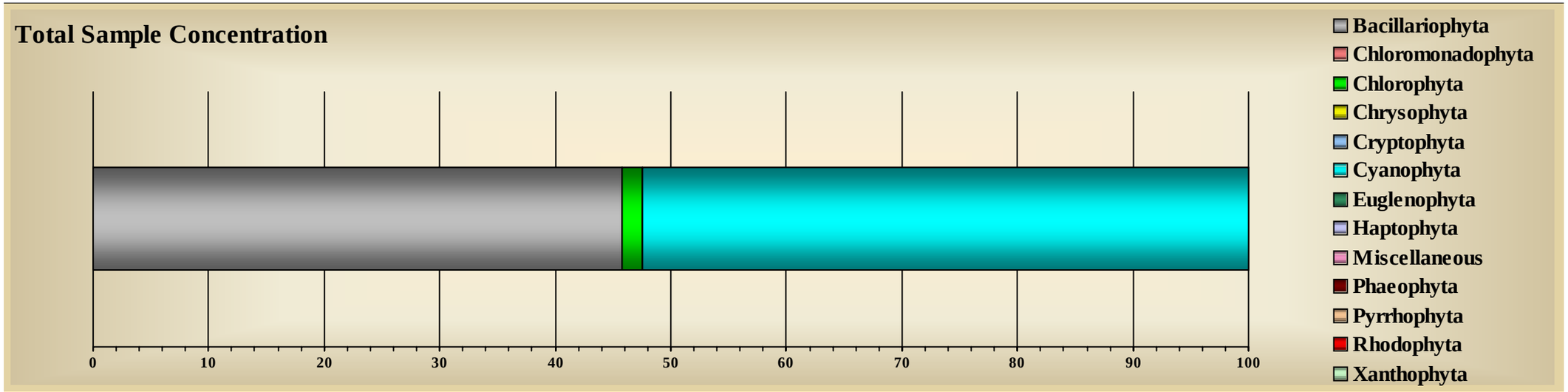
Division: Cyanophyta

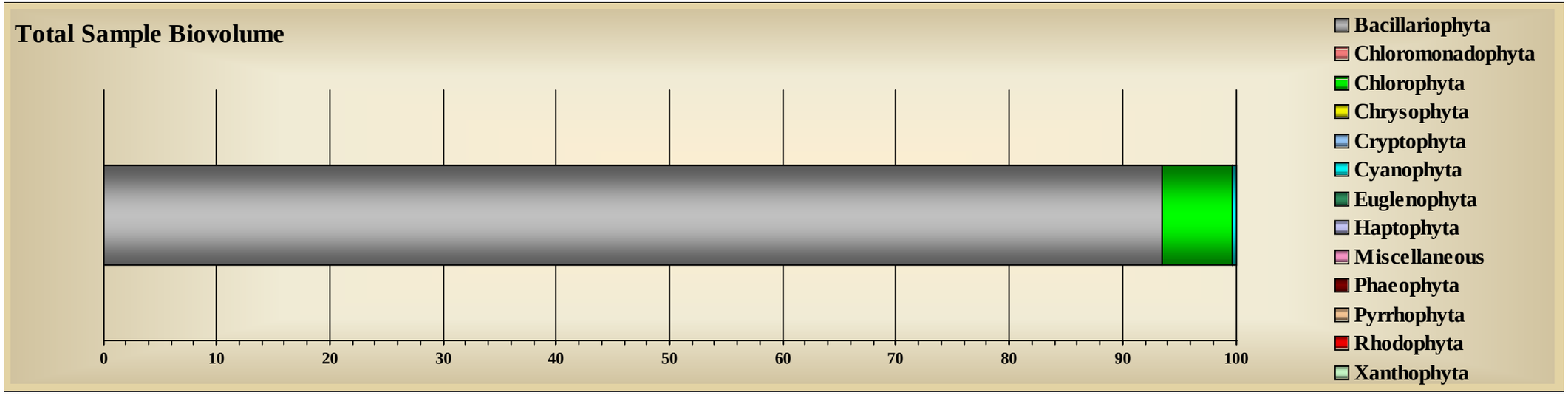
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	8.00	1,834.122	0.16	15,365.542	0.00
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	4.00	3,668.244	0.32	26,551.486	0.01
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	32.00	1,834.122	0.16	53,103.155	0.02
4168	*Merismopedia*	*punctata*	.	.	.	.	Vegetative	24.00	608.848	0.05	130,067.100	0.04
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	32.00	66,028.397	5.81	597,411.727	0.19

4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	27,511.832	2.42	73,753.719	0.02
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	82,535.496	7.26	33,187.523	0.01
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	412,677.479	36.31	110,638.832	0.03
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		596,698.540	52.50	1,040,079.083	0.33

Total Richness ~ 39 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,136,591.247	316,675,504.799
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060092-222-CJ	**Sample ID:**	WCKD-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.44	259,102.042	27.42	18,160,513.921	7.84
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	22.80	2,927.707	0.31	503,590.435	0.22
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	27.20	1,463.853	0.15	2,882,032.119	1.24
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	33.60	1,463.853	0.15	1,045,092.916	0.45
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	40.00	1,463.853	0.15	1,648,884.405	0.71
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	23.47	5,855.413	0.62	779,472.628	0.34
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	17.60	4,391.560	0.46	197,866.129	0.09
109032	*Cymbella*	*turgidula*	.	.	.	.	Vegetative	58.00	583.122	0.06	5,498,838.054	2.37
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	41.60	4,391.560	0.46	44,279,457.280	19.12
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	18.40	8,783.120	0.93	2,352,246.906	1.02
1160	*Gomphonema*	*spp*	.	.	.	.	Vegetative	40.00	1,463.853	0.15	970,316.799	0.42
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	22.20	21,957.800	2.32	5,146,359.408	2.22
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	25.60	1,463.853	0.15	358,284.107	0.15
9223	*Navicula*	*viridula*	.	linearis	.	.	Vegetative	56.00	291.561	0.03	1,256,704.653	0.54
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	60.00	4,391.560	0.46	3,844,898.636	1.66
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	38.13	14,638.533	1.55	22,582,221.423	9.75
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	56.27	16,102.387	1.70	10,995,310.306	4.75

1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	133.14	19,030.094	2.01	93,543,674.660	40.39

Summary for Division ~ Bacillariophyta (18 detail records) **Sum Total Bacillariophyta** 369,765.725 39.13 216,045,764.785 93.29

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	192.00	2.970	0.00	114,666.317	0.05
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.16	10,246.973	1.08	429,636.125	0.19
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	18.00	583.122	0.06	300,436.685	0.13
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	369.60	124.754	0.01	4,180,124.760	1.80
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	296.00	32.674	0.00	1,085,245.452	0.47
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	20.00	1,463.853	0.15	981,083.879	0.42
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	49.60	356.440	0.04	4,109,675.809	1.77
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	16.00	291.561	0.03	58,621.783	0.03
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	608.00	14.852	0.00	2,796,484.533	1.21
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	216.00	2.970	0.00	32,249.902	0.01

Summary for Division ~ Chlorophyta (10 detail records) **Sum Total Chlorophyta** 13,120.169 1.39 14,088,225.245 6.08

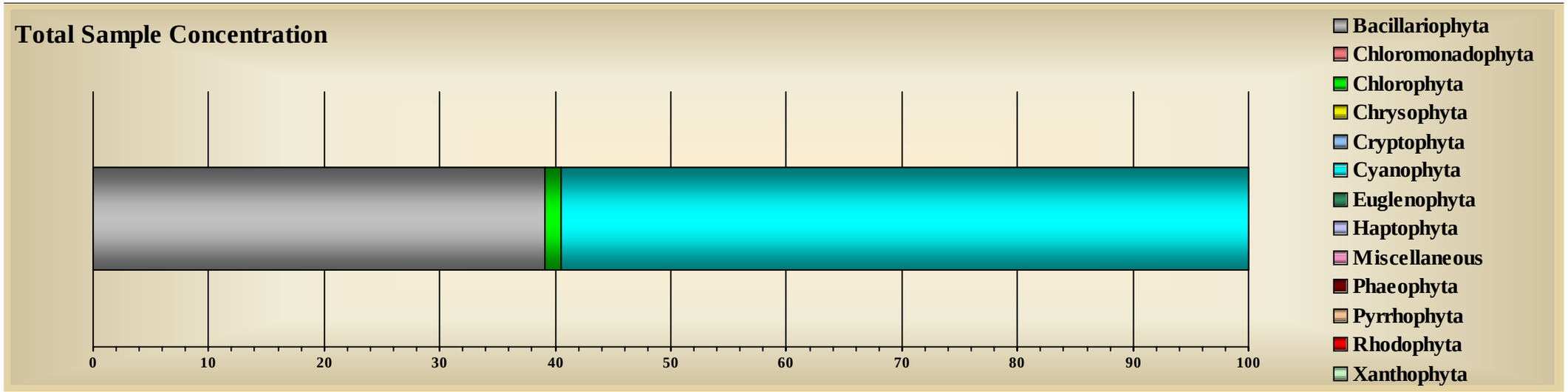
Division: Cyanophyta

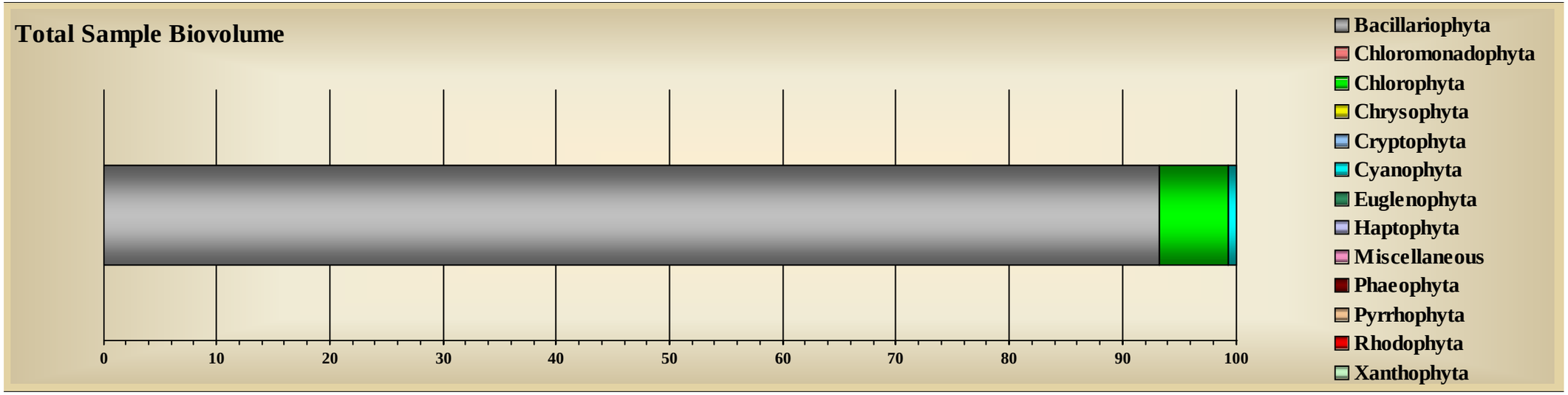
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	3.20	1,463.853	0.15	4,598.842	0.00
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	16.00	1,463.853	0.15	113,020.896	0.05
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	6.00	2,927.707	0.31	7,848.596	0.00
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	24.00	1,463.853	0.15	803,703.939	0.35
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	19.20	5,855.413	0.62	104,092.855	0.04
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	35,132.480	3.72	238,401.984	0.10
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	8,783.120	0.93	23,545.788	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	105,397.441	11.15	42,380.311	0.02

4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	4,391.560	0.46	9,418.579	0.00
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	395,240.403	41.82	105,963.952	0.05
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		562,119.684	59.48	1,452,975.741	0.63

Total Richness ~ 38 Taxa	Total Sample Concentration	Total Sample Biovolume
	945,005.577	231,586,965.770
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060093-222-CJ	**Sample ID:**	WCKD-1	**Replicate:**	.
Customer ID:	222	**Sample Date:**	10/25/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WCKD	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West CKD Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	11.20	3,874.906	0.44	392,664.365	0.63
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	1,291.635	0.15	101,801.916	0.16
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	28.00	257.260	0.03	101,833.818	0.16
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	25.60	1,291.635	0.15	2,962,701.391	4.76
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	80.00	257.260	0.03	1,734,272.663	2.79
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	22.93	23,249.435	2.66	6,134,907.579	9.86
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.47	42,623.965	4.88	2,114,451.293	3.40
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	33.60	1,291.635	0.15	8,725,875.813	14.02
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	9.60	1,291.635	0.15	99,724.320	0.16
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	28.80	2,583.271	0.30	1,277,095.106	2.05
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	32.00	257.260	0.03	465,526.001	0.75
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	11.20	1,291.635	0.15	130,888.122	0.21
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	42.67	5,166.541	0.59	1,578,343.724	2.54
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	48.00	2,583.271	0.30	568,732.856	0.91
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	140.00	514.519	0.06	2,593,176.700	4.17
Summary for Division ~ Bacillariophyta (15 detail records)							**Sum Total Bacillariophyta**		87,825.863	10.06	28,981,995.666	46.56

☑ = Identification is Uncertain
✱ = Family Level Identification

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.31	18,082.894	2.07	369,118.887	0.59
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.80	1,291.635	0.15	29,516.708	0.05
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	384.80	228.017	0.03	6,344,437.003	10.19
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	769.60	26.209	0.00	4,097,107.610	6.58
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	52.00	542.522	0.06	4,002,238.777	6.43
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	17.00	514.519	0.06	94,290.580	0.15
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	614.40	62.901	0.01	7,780,446.874	12.50
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	600.00	7.863	0.00	818,104.124	1.31
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total Chlorophyta**		20,756.560	2.38	23,535,260.563	37.81

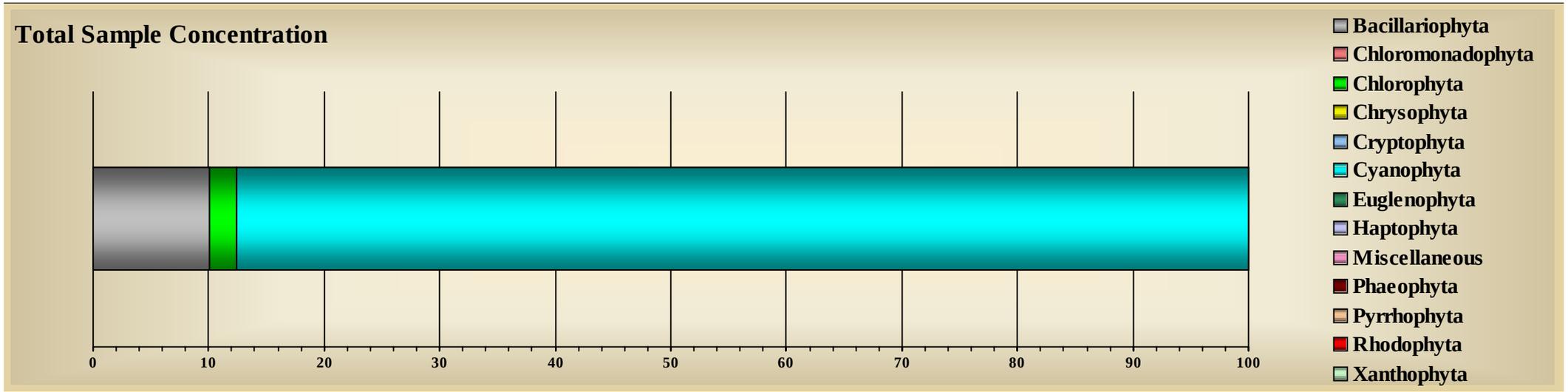
Division: Cyanophyta

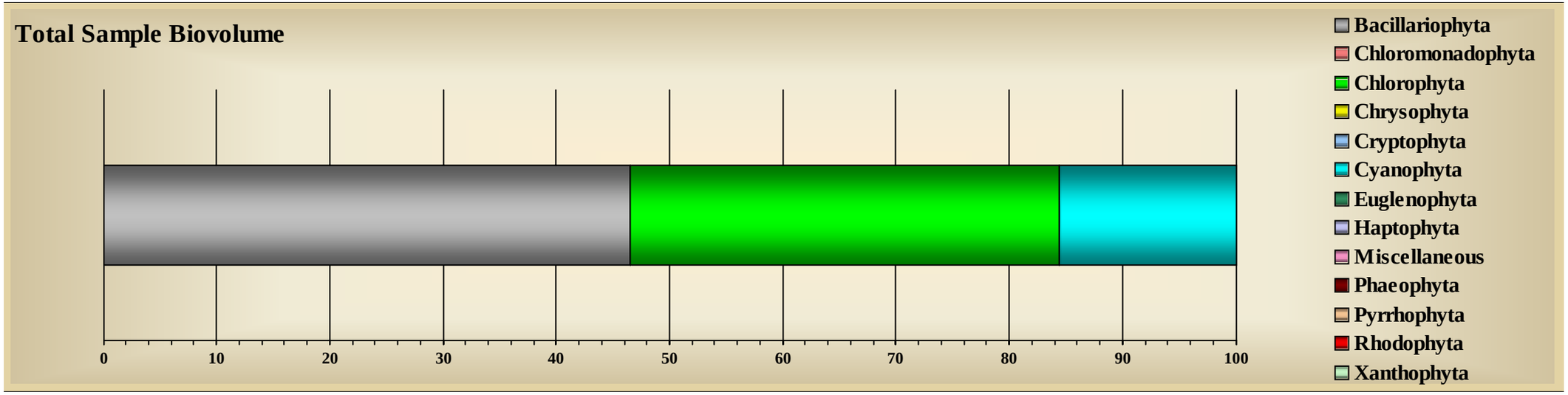
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	8.00	7,749.812	0.89	83,860.714	0.13
4051	*Aphanocapsa*	*elachista*	.	.	.	.	Vegetative	16.00	1,291.635	0.15	55,402.371	0.09
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	44.00	2,583.271	0.30	1,533,261.002	2.46
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.00	2,583.271	0.30	41,551.908	0.07
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	304.00	13.104	0.00	160,722.549	0.26
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	12.00	3,874.906	0.44	324,623.342	0.52
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	14.40	2,583.271	0.30	709,150.663	1.14
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	60.80	89,122.836	10.21	5,805,826.932	9.33
4170	*Oscillatoria*	*spp*	.	.	.	.	Vegetative	64.00	1,291.635	0.15	373,966.136	0.60
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	19.20	27,124.341	3.11	147,249.912	0.24
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	4.80	2,583.271	0.30	6,232.657	0.01
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.20	69,748.306	7.99	237,234.914	0.38

4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	116,247.177	13.31	46,742.990	0.08
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	395,240.403	45.26	105,963.952	0.17
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	42,623.965	4.88	91,415.618	0.15
Summary for Division ~ Cyanophyta (15 detail records)						**Sum Total Cyanophyta**			764,661.203	87.57	9,723,205.660	15.62

Total Richness ~ 38 Taxa	Total Sample Concentration	Total Sample Biovolume
	873,243.627	62,240,461.889
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060094-222-CJ	**Sample ID:**	WREF-NS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde

Report Notes: West Reference
Near Shore
Replicate 1
Jar# 1 of 1

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	14.08	118,717.430	21.21	10,873,780.516	9.13
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	52.00	1,840.580	0.33	7,111,805.912	5.97
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.00	8,282.611	1.48	339,255.762	0.28
1115	*Cymbella*	*minuta*	.	.	.	.	Vegetative	14.40	920.290	0.16	178,674.701	0.15
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	32.00	920.290	0.16	5,921,130.095	4.97
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	19.20	5,521.741	0.99	1,135,968.985	0.95
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	32.00	1,840.580	0.33	947,380.734	0.80
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	25.60	14,724.642	2.63	4,762,626.701	4.00
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	25.60	920.290	0.16	290,135.367	0.24
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	58.67	3,681.161	0.66	1,947,579.497	1.64
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	47.52	13,804.352	2.47	15,626,968.537	13.12
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	57.24	12,884.062	2.30	9,865,640.753	8.29
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	123.60	8,282.611	1.48	53,644,817.366	45.05
Summary for Division ~ Bacillariophyta (13 detail records)							**Sum Total Bacillariophyta**		192,340.642	34.36	112,645,764.927	94.60

☑ = Identification is Uncertain
✱ = Family Level Identification

Division: Chlorophyta

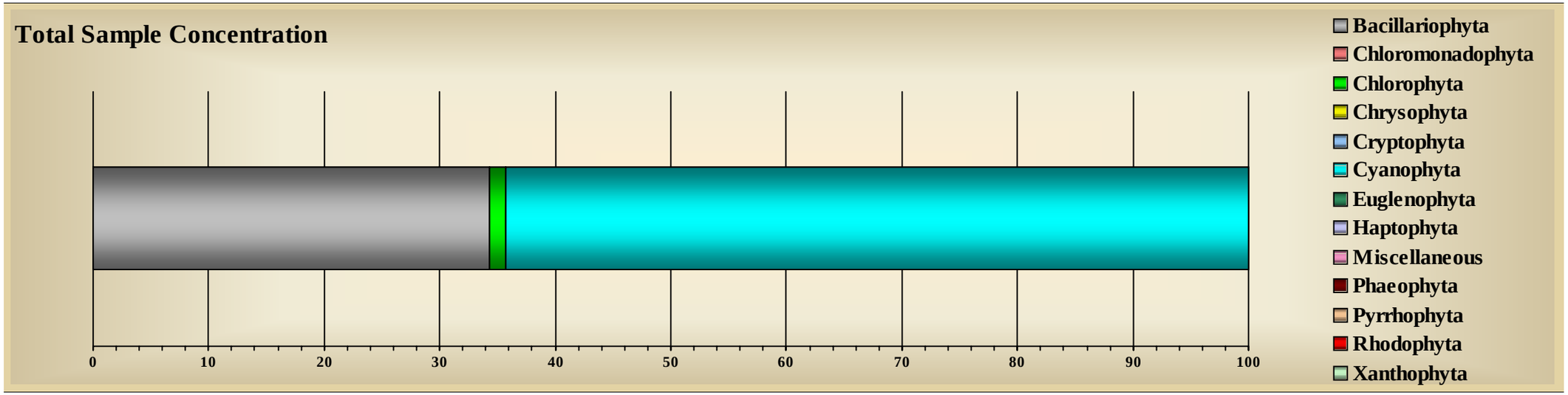
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	1.245	0.00	112,637.524	0.09
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.90	6,442.031	1.15	373,679.031	0.31
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	16.00	920.290	0.16	370,070.666	0.31
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	265.60	69.093	0.01	1,570,138.929	1.32
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	342.00	8.714	0.00	624,528.140	0.52
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	46.00	78.430	0.01	565,865.804	0.48
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	16.00	122.198	0.02	24,569.424	0.02
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	540.00	9.959	0.00	1,982,420.429	1.66
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	160.00	1.245	0.00	23,466.151	0.02
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	416.00	2.490	0.00	102,124.689	0.09
Summary for Division ~ Chlorophyta (10 detail records)							**Sum Total Chlorophyta**		7,655.696	1.37	5,749,500.786	4.83

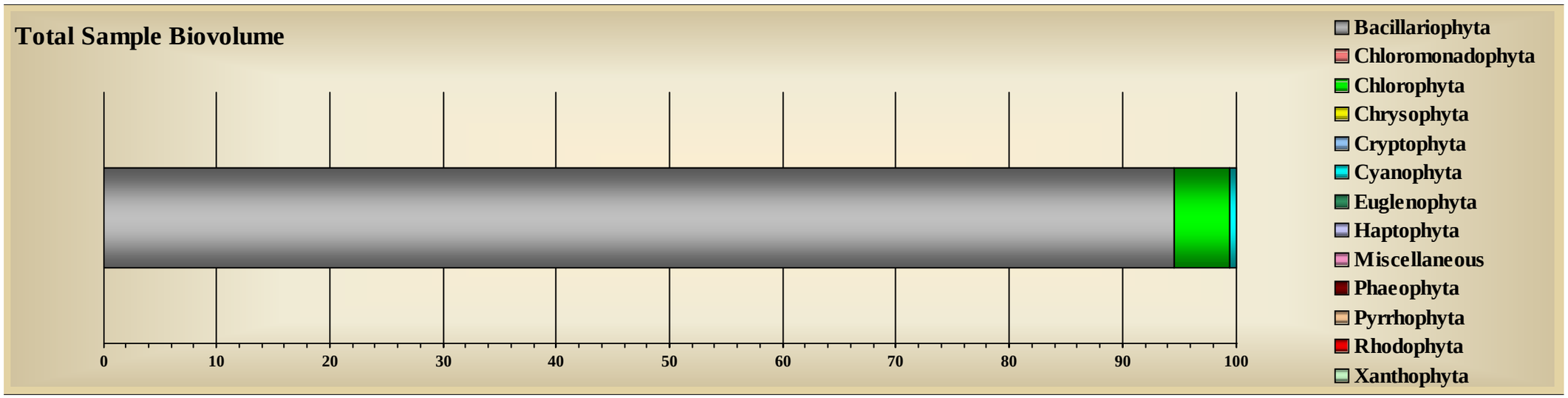
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	24.00	920.290	0.16	133,225.436	0.11
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	320.00	1.245	0.00	20,024.449	0.02
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	11.20	920.290	0.16	84,622.796	0.07
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	26.00	7,362.321	1.32	179,854.145	0.15
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	16,565.223	2.96	112,408.289	0.09
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	5,521.741	0.99	14,802.683	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	88,347.855	15.78	35,524.672	0.03
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	231,913.119	41.43	62,175.907	0.05
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	8,282.611	1.48	34,694.203	0.03
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		359,834.695	64.28	677,332.580	0.57

Total Richness ~ 32 Taxa	Total Sample Concentration	Total Sample Biovolume
	559,831.033	119,072,598.293
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060095-222-CJ	**Sample ID:**	WREF-NS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Near Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.75	569,611.168	58.25	52,036,942.209	22.11
1862	*Cymbella*	*affinis*	.	.	.	.	Vegetative	36.00	2,109.671	0.22	2,333,127.346	0.99
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	28.00	420.191	0.04	555,323.988	0.24
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	36.00	2,109.671	0.22	2,313,684.618	0.98
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	25.60	2,109.671	0.22	345,648.496	0.15
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	17.60	12,658.026	1.29	760,427.112	0.32
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	16.00	2,109.671	0.22	271,471.620	0.12
1161	*Gomphonema*	*parvulum*	.	.	.	.	Vegetative	30.00	210.095	0.02	166,390.526	0.07
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	20.80	16,877.368	1.73	3,287,024.368	1.40
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	12.80	2,109.671	0.22	244,324.584	0.10
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	42.80	6,329.013	0.65	1,139,019.808	0.48
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	44.00	6,329.013	0.65	17,887,309.650	7.60
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	37.33	25,316.052	2.59	15,683,800.490	6.67
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	168.00	18,987.039	1.94	136,397,679.642	57.97
Summary for Division ~ Bacillariophyta (14 detail records)							**Sum Total Bacillariophyta**		667,286.320	68.23	233,422,174.457	99.20

☑ = Identification is Uncertain
✱ = Family Level Identification

Division: Chlorophyta

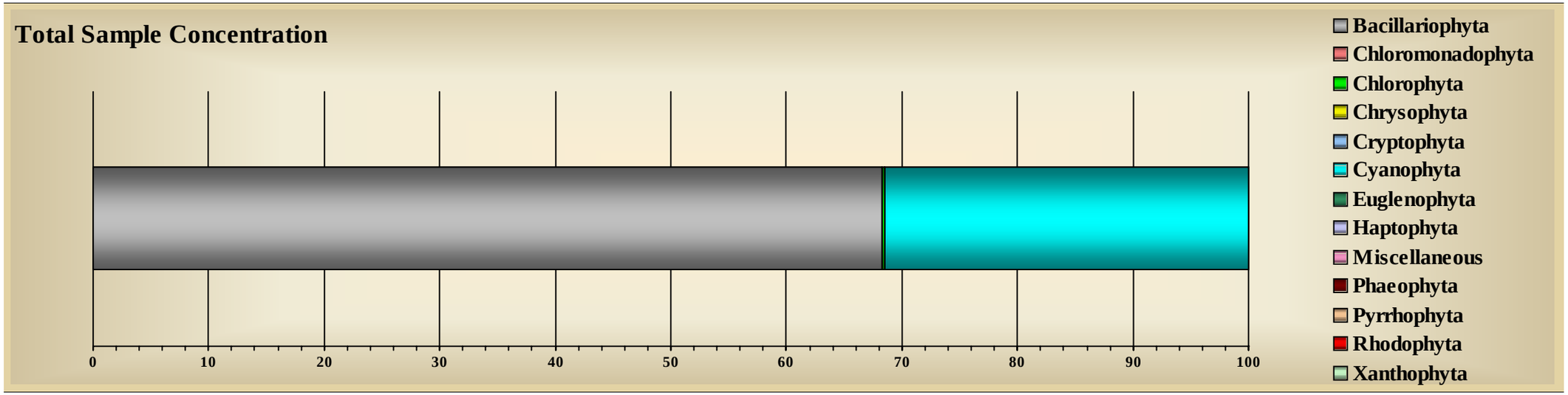
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	219.20	10.702	0.00	91,933.518	0.04
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	160.00	6.421	0.00	84,241.012	0.04
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	29.33	96.317	0.01	238,461.280	0.10
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	19.20	2,109.671	0.22	253,373.596	0.11
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	200.00	2.140	0.00	33,621.094	0.01
Summary for Division ~ Chlorophyta (5 detail records)							**Sum Total Chlorophyta**		2,225.252	0.23	701,630.499	0.30

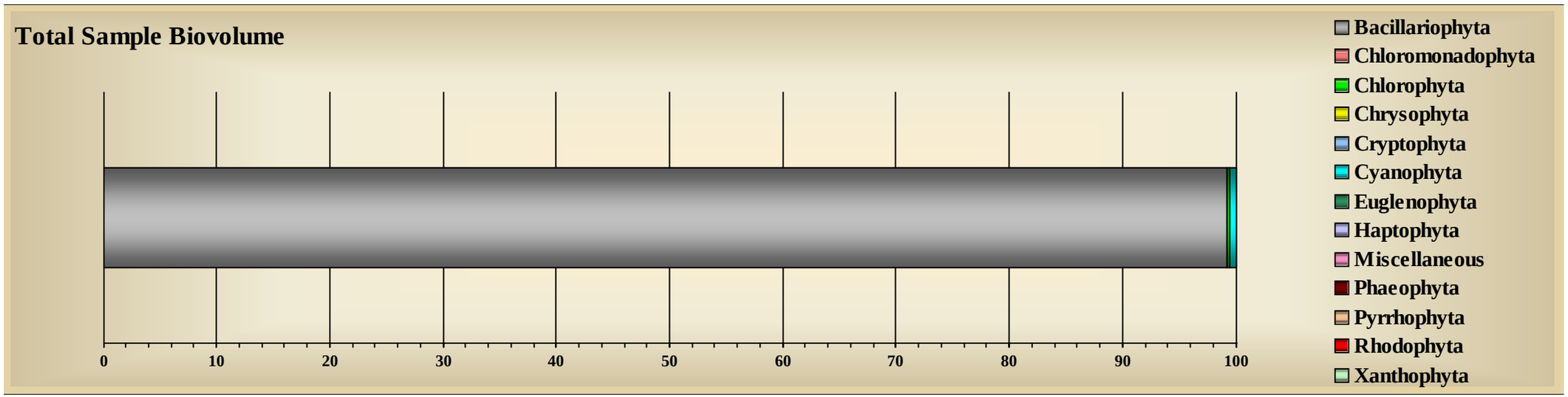
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	12.00	4,219.342	0.43	88,369.899	0.04
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	24.00	2,109.671	0.22	763,514.194	0.32
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	20.00	420.191	0.04	190,089.763	0.08
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	8,438.684	0.86	22,622.424	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	37,974.078	3.88	15,269.377	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	8,438.684	0.86	35,347.959	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	246,831.506	25.24	66,175.527	0.03
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total Cyanophyta**		308,432.156	31.54	1,181,389.142	0.50

Total Richness ~ 26 Taxa	Total Sample Concentration	Total Sample Biovolume
	977,943.728	235,305,194.099
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060096-222-CJ	**Sample ID:**	WREF-NS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-NS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Near Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.76	164,683.501	24.82	14,569,088.225	7.04
1098	*Cymbella*	*caespitosa*	.	.	.	.	Vegetative	25.60	914.908	0.14	449,695.747	0.22
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	53.60	2,744.725	0.41	7,164,215.368	3.46
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.40	10,978.900	1.65	712,017.900	0.34
4272	*Diatoma*	*vulgaris*	.	.	.	distorta	Vegetative	17.60	914.908	0.14	291,381.929	0.14
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	144.00	914.908	0.14	38,262,273.147	18.50
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	17.40	10,063.992	1.52	2,804,550.691	1.36
☑ 1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	36.00	728.902	0.11	377,197.184	0.18
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	40.00	364.451	0.05	824,368.942	0.40
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	22.00	12,808.717	1.93	2,654,709.016	1.28
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	40.00	546.677	0.08	549,579.270	0.27
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	32.00	914.908	0.14	176,595.150	0.09
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	56.27	3,659.633	0.55	1,824,390.540	0.88
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	44.80	7,319.267	1.10	5,585,863.808	2.70
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	50.51	9,149.083	1.38	6,309,124.651	3.05
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	149.09	17,383.258	2.62	119,837,529.298	57.94
Summary for Division ~ Bacillariophyta (16 detail records)							**Sum Total Bacillariophyta**		244,090.740	36.79	202,392,580.865	97.86

☑ = Identification is Uncertain

✱ = Family Level Identification

Division: Chlorophyta

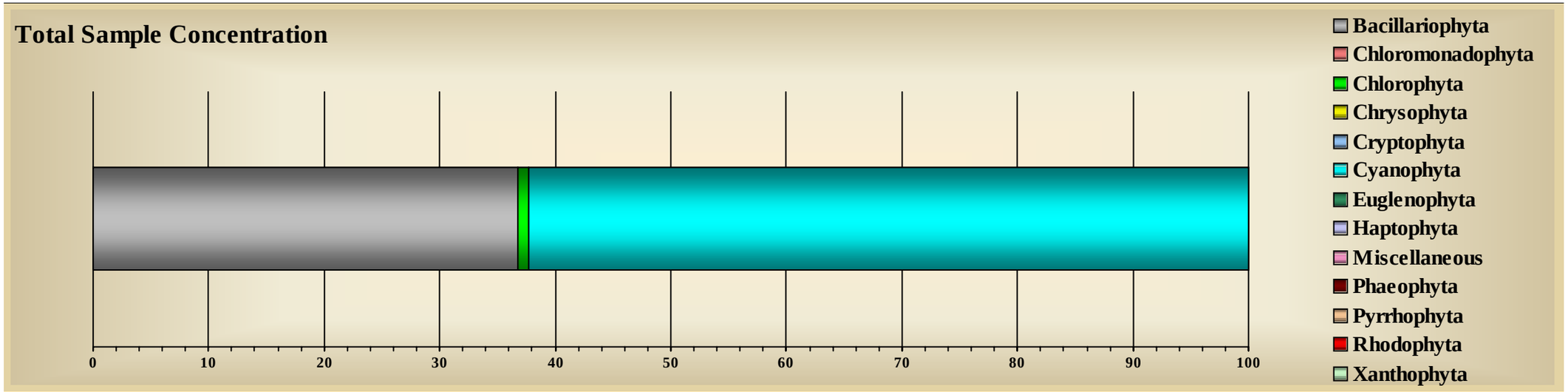
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.40	5,489.450	0.83	136,493.528	0.07
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	228.80	77.971	0.01	745,834.966	0.36
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	267.43	14.852	0.00	433,198.085	0.21
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	31.00	133.665	0.02	1,141,875.518	0.55
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	480.00	1.857	0.00	179,166.121	0.09
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	400.00	5.569	0.00	251,952.357	0.12
103705	*Ulothrix*	*zonata*	.	.	.	.	Vegetative	192.00	1.857	0.00	161,249.509	0.08
Summary for Division ~ Chlorophyta (7 detail records)							**Sum Total Chlorophyta**		5,725.220	0.86	3,049,770.083	1.47

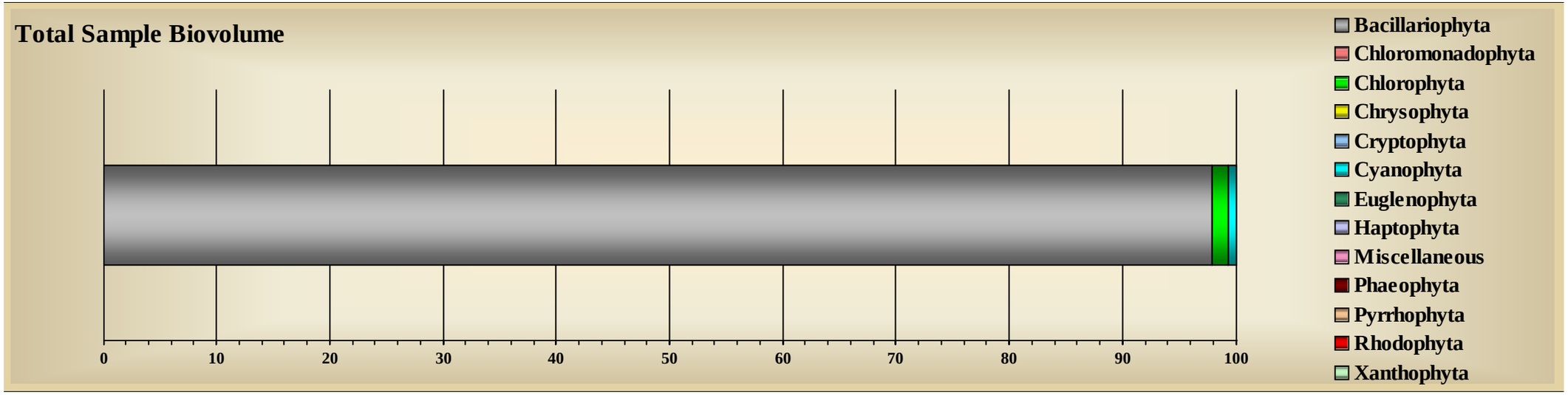
Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	80.00	182.226	0.03	114,495.681	0.06
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	6.40	1,829.817	0.28	9,810.928	0.00
4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	8.00	914.908	0.14	7,848.633	0.00
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	12.80	1,829.817	0.28	704,418.305	0.34
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	56.00	2,744.725	0.41	173,835.787	0.08
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	16.10	43,915.600	6.62	189,978.887	0.09
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	2,744.725	0.41	4,139.045	0.00
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	131,746.801	19.86	52,975.389	0.03
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	214,088.551	32.26	57,397.141	0.03
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	13,723.625	2.07	57,485.521	0.03
Summary for Division ~ Cyanophyta (10 detail records)							**Sum Total Cyanophyta**		413,720.795	62.35	1,372,385.316	0.66

Total Richness ~ 33 Taxa	Total Sample Concentration	Total Sample Biovolume
	663,536.755	206,814,736.264
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060097-222-CJ	**Sample ID:**	WREF-OS-1-1	**Replicate:**	1
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Off Shore Replicate 1 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	12.88	523,887.279	33.92	54,984,222.612	9.18
1343	*Amphora*	*pediculus*	.	.	.	.	Vegetative	9.60	2,686.601	0.17	305,954.201	0.05
108384	*Anomoeneis*	*vitrea*	.	.	.	.	Vegetative	24.00	2,686.601	0.17	583,387.172	0.10
1066	*Cocconeis*	*pediculus*	.	.	.	.	Vegetative	28.80	2,686.601	0.17	9,956,473.701	1.66
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	33.20	2,686.601	0.17	2,580,512.912	0.43
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	17.07	24,179.413	1.57	1,518,595.279	0.25
1115	*Cymbella*	*minuta*	.	.	.	.	Vegetative	9.60	2,686.601	0.17	134,802.913	0.02
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	19.20	2,686.601	0.17	792,311.001	0.13
1355	*Epithemia*	*turgida*	.	westermannii	.	.	Vegetative	80.00	445.917	0.03	12,100,393.628	2.02
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	20.57	18,806.210	1.22	8,305,704.349	1.39
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	6.40	2,686.601	0.17	216,069.383	0.04
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	48.00	2,686.601	0.17	6,672,544.594	1.11
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	19.60	37,612.420	2.44	8,186,079.928	1.37
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	24.00	445.917	0.03	151,295.945	0.03
9236	*Nitzschia*	*constricta*	.	.	.	.	Vegetative	44.00	445.917	0.03	1,540,977.236	0.26
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	45.87	8,059.804	0.52	3,326,055.555	0.56
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	40.20	45,672.224	2.96	48,957,701.421	8.17

9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	55.20	40,299.021	2.61	28,920,725.720	4.83
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	132.80	61,791.833	4.00	395,088,081.338	65.94
Summary for Division ~ Bacillariophyta (19 detail records)							**Sum Total**	**Bacillariophyta**	783,138.766	50.70	584,321,888.884	97.53

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	240.00	2.271	0.00	175,372.015	0.03
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	2.58	26,866.014	1.74	287,291.724	0.05
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	16.00	445.917	0.03	239,084.934	0.04
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	198.55	64.736	0.00	611,894.818	0.10
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	283.20	31.800	0.00	1,365,869.409	0.23
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	39.00	115.843	0.01	846,093.822	0.14
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,060.00	13.629	0.00	5,562,581.087	0.93
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	632.00	18.171	0.00	2,066,101.546	0.34
Summary for Division ~ Chlorophyta (8 detail records)							**Sum Total**	**Chlorophyta**	27,558.381	1.78	11,154,289.354	1.86

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1611	*Stichogloea*	*olivacea*	.	.	.	.	Vegetative	20.00	5,373.203	0.35	1,471,331.243	0.25
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	5,373.203	0.35	1,471,331.243	0.25

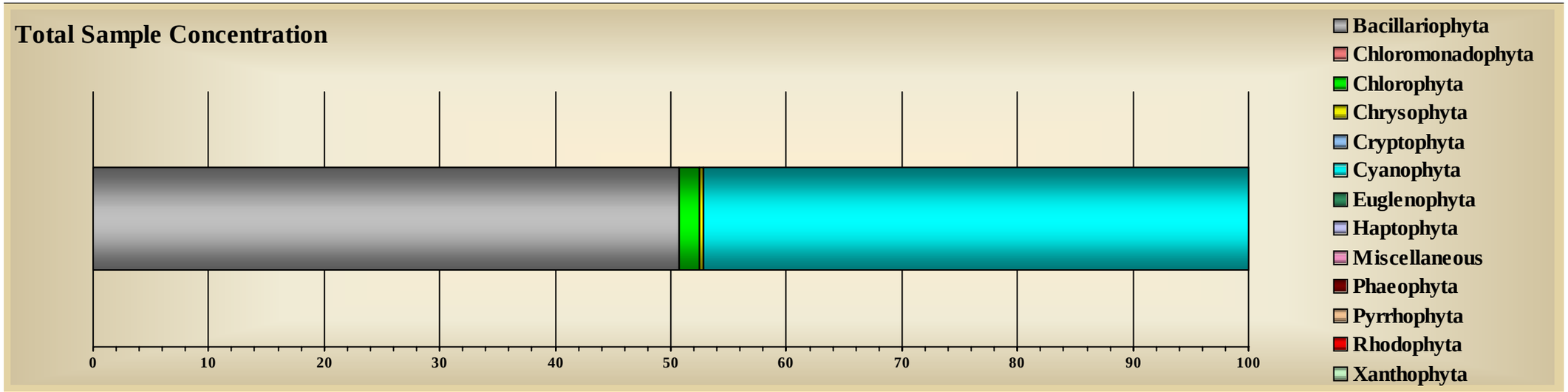
Division: Cyanophyta

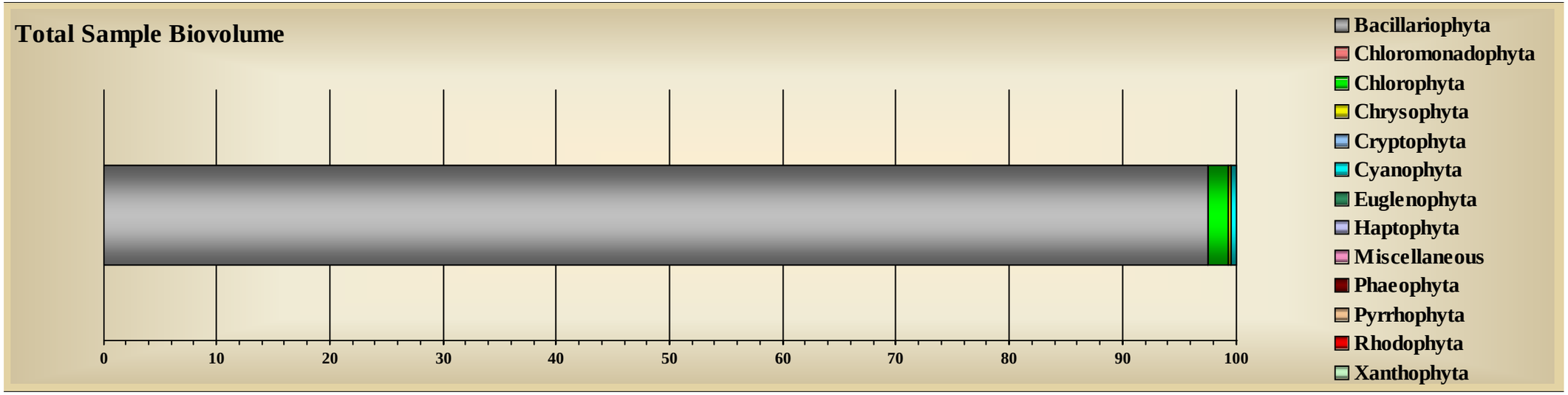
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	13.60	5,373.203	0.35	106,909.543	0.02
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	2,686.601	0.17	28,809.233	0.00

4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	56.00	2,686.601	0.17	576,184.931	0.10
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	9.60	2,686.601	0.17	180,057.640	0.03
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	12.00	445.917	0.03	58,370.353	0.01
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	49.60	5,373.203	0.35	277,108.967	0.05
☑ 4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	20.00	120,897.064	7.83	683,660.809	0.11
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	241,794.129	15.65	97,225.419	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	322,392.172	20.87	86,433.341	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	24,179.413	1.57	101,282.725	0.02
Summary for Division ~ Cyanophyta (10 detail records)						**Sum Total Cyanophyta**			728,514.904	47.17	2,196,042.960	0.37

Total Richness ~ 38 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,544,585.253	599,143,552.441
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060098-222-CJ	**Sample ID:**	WREF-OS-3-1	**Replicate:**	3
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Off Shore Replicate 3 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	14.08	352,616.438	25.35	38,015,366.564	4.68
9765	*Achnanthes*	*taeniata*	.	.	.	.	Vegetative	25.60	3,013.816	0.22	620,506.680	0.08
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	46.40	6,027.631	0.43	13,961,730.307	1.72
1111	*Cymbella*	*delicatula*	.	.	.	.	Vegetative	17.60	3,013.816	0.22	135,790.480	0.02
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	24.00	6,027.631	0.43	840,975.135	0.10
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.20	36,165.789	2.60	1,950,446.288	0.24
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	18.40	6,027.631	0.43	1,529,452.400	0.19
9058	*Gomphonema*	*augur*	.	.	.	.	Vegetative	43.33	900.409	0.06	1,213,718.797	0.15
1163	*Gomphonema*	*clevei*	.	.	.	.	Vegetative	52.00	6,027.631	0.43	4,167,778.012	0.51
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	24.80	39,179.604	2.82	14,100,167.520	1.74
9057	*Gomphonema*	*truncatum*	.	.	.	.	Vegetative	40.00	600.272	0.04	942,905.640	0.12
9072	*Navicula*	*cryptotenella*	.	.	.	.	Vegetative	20.80	3,013.816	0.22	771,997.633	0.10
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	3,013.816	0.22	319,948.785	0.04
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	64.00	6,027.631	0.43	3,950,268.522	0.49
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	37.20	39,179.604	2.82	42,517,079.576	5.24
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	54.40	48,221.051	3.47	29,799,838.161	3.67
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	144.40	69,317.761	4.98	646,995,347.065	79.70

Summary for Division ~ Bacillariophyta (17 detail records)	**Sum Total Bacillariophyta**	628,374.348	45.17	801,833,317.564	98.77

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	280.00	3.058	0.00	276,653.569	0.03
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	3.73	9,041.447	0.65	277,934.989	0.03
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	613.33	27.519	0.00	767,713.654	0.09
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	345.60	27.519	0.00	529,791.584	0.07
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	56.00	137.596	0.01	526,890.168	0.06
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	9.07	3,013.816	0.22	121,192.763	0.01
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	712.00	18.346	0.00	3,686,869.892	0.45
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	643.20	15.289	0.00	1,288,590.844	0.16
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	640.00	3.058	0.00	393,462.853	0.05

Summary for Division ~ Chlorophyta (9 detail records)	**Sum Total Chlorophyta**	12,287.648	0.88	7,869,100.315	0.97

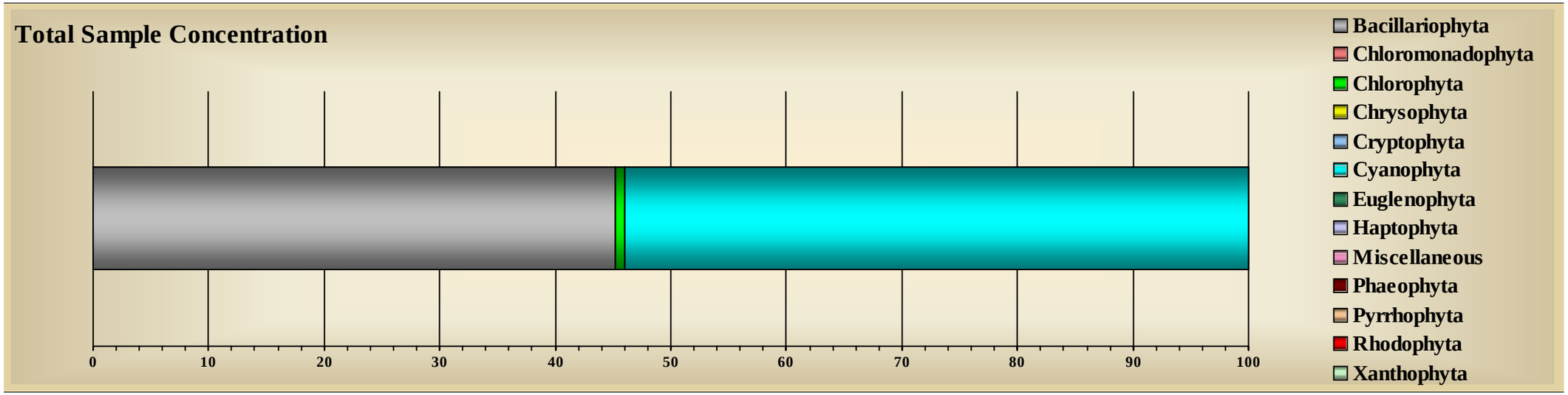
Division: Cyanophyta

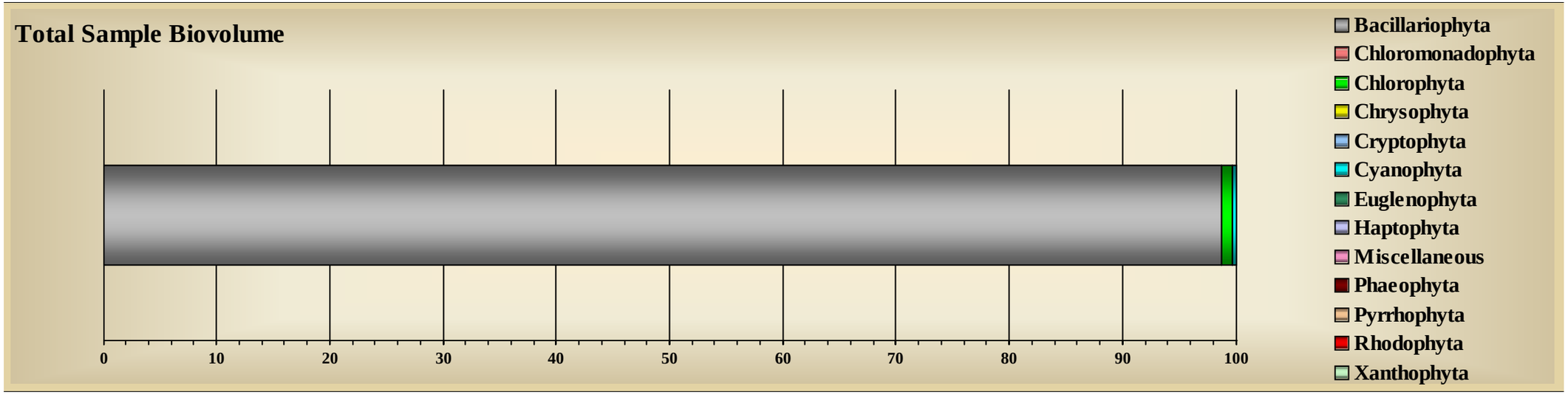
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	6.93	9,041.447	0.65	94,682.034	0.01
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.00	6,027.631	0.43	16,158.874	0.00
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	62.00	15,069.079	1.08	940,758.052	0.12
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	24.00	99,455.918	7.15	674,887.970	0.08
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	4.80	6,027.631	0.43	32,722.203	0.00
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	9.60	3,013.816	0.22	58,172.369	0.01
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	6,027.631	0.43	16,158.874	0.00
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	81,373.024	5.85	32,720.093	0.00
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.60	63,290.130	4.55	135,738.341	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	461,113.803	33.15	123,624.611	0.02

Summary for Division ~ Cyanophyta (10 detail records)	**Sum Total Cyanophyta**	750,440.111	53.95	2,125,623.422	0.26

Total Richness ~ 36 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,391,102.106	811,828,041.301
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060099-222-CJ	**Sample ID:**	WREF-OS-5-1	**Replicate:**	5
Customer ID:	222	**Sample Date:**	10/26/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF-OS	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Off Shore Replicate 5 Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	13.84	451,814.029	40.44	38,907,874.727	11.29
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	53.76	6,845.667	0.61	17,775,864.463	5.16
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	26.40	1,369.133	0.12	385,547.971	0.11
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	15.60	46,208.253	4.14	1,632,445.160	0.47
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	20.00	227.246	0.02	189,068.650	0.05
1096	*Cymbella*	*tumida*	.	.	.	.	Vegetative	84.00	227.246	0.02	2,545,154.910	0.74
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	49.00	454.492	0.04	5,671,335.053	1.65
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	18.56	6,845.667	0.61	1,561,391.928	0.45
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	11.20	2,738.267	0.25	405,213.108	0.12
1166	*Gomphonema*	*affine*	.	.	.	.	Vegetative	40.00	227.246	0.02	228,452.559	0.07
9286	*Gomphonema*	*olivaceum*	.	.	.	.	Vegetative	28.00	1,369.133	0.12	1,313,158.318	0.38
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	22.40	39,704.869	3.55	9,152,417.044	2.66
1214	*Navicula*	*cryptocephala*	.	.	.	.	Vegetative	26.00	227.246	0.02	83,527.962	0.02
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	17.60	1,369.133	0.12	145,348.162	0.04
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	72.00	5,476.534	0.49	2,271,228.049	0.66
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	45.92	30,120.935	2.70	46,571,110.542	13.52
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	58.72	30,120.935	2.70	18,139,260.951	5.27

1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	125.09	41,074.003	3.68	187,013,071.971	54.29

Summary for Division ~ Bacillariophyta (18 detail records) **Sum Total Bacillariophyta** 666,420.035 59.65 333,991,471.527 96.95

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	317.33	4.630	0.00	977,509.276	0.28
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	4.69	8,214.801	0.74	671,684.808	0.19
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	12.00	227.246	0.02	25,700.906	0.01
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	250.40	166.688	0.01	2,261,397.885	0.66
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	266.00	30.096	0.00	818,242.176	0.24
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	30.00	270.868	0.02	476,822.381	0.14
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	9.60	1,369.133	0.12	89,190.965	0.03
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	610.00	11.576	0.00	2,067,024.822	0.60
☑ 103704	*Ulothrix*	*variabilis*	.	.	.	.	Vegetative	730.67	13.891	0.00	1,613,355.786	0.47

Summary for Division ~ Chlorophyta (9 detail records) **Sum Total Chlorophyta** 10,308.929 0.92 9,000,929.004 2.61

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1611	*Stichogloea*	*olivacea*	.	.	.	.	Vegetative	26.00	227.246	0.02	231,650.910	0.07

Summary for Division ~ Chrysophyta (1 detail record) **Sum Total Chrysophyta** 227.246 0.02 231,650.910 0.07

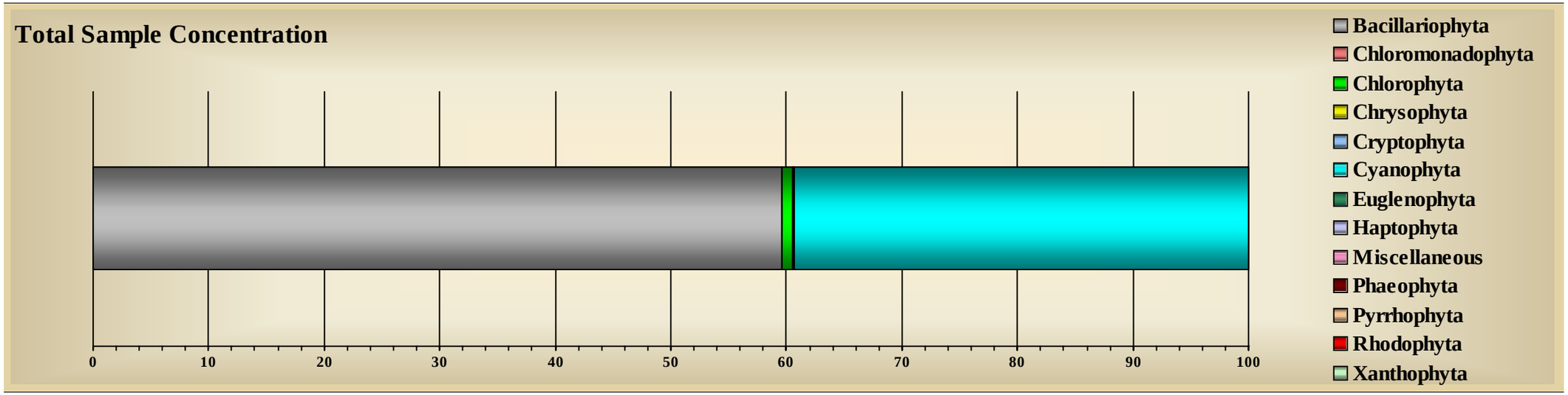
Division: Cyanophyta

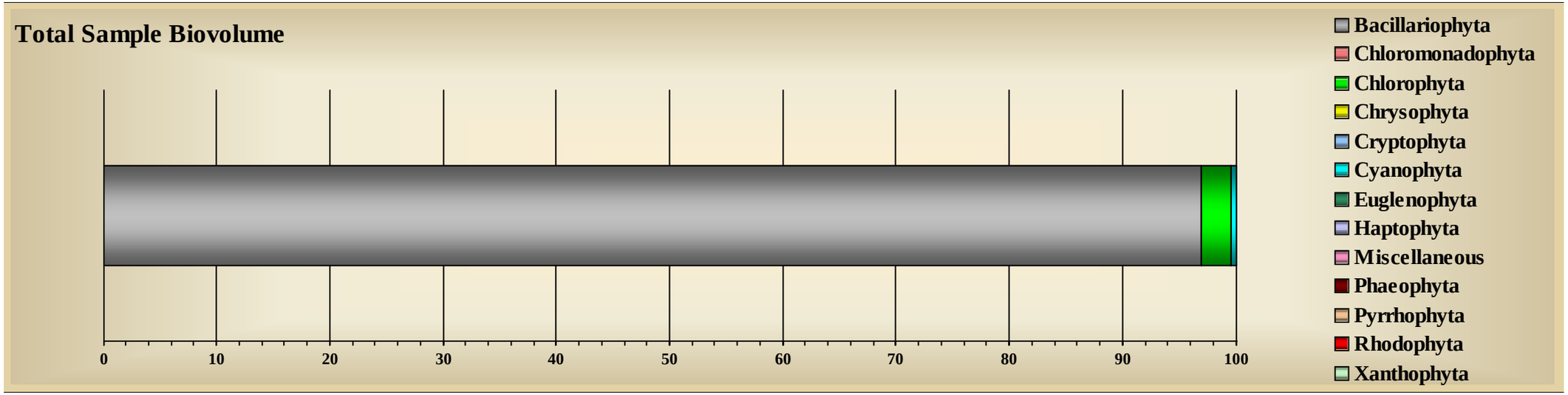
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	4.00	4,107.400	0.37	20,072.454	0.01
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	240.00	2.315	0.00	27,928.837	0.01

4083	*Chroococcus*	*minimus*	.	.	.	.	Vegetative	16.00	1,369.133	0.12	178,381.792	0.05
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	56.00	10,953.067	0.98	644,156.464	0.19
4617	*Oscillatoria*	*angustissima*	.	.	.	.	Vegetative	20.00	51,342.503	4.60	290,336.722	0.08
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.00	2,738.267	0.25	7,340.746	0.00
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	41,074.003	3.68	16,515.857	0.00
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	328,592.021	29.41	88,095.521	0.03
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		440,178.710	39.40	1,272,828.391	0.37

Total Richness ~ 36 Taxa	Total Sample Concentration	Total Sample Biovolume
	1,117,134.919	344,496,879.832
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Tracking Code:	060100-222-CJ	**Sample ID:**	WREF-1	**Replicate:**	.
Customer ID:	222	**Sample Date:**	10/24/2006	**Sample Level:**	.
Job ID:	2	**Station:**	WREF	**Sample Depth:**	0
System Name:	Little Traverse Bay	**Site:**	Bay Harbor	**Preservative:**	Glutaraldehyde
Report Notes:	West Reference Jar# 1 of 1				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
1013	*Achnanthes*	*minutissima*	.	.	.	.	Vegetative	9.60	6,096.519	2.53	264,768.146	0.35
1099	*Cymbella*	*cistula*	.	.	.	.	Vegetative	56.00	338.696	0.14	793,071.282	1.06
9371	*Cymbella*	*gracilis*	.	.	.	.	Vegetative	26.40	2,370.868	0.98	656,306.860	0.88
9379	*Cymbella*	*helmckei*	.	.	.	.	Vegetative	80.00	168.648	0.07	3,525,866.598	4.70
1091	*Cymbella*	*microcephala*	.	.	.	.	Vegetative	16.53	17,273.469	7.16	731,104.776	0.98
1095	*Cymbella*	*silesiaca*	.	.	.	.	Vegetative	16.00	338.696	0.14	73,989.145	0.10
9397	*Fragilaria*	*capucina*	.	vaucheriae	.	.	Vegetative	24.00	677.391	0.28	130,749.664	0.17
9045	*Fragilaria*	*construens*	.	.	venter	.	Vegetative	16.00	338.696	0.14	272,395.060	0.36
9055	*Gomphonema*	*pumilum*	.	.	.	.	Vegetative	28.00	2,370.868	0.98	841,196.895	1.12
1000481	*Synedra*	*radians*	.	.	.	.	Vegetative	28.40	677.391	0.28	196,996.129	0.26
9504	*Synedra*	*tenera*	.	.	.	.	Vegetative	43.20	1,016.086	0.42	315,956.854	0.42
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	160.00	1,354.782	0.56	11,912,254.232	15.89
Summary for Division ~ Bacillariophyta (12 detail records)								**Sum Total Bacillariophyta**	33,022.110	13.70	19,714,655.641	26.30

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
8190	*Bulbochaete*	*spp*	.	.	.	.	Vegetative	800.00	2.577	0.00	746,174.197	1.00
2101	*Chlorococcum*	*humicola*	.	.	.	.	Vegetative	5.60	2,709.564	1.12	264,404.929	0.35
2791	*Cladophora*	*fracta*	.	.	.	.	Vegetative	800.00	2.577	0.00	1,243,623.661	1.66
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	20.00	338.696	0.14	236,075.728	0.31
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	198.40	193.290	0.08	4,859,362.306	6.48
2350	*Oedogonium*	*spp*	.	.	.	.	Vegetative	160.00	7.732	0.00	155,452.958	0.21
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	8.00	338.696	0.14	32,687.399	0.04
2382	*Pediastrum*	*boryanum*	.	.	.	.	Vegetative	60.00	278.337	0.12	3,993,076.757	5.33
2488	*Scenedesmus*	*denticulatus*	.	.	.	.	Vegetative	12.00	1,016.086	0.42	101,739.516	0.14
2950	*Spirogyra*	*spp*	.	.	.	.	Vegetative	1,103.20	85.048	0.04	34,617,741.398	46.18
130069	*Trentepohlia*	*spp*	.	.	.	.	Vegetative	160.00	2.577	0.00	46,635.887	0.06
2740	*Zygnema*	*spp*	.	.	.	.	Vegetative	822.86	38.658	0.02	6,395,778.826	8.53
Summary for Division ~ Chlorophyta (12 detail records)							**Sum Total Chlorophyta**		5,013.837	2.08	52,692,753.562	70.29

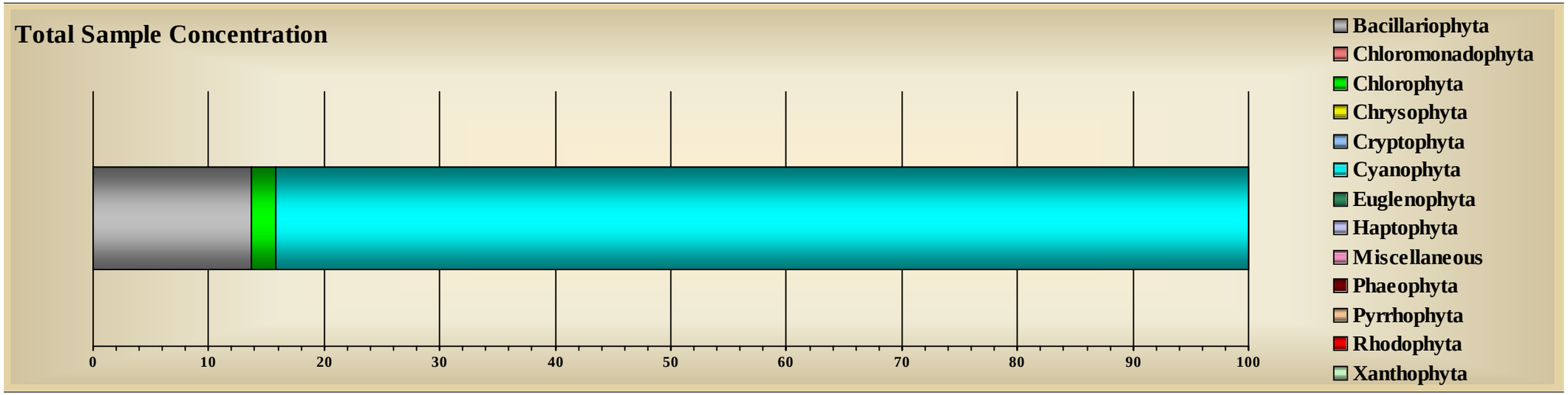
Division: Cyanophyta

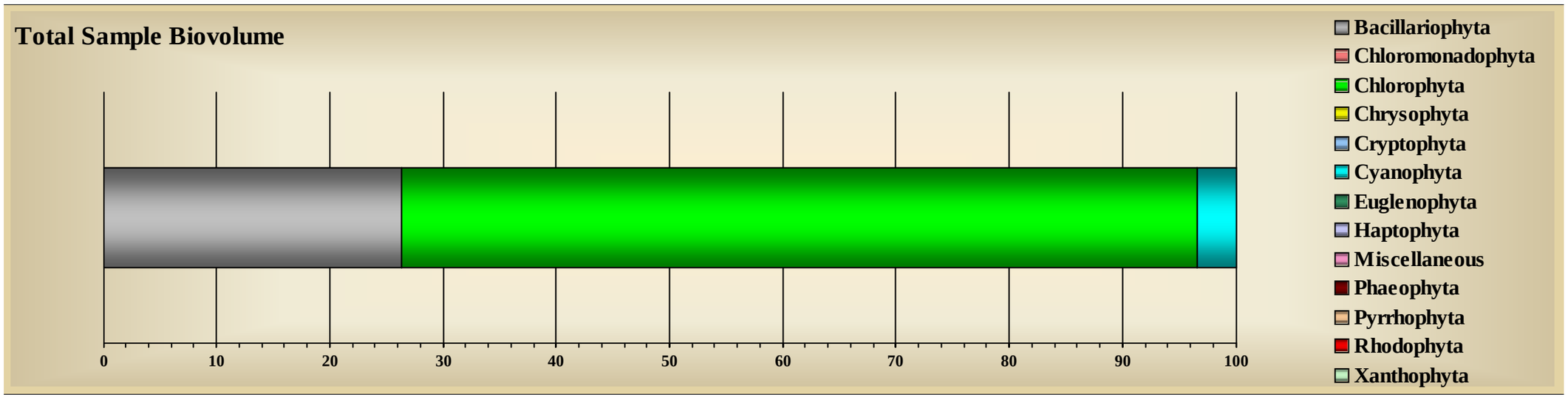
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/square_cm	Relative Count	Total Biovolume µm^3 /square_cm	Relative Total Biovolume
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	6.40	1,016.086	0.42	3,724.160	0.00
4053	*Aphanocapsa*	*pulchra*	.	.	.	.	Vegetative	32.00	677.391	0.28	303,992.876	0.41
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	8.27	1,354.782	0.56	10,653.734	0.01
4310	*Calothrix*	*spp*	.	.	.	.	Vegetative	1,493.33	20.618	0.01	1,547,620.556	2.06
4086	*Chroococcus*	*minutus*	.	.	.	.	Vegetative	9.40	1,693.477	0.70	93,749.385	0.13
4511	*Chroococcus*	*turgidus*	.	.	.	.	Vegetative	16.00	677.391	0.28	212,740.524	0.28
107595	*Lyngbya*	*subtillissima*	.	.	.	.	Vegetative	24.53	2,709.564	1.12	63,195.699	0.08
4168	*Merismopedia*	*punctata*	.	.	.	.	Vegetative	20.00	168.648	0.07	45,211.582	0.06

4170	*Oscillatoria*	*spp*	.	.	.	.	Vegetative	25.60	677.391	0.28	78,449.799	0.10
4252	*Oscillatoria*	*hamelii*	.	.	.	.	Vegetative	40.00	338.696	0.14	61,288.878	0.08
4460	*Pseudanabaena*	*spp*	.	.	.	.	Vegetative	7.20	338.696	0.14	2,757.997	0.00
4463	*Pseudanabaena*	*galeata*	.	.	.	.	Vegetative	9.60	338.696	0.14	3,677.318	0.00
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.20	21,337.815	8.85	62,923.083	0.08
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	60,965.186	25.29	24,514.101	0.03
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	2.00	4,064.346	1.69	17,024.732	0.02
4660	*Synechocystis*	*spp*	.	.	.	.	Vegetative	0.80	106,689.076	44.25	28,603.341	0.04
Summary for Division ~ Cyanophyta (16 detail records)							**Sum Total Cyanophyta**		203,067.858	84.22	2,560,127.765	3.41

Total Richness ~ 40 Taxa	Total Sample Concentration	Total Sample Biovolume
	241,103.805	74,967,536.968
	NU/square_cm	µm^3 /square_cm

SUMMARY GRAPHICS





Species List

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1010	Achnanthes	spp	.	.	.	.	Vegetative	(Greg.) Hust.
108135	Achnanthes	deflexa	.	.	.	.	Vegetative	C. W. Reimer in Patrick & Reimer
1013	Achnanthes	minutissima	.	.	.	.	Vegetative	Kutzing
9765	Achnanthes	taeniata	.	.	.	.	Vegetative	Grunow in Cleve & Grunow
1341	Amphora	ovalis	.	.	.	.	Vegetative	(Kutzing) Kutzing
1343	Amphora	pediculus	.	.	.	.	Vegetative	(Kutzing) Grunow
1347	Amphora	veneta	.	.	.	.	Vegetative	Kutzing
108384	Anomoeneis	vitrea	.	.	.	.	Vegetative	(Grunow) Ross
9351	Bacillaria	paradoxa	.	.	.	.	Vegetative	Gmelin
1066	Cocconeis	pediculus	.	.	.	.	Vegetative	Ehrenb.
9212	Cocconeis	placentula	.	lineata	.	.	Vegetative	(Ehrenb.) Van Heurck
1000073	Cyclotella	hakanssoniae	.	.	.	.	Vegetative	Wendker
1085	Cyclotella	meneghiniana	.	.	.	.	Vegetative	Kltz.
9361	Cyclotella	pseudostelligera	.	.	.	.	Vegetative	Hust.
1090	Cymbella	spp	.	.	.	.	Vegetative	(Schmidt) Cleve
1862	Cymbella	affinis	.	.	.	.	Vegetative	Kltz.
1098	Cymbella	caespitosa	.	.	.	.	Vegetative	(Kutzing) Brun
1099	Cymbella	cistula	.	.	.	.	Vegetative	(Ehrenberg in Hemprich & Ehrenberg) Kirchner in
1111	Cymbella	delicatula	.	.	.	.	Vegetative	Kltz.
1000572	Cymbella	excisa	.	.	.	.	Vegetative	Kutzing
9371	Cymbella	gracilis	.	.	.	.	Vegetative	(Ehrenberg) Kutzing
9379	Cymbella	helmckei	.	.	.	.	Vegetative	Kramer
1091	Cymbella	microcephala	.	.	.	.	Vegetative	Grunow

1115	Cymbella	minuta	.	.	.	.	Vegetative	Hilse
1094	Cymbella	naviculiformis	.	.	.	.	Vegetative	Auersw. ex Heib.
1095	Cymbella	silesiaca	.	.	.	.	Vegetative	Bleisch
1096	Cymbella	tumida	.	.	.	.	Vegetative	(Br,b.) Van Heurck
9952	Cymbella	tumidula	.	.	.	.	Vegetative	Grunow
109032	Cymbella	turgidula	.	.	.	.	Vegetative	Grunow
10400	Cymbellonitzschia	spp	.	.	.	.	Vegetative	Hust.
109046	Denticula	tenuis	.	.	.	.	Vegetative	Kltz.
1109	Diatoma	tenuis	.	.	.	.	Vegetative	Agardh
4272	Diatoma	vulgaris	.	.	.	distorta	Vegetative	Grunow in Van Heurck
1108	Diatoma	vulgaris	.	vulgaris	.	.	Vegetative	Bory
1354	Epithemia	turgida	.	.	.	.	Vegetative	(Ehrenb.) Kltz.
1355	Epithemia	turgida	.	westermannii	.	.	Vegetative	(Ehrenb.) Grunow
109195	Eucocconeis	flexella	.	.	.	.	Vegetative	(Kltz.) Cleve
1140	Eunotia	spp	.	.	.	.	Vegetative	N”rpell-Schempp & Lange-Bert. in Lange-Bert.
9407	Fragilaria	berolinensis	.	.	.	.	Vegetative	(Lemmermann) Lange-Bertalot
9395	Fragilaria	capucina	.	gracilis	.	.	Vegetative	(ostrup) Hustedt
9397	Fragilaria	capucina	.	vaucheriae	.	.	Vegetative	(Kutzing) Lange-Bertalot
1159	Fragilaria	construens	.	.	construens	.	Vegetative	(Ehrenberg) Hustedt
9045	Fragilaria	construens	.	.	venter	.	Vegetative	(Ehrenberg) Hustedt
1152	Fragilaria	crotonensis	.	.	.	.	Vegetative	Kitton
9321	Gomphoneis	herculeana	.	.	.	.	Vegetative	(Ehrenb.) Cleve
1160	Gomphonema	spp	.	.	.	.	Vegetative	C. Agardh
1166	Gomphonema	affine	.	.	.	.	Vegetative	Kltz.
9058	Gomphonema	augur	.	.	.	.	Vegetative	Ehrenb.
1163	Gomphonema	clevei	.	.	.	.	Vegetative	Fricke
9053	Gomphonema	minutum	.	.	.	.	Vegetative	(Agardh) Agardh

9286	Gomphonema	olivaceum	.	.	.	.	Vegetative	(Lyngbye) Desmazieres
1161	Gomphonema	parvulum	.	.	.	.	Vegetative	(Kützing.) Kützing.
9055	Gomphonema	pumilum	.	.	.	.	Vegetative	(Grunow) Reichardt & Lange-Bertalot
9057	Gomphonema	truncatum	.	.	.	.	Vegetative	Ehrenb.
1210	Navicula	spp	.	.	.	.	Vegetative	Bory .
1214	Navicula	cryptocephala	.	.	.	.	Vegetative	Kützing.
9072	Navicula	cryptotenella	.	.	.	.	Vegetative	Lange-Bert.
1000065	Navicula	cryptotenelloides	.	.	.	.	Vegetative	.
9305	Navicula	decussis	.	decussis	.	.	Vegetative	Ostrup
9076	Navicula	goeppertiana	.	goeppertiana	.	.	Vegetative	(Bleisch) H.L. Smith
9086	Navicula	minuscula	.	.	.	.	Vegetative	Grunow
10356	Navicula	radiosafallax	.	.	.	.	Vegetative	Lange-Bert.
9101	Navicula	subminuscula	.	.	.	.	Vegetative	Manguin
9102	Navicula	tripunctata	.	.	.	.	Vegetative	(O. F. Müll.) Bory
9223	Navicula	viridula	.	linearis	.	.	Vegetative	Hust.
1221	Nitzschia	acicularis	.	.	.	.	Vegetative	(Kutzing) W. Smith
9236	Nitzschia	constricta	.	.	.	.	Vegetative	(Kutzing) Ralfs .
9113	Nitzschia	dissipata	.	.	.	.	Vegetative	(Kützing.) Grunow
9114	Nitzschia	fonticola	.	.	.	.	Vegetative	Grunow
1222	Nitzschia	gracilis	.	.	.	.	Vegetative	Hantzsch
9117	Nitzschia	intermedia	.	.	.	.	Vegetative	Hantzsch
9123	Nitzschia	palea	.	.	.	.	Vegetative	(Kützing.) W. Sm.
1223	Nitzschia	perminuta	.	.	.	.	Vegetative	(Grunow) M. Perag.
9124	Nitzschia	recta	.	.	.	.	Vegetative	Hantzsch
1271	Rhoicosphenia	curvata	.	.	.	.	Vegetative	(kutzing) Grunow
1752	Rhopalodia	brebissonii	.	.	.	.	Vegetative	Krammer
1754	Rhopalodia	gibba	.	minuta	.	.	Vegetative	Krammer

1314	Synedra	delicatissima	.	.	.	.	Vegetative	W. Smith
1477	Synedra	filiformis	.	.	.	.	Vegetative	Grunow
1000481	Synedra	radians	.	.	.	.	Vegetative	Kutz
1000541	Synedra	radians	.	.	.	.	Vegetative	.
9504	Synedra	tenera	.	.	.	.	Vegetative	W. Sm.
1315	Synedra	ulna	.	.	.	.	Vegetative	(Nitzsch) Ehrenb.

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
8190	Bulbochaete	spp	.	.	.	.	Vegetative	Transeau and Brown In Tiff.
2100	Chlorococcum	spp	.	.	.	.	Vegetative	(Naegeli) Rabenhor
2101	Chlorococcum	humicola	.	.	.	.	Vegetative	(Naegeli) Rabenhor
2791	Cladophora	fracta	.	.	.	.	Vegetative	(Dillw.) Kuetzing
2180	Cosmarium	spp	.	.	.	.	Vegetative	Corda
2246	Euastrum	spp	.	.	.	.	Vegetative	Nordstedt
10170	Geminella	spp	.	.	.	.	Vegetative	Prescott
8041	Monoraphidium	capricornutum	.	.	.	.	Vegetative	(Printz) Nygaard
2340	Mougeotia	spp	.	.	.	.	Vegetative	Kisselew
2350	Oedogonium	spp	.	.	.	.	Vegetative	De Bary
2363	Oocystis	parva	.	.	.	.	Vegetative	West & West
2380	Pediastrum	spp	.	.	.	.	Vegetative	(Ehrenberg) Meneg.
2382	Pediastrum	boryanum	.	.	.	.	Vegetative	(Turpin) Meneghini
1000013	Pediastrum	duplex	.	.	.	.	Vegetative	West & West
102560	Pediastrum	integrum	.	.	.	.	Vegetative	Naeg.
2387	Pediastrum	tetras	.	tetraodon	.	.	Vegetative	(Corda) Rabenhorst
8451	Protoderma	viride	.	.	.	.	Vegetative	Kuetzing
2471	Rhizoclonium	hieroglyphicum	.	.	.	.	Vegetative	(C. Agardh) Kuetzing
2483	Scenedesmus	bijuga	.	.	.	.	Vegetative	(Turpin) Lagerh.

2488	Scenedesmus	denticulatus	.	.	.	.	Vegetative	Lagerhiem
8303	Scenedesmus	opoliensis	.	carinatus	.	.	Vegetative	Lemmermann
2884	Scenedesmus	quadricauda	.	.	.	.	Vegetative	(Turpin) Breb.
2950	Spirogyra	spp	.	.	.	.	Vegetative	Skuja
2540	Stigeoclonium	spp	.	.	.	.	Vegetative	(Hazen) Collins Em Cox and Bold
2554	Tetraedron	minimum	.	.	.	.	Vegetative	(Braun) Hansgirg
130069	Trentepohlia	spp	.	.	.	.	Vegetative	(Flotow) Hansgrig
103684	Ulothrix	aequalis	.	.	.	.	Vegetative	Kuetzing
103704	Ulothrix	variabilis	.	.	.	.	Vegetative	Kuetzing
103705	Ulothrix	zonata	.	.	.	.	Vegetative	(Weber and Mohr) Kuetzing
2740	Zygnema	spp	.	.	.	.	Vegetative	Czurda

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1653	*.	spp	.	.	.	.	Cyst	N/A
1611	Stichogloea	olivacea	.	.	.	.	Vegetative	Chodat

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
3040	Rhodomonas	spp	.	.	.	.	Vegetative	Karsten .

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
4050	Aphanocapsa	spp	.	.	.	.	Vegetative	W. and G. S. West
4054	Aphanocapsa	delicatissima	.	.	.	.	Vegetative	West & West
4051	Aphanocapsa	elachista	.	.	.	.	Vegetative	West & West
4053	Aphanocapsa	pulchra	.	.	.	.	Vegetative	(Kutz.) Rabenh.
4062	Aphanothece	nidulans	.	.	.	.	Vegetative	P. Richter
4069	Aphanothece	stagnina	.	.	.	.	Vegetative	(Spreg.) A. Br. .

4310	Calothrix	spp	.	.	.	.	Vegetative	(Naeg.) Born. and Flah.
4080	Chroococcus	spp	.	.	.	.	Vegetative	(Breb.) Naegeli
4512	Chroococcus	cohaerens	.	.	.	.	Vegetative	(Breb.) Naegeli
4083	Chroococcus	minimus	.	.	.	.	Vegetative	(Keis.) Lemmermann
4086	Chroococcus	minutus	.	.	.	.	Vegetative	(Kuetzing) Naegeli
4511	Chroococcus	turgidus	.	.	.	.	Vegetative	(Kutzing) Nageli .
4720	Cyanosarcina	spp	.	.	.	.	Vegetative	Kovacik
4150	Lyngbya	spp	.	.	.	.	Vegetative	Agardh
107564	Lyngbya	birgei	.	.	.	.	Vegetative	.
4157	Lyngbya	diguetii	.	.	.	.	Vegetative	Lemmermann
107595	Lyngbya	subtillissima	.	.	.	.	Vegetative	.
4168	Merismopedia	punctata	.	.	.	.	Vegetative	Meyer In Wiegmann
4170	Oscillatoria	spp	.	.	.	.	Vegetative	Gomont
4617	Oscillatoria	angustissima	.	.	.	.	Vegetative	West and West
4252	Oscillatoria	hamelii	.	.	.	.	Vegetative	Fremy 1930
4460	Pseudanabaena	spp	.	.	.	.	Vegetative	Lauterborn
4463	Pseudanabaena	galeata	.	.	.	.	Vegetative	Bocher .
4321	Synechococcus	elongatus	.	.	.	.	Vegetative	Nageli
4323	Synechococcus	sp. 1	.	.	.	< 1um ovoid	Vegetative	Nageli
4285	Synechocystis	spp	.	.	.	>1 um spherical	Vegetative	N/A
4660	Synechocystis	spp	.	.	.	.	Vegetative	C. Sauvageau 1892

Tables:

G1. Replicate Total Concentration – June 2006
G2. Replicate Total Conentration – October 2006
G3. Replicate Total Biovolume – June 2006
G4. Replicate Total Biovolume – October 2006
G5. Replicate Total Taxa Richness – June 2006
G6. Replicate Total Taxa Richness – October 2006

Table F1. Replicate Total Concentration (NU/sq cm) – June 2006

Nearshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	4,049,998	3,165,233	3,023,025	4,183,697	3,762,374	3,532,675
2	2,377,135	3,010,620	2,467,918	1,899,125	1,807,434	3,424,445
3	2,636,093	3,838,596	2,141,930	4,122,540	1,170,452	2,286,489

Offshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	5,704,679	2,279,554	2,965,540	4,394,390	2,563,990	2,776,686
2	4,510,058	2,805,697	4,028,018	3,663,737	2,129,632	2,048,646
3	3,505,706	2,787,720	5,796,429	1,667,572	1,488,179	2,027,016

Table F2. Replicate Total Concentration (NU/sq cm) – October 2006

Nearshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	2,920,209	2,298,856	463,827	1,210,584	330,608	559,831
2	3,146,392	1,902,057	1,383,636	377,628	322,642	977,943
3	3,216,931	2,643,921	487,591	1,387,304	207,966	663,536

Offshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	1,969,823	2,904,265	1,337,515	330,608	818,428	1,544,585
2	2,307,776	2,385,911	1,339,438	322,642	1,136,591	1,391,102
3	2,941,603	4,592,599	863,355	207,966	945,005	1,117,134

Table F3. Replicate Total Biovolume (um cube/sq cm) – June 2006

Nearshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	243,879,513	305,402,272	242,283,145	283,123,651	309,696,520	481,713,719
2	176,779,069	397,945,467	258,965,461	221,859,498	287,579,951	415,240,694
3	182,046,493	229,424,391	634,395,648	456,074,560	105,637,502	614,525,341

Offshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	612,086,234	312,003,651	472,167,730	541,460,159	230,559,191	383,296,109
2	297,703,232	268,112,108	532,858,078	311,120,875	349,097,063	334,687,657
3	263,227,806	207,502,141	445,339,628	437,847,459	1,007,551,733	283,118,874

Table F4. Replicate Total Biovolume (um cube/sq cm) – October 2006

Nearshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	507,120,274	1,077,687,983	122,560,847	245,288,660	353,282,152	119,072,598
2	372,808,414	772,001,151	544,987,359	131,493,875	358,525,746	235,305,194
3	794,970,024	1,147,546,136	194,976,213	844,667,099	480,253,669	206,814,736

Offshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	702,183,681	1,525,901,819	742,744,548	48,858,538	135,834,327	599,143,552
2	1,394,464,847	1,338,135,981	319,034,471	34,519,765	316,675,504	811,828,041
3	985,827,990	1,989,668,898	360,440,934	42,378,363	231,586,965	344,496,879

Table F5. Replicate Total Taxa Richness – June 2006

Nearshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	43	36	45	42	38	40
2	44	37	40	39	45	35
3	34	40	43	44	41	42

Offshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	41	38	39	42	31	35
2	41	35	43	43	43	38
3	41	35	42	36	49	42

Table F6. Replicate Total Taxa Richness – October 2006

Nearshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	44	34	42	36	30	32
2	48	43	47	48	41	26
3	45	39	52	46	42	33

Offshore

Replicate	EREF	ECKD	SEEP1	SEEP2	WCKD	WREF
1	51	42	52	31	43	38
2	45	33	39	24	39	36
3	45	47	42	29	38	36

Figures:

G1. Nearshore Replicate Total Concentrations – June 2006
G2. Nearshore Replicate Total Biovolume – June 2006
G3. Offshore Replicate Total Biovolume – June 2006
G4. Nearshore Replicate Total Biovolume – October 2006
G5. Offshore Replicate Total Biovolume – October 2006
G6. Nearshore Replicate Total Taxa Richness – June 2006
G7. Offshore Replicate Total Taxa Richness – June 2006
G8. Nearshore Replicate Total Taxa Richness – October 2006
G9. Offshore Replicate Total Taxa Richness – October 2006
G10. EREF June vs. October Total Concentration
G11. ECKD June vs. October Total Concentration
G12. SEEP1 June vs. October Total Concentration
G13. SEEP2 June vs. October Total Concentration
G14. WCKD June vs. October Total Concentration
G15. WREF June vs. October Total Concentration
G16. EREF June vs. October Total Biovolume
G17. ECKD June vs. October Total Biovolume
G18. SEEP1 June vs. October Total Biovolume
G19. SEEP2 June vs. October Total Biovolume
G20. WCKD June vs. October Total Biovolume
G21. WREF June vs. October Total Biovolume
G22. EREF June vs. October Total Taxa Richness
G23. ECKD June vs. October Total Taxa Richness
G24. SEEP1 June vs. October Total Taxa Richness
G25. SEEP2 June vs. October Total Taxa Richness
G26. WCKD June vs. October Total Taxa Richness
G27. WREF June vs. October Total Taxa Richness

Figure G1. Periphyton total concentrations data for each nearshore replicate for June 2006

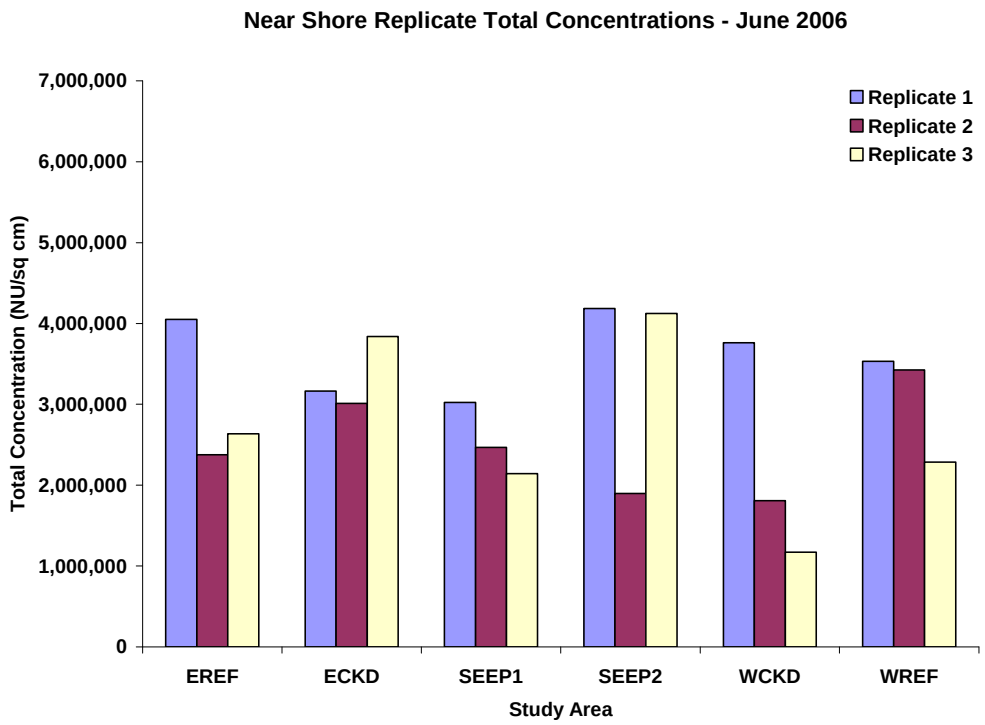


Figure G2. Periphyton total biovolume data for each nearshore replicate for June 2006

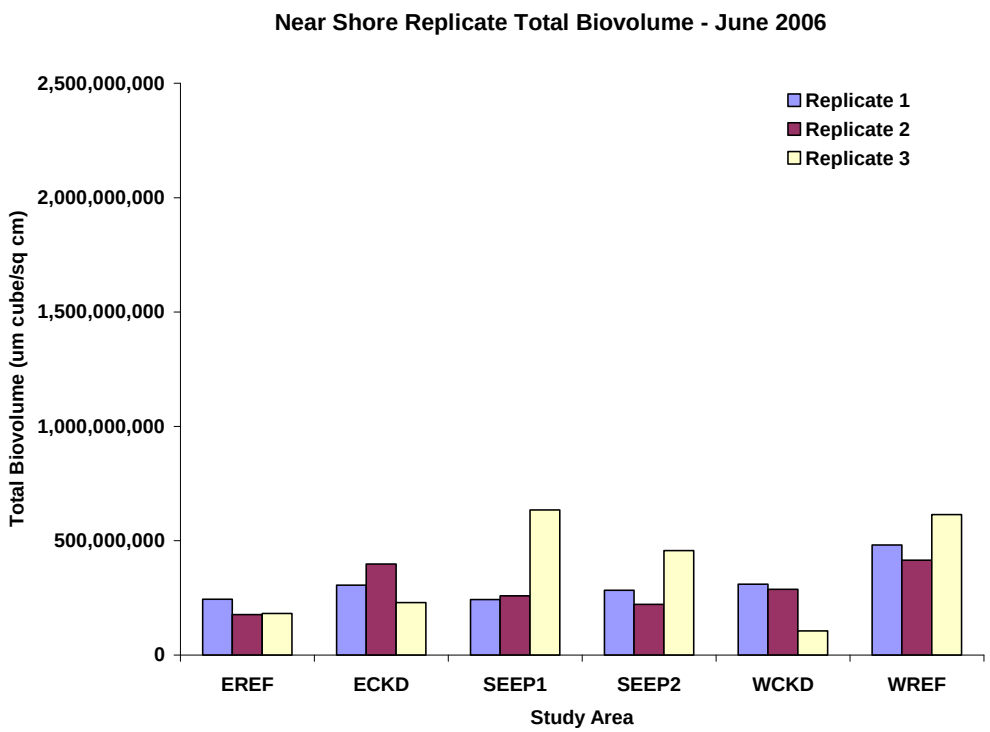


Figure G3. Periphyton total biovolume data for each offshore replicate for June 2006

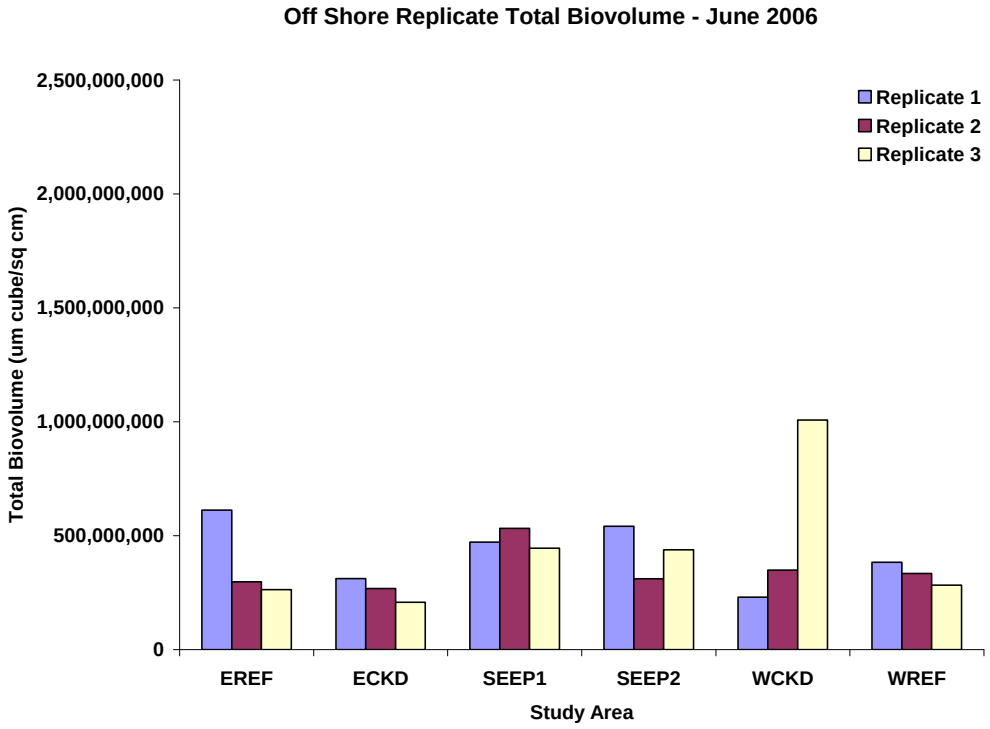


Figure G4. Periphyton total biovolume data for each nearshore replicate for October 2006

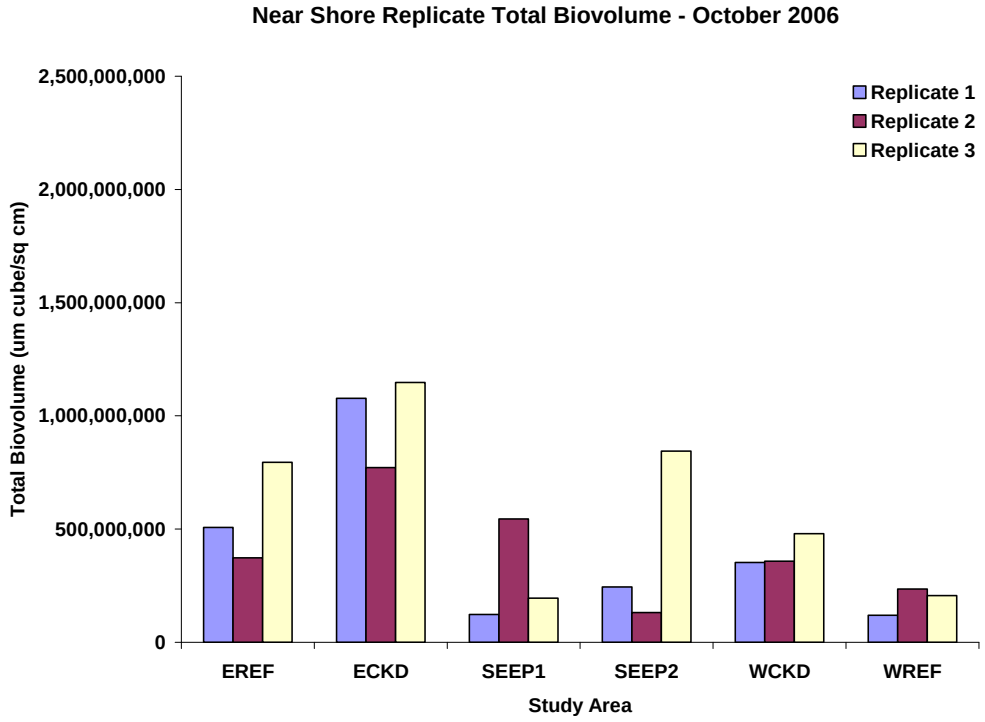


Figure G5. Periphyton total biovolume data for each offshore replicate for October 2006

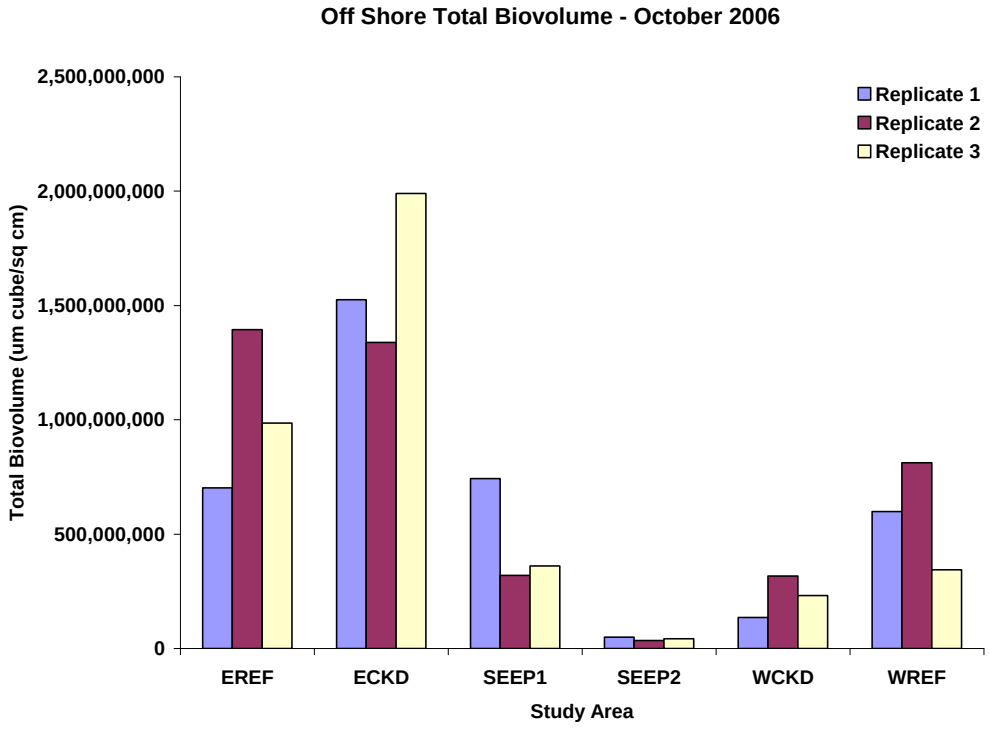


Figure G6. Periphyton total taxa richness data for each nearshore replicate for June 2006

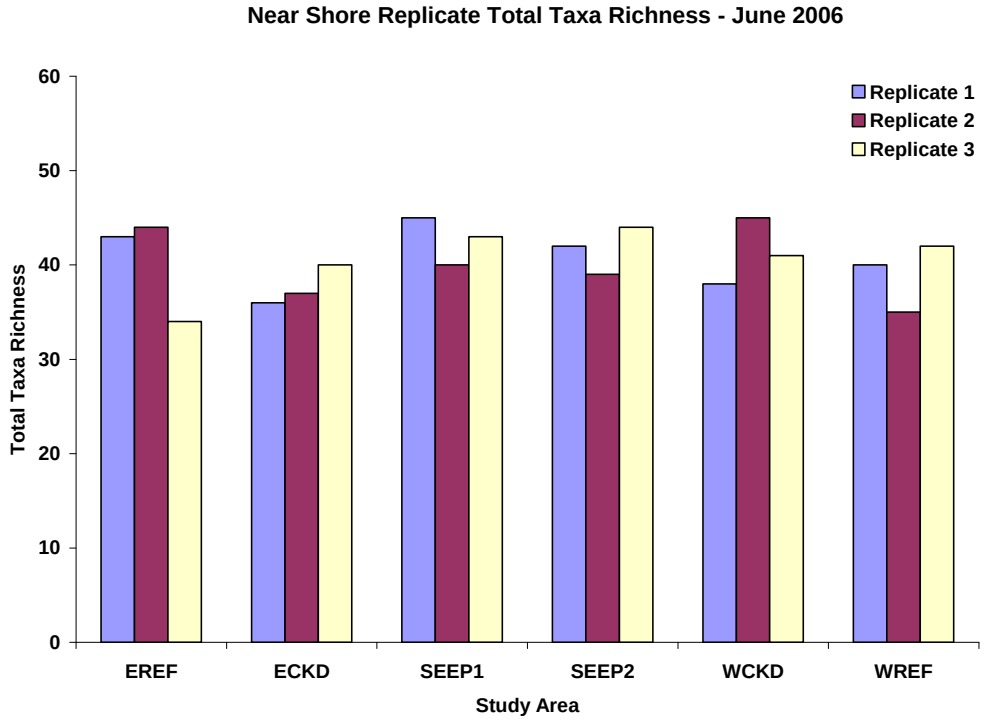


Figure G7. Periphyton total taxa richness data for each offshore replicate for June 2006

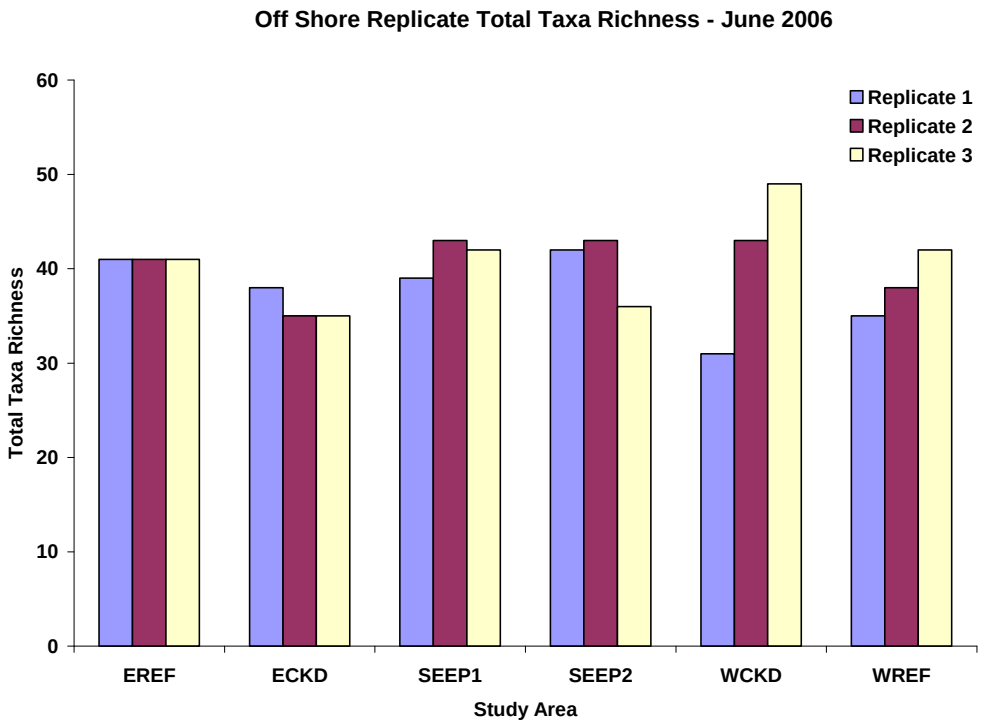


Figure G8. Periphyton total taxa richness data for each nearshore replicate for October 2006

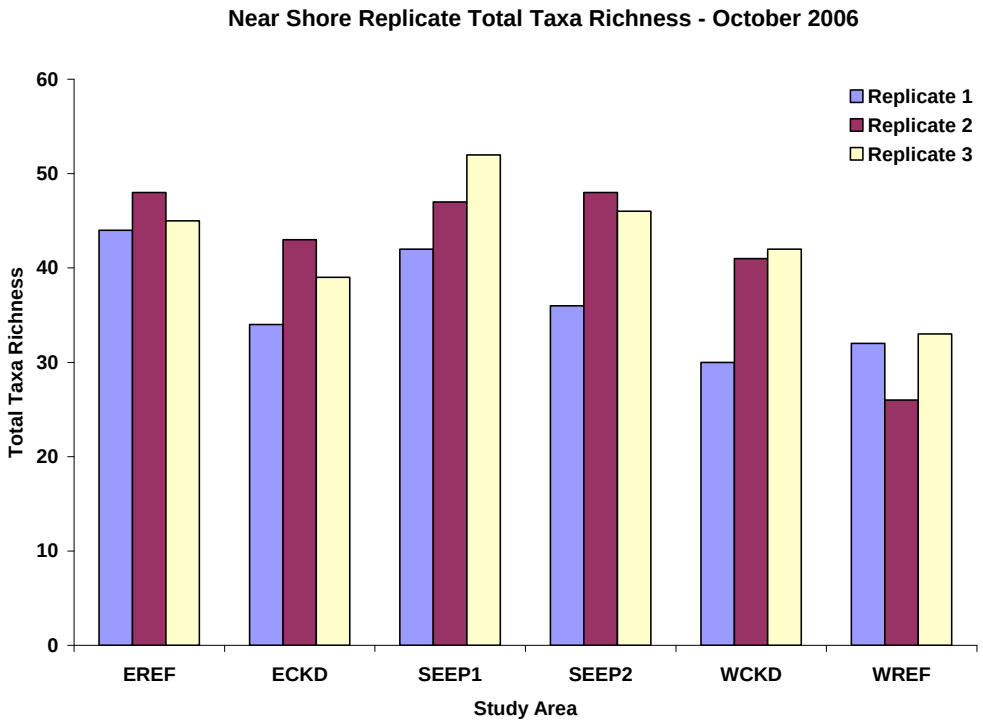


Figure G9. Periphyton total taxa richness data for each offshore replicate for October 2006

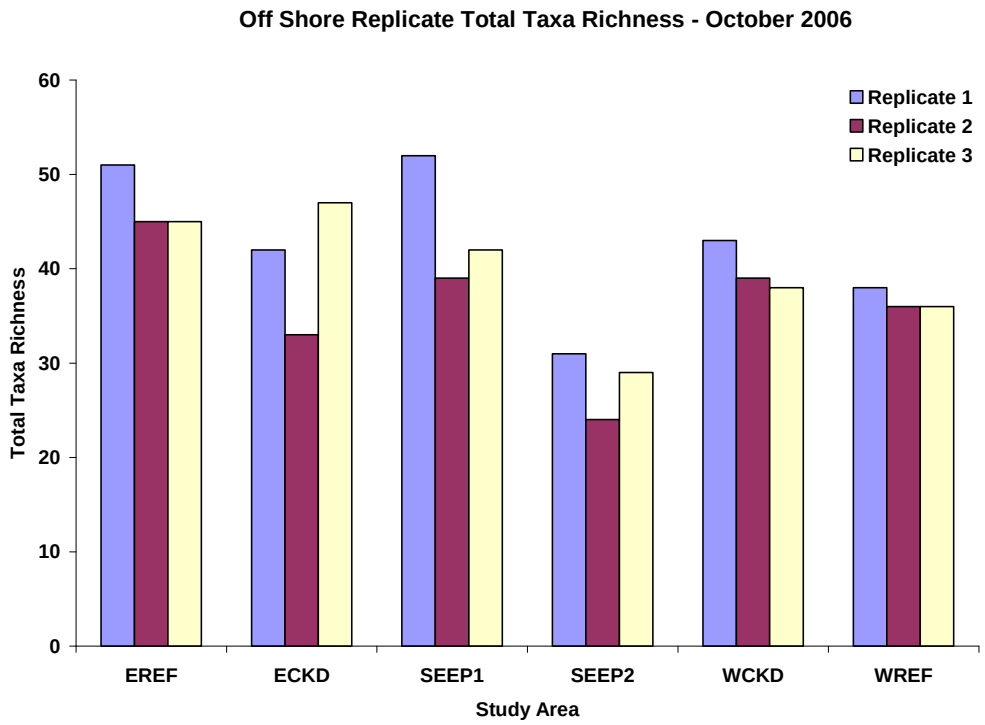


Figure G10. EREF June vs. October average total concentration for nearshore and offshore areas

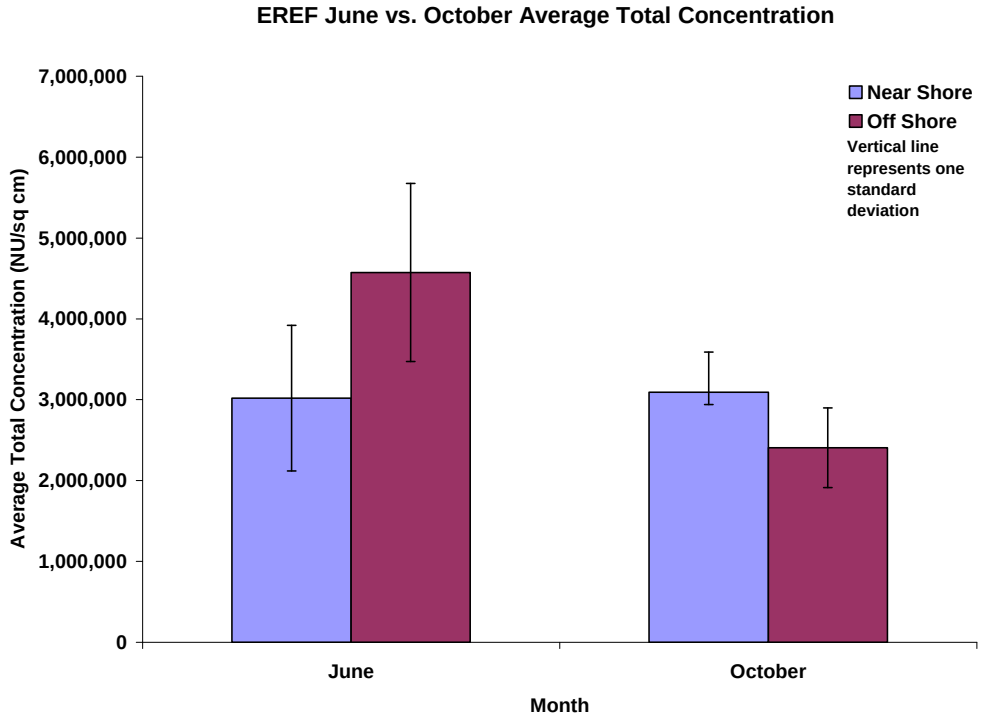


Figure G11. ECKD June vs. October average total concentration for nearshore and offshore areas

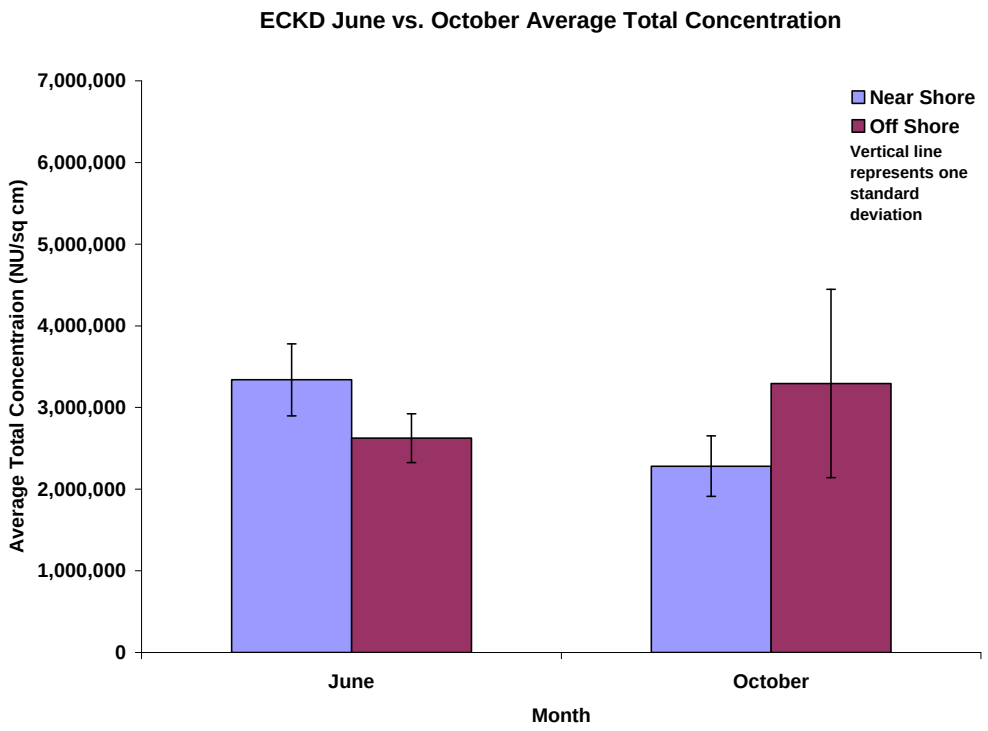


Figure G12. SEEP1 June vs. October average total concentration for nearshore and offshore areas

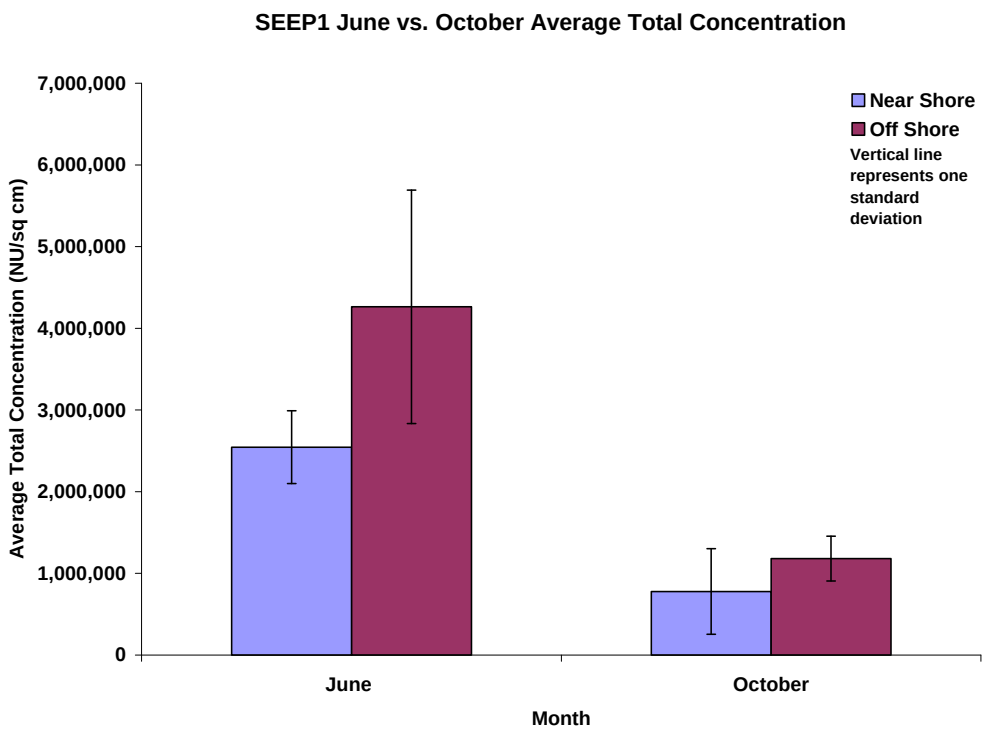


Figure G13. SEEP2 June vs. October average total concentration for nearshore and offshore areas

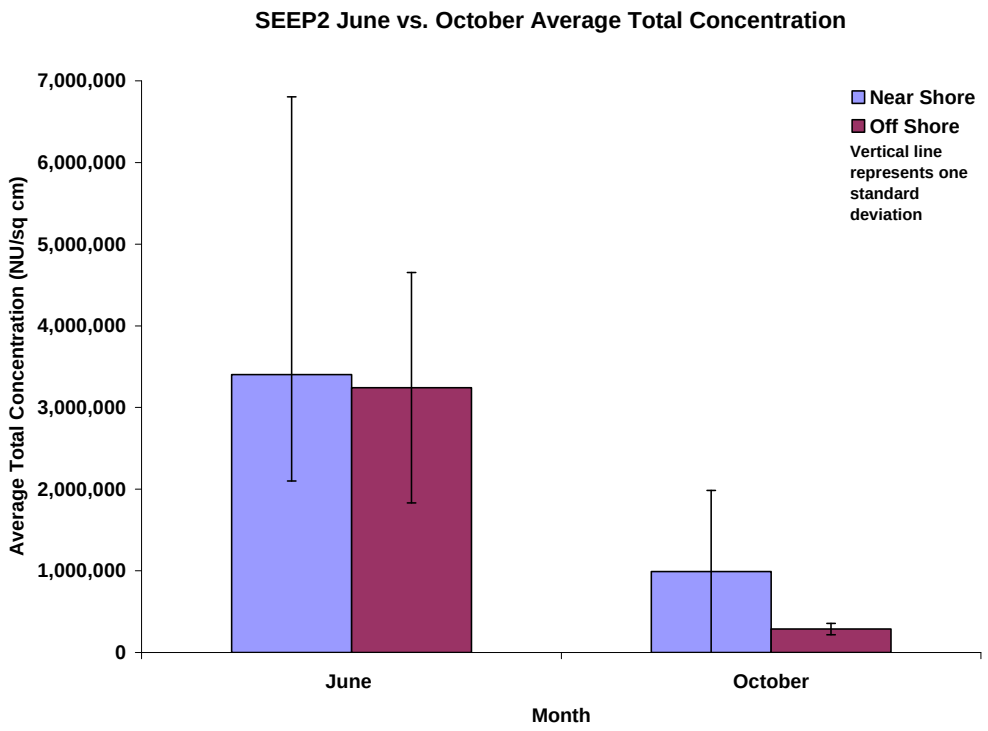


Figure G14. WCKD June vs. October average total concentration for nearshore and offshore areas

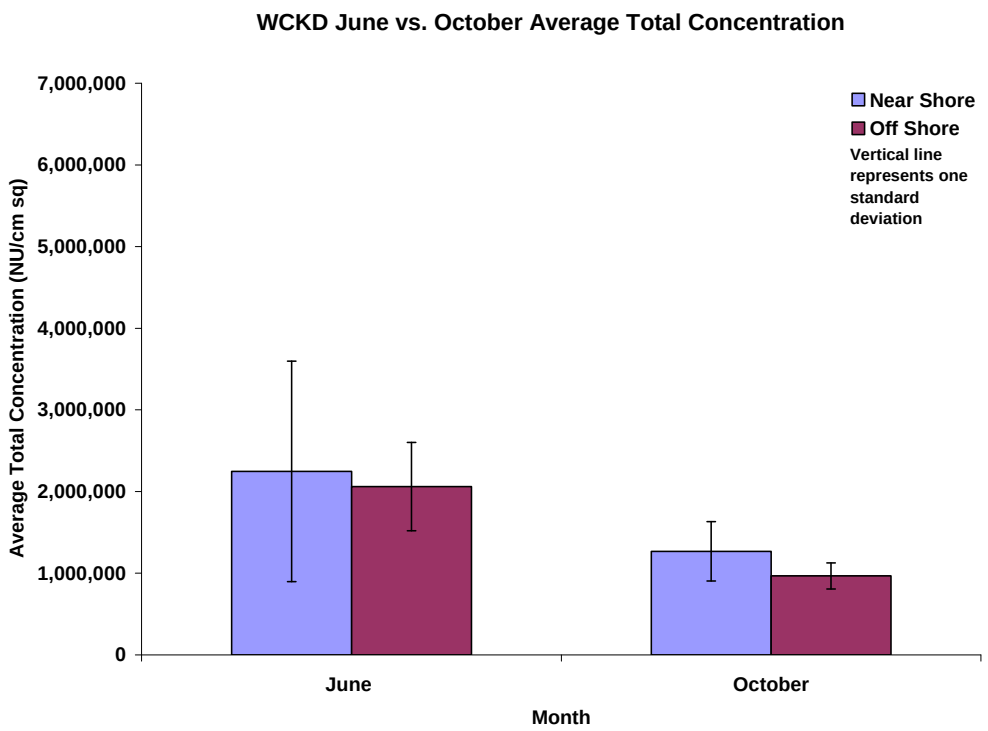


Figure G15. WREF June vs. October average total concentration for nearshore and offshore areas

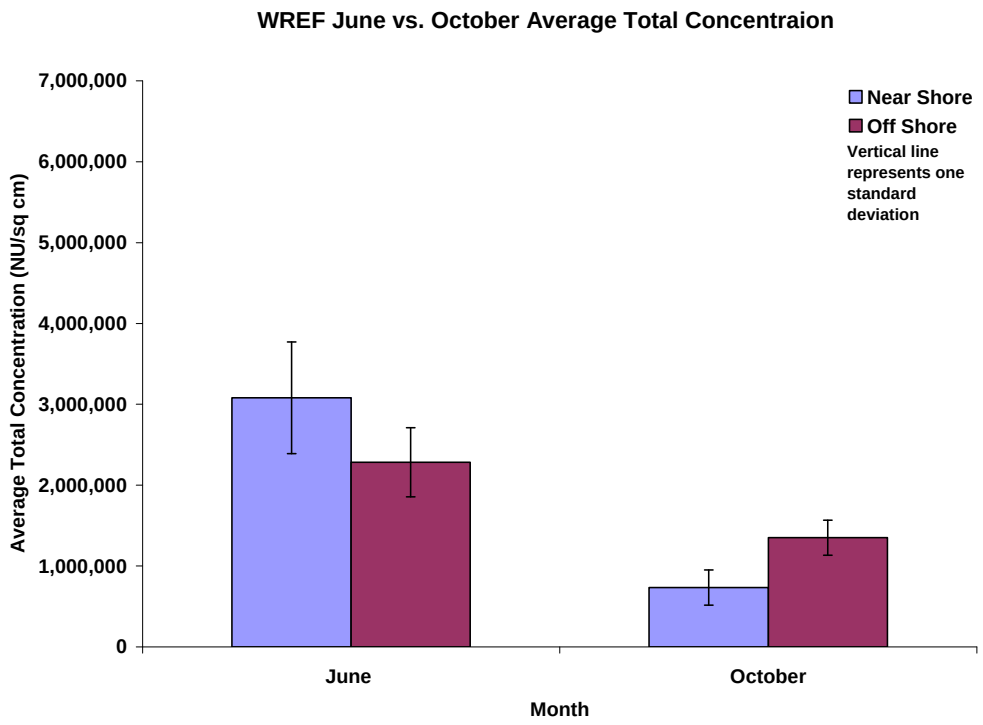


Figure G16. EREF June vs. October average total biovolume for nearshore and offshore areas

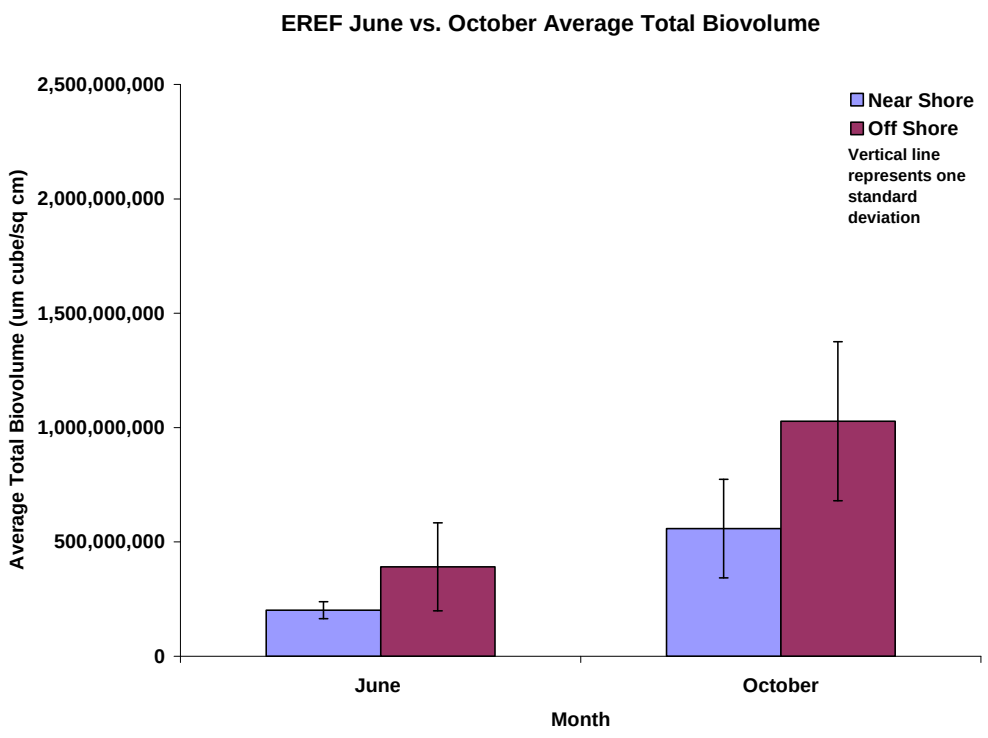


Figure G17. ECKD June vs. October average total biovolume for nearshore and offshore areas

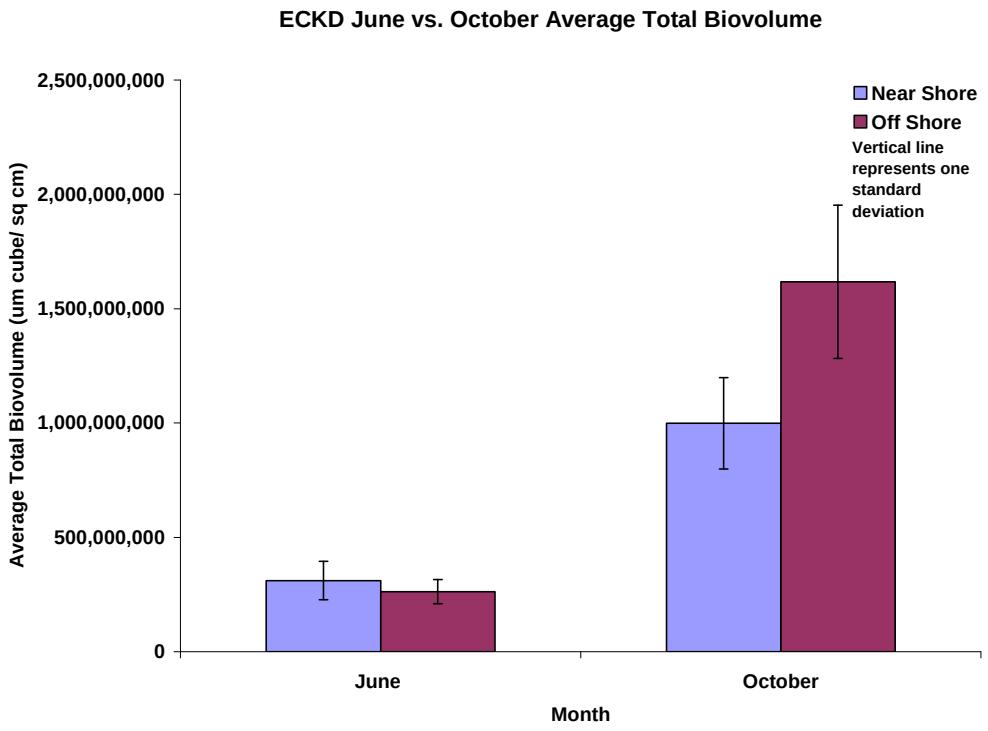


Figure G18. SEEP1 June vs. October average total biovolume for nearshore and offshore areas

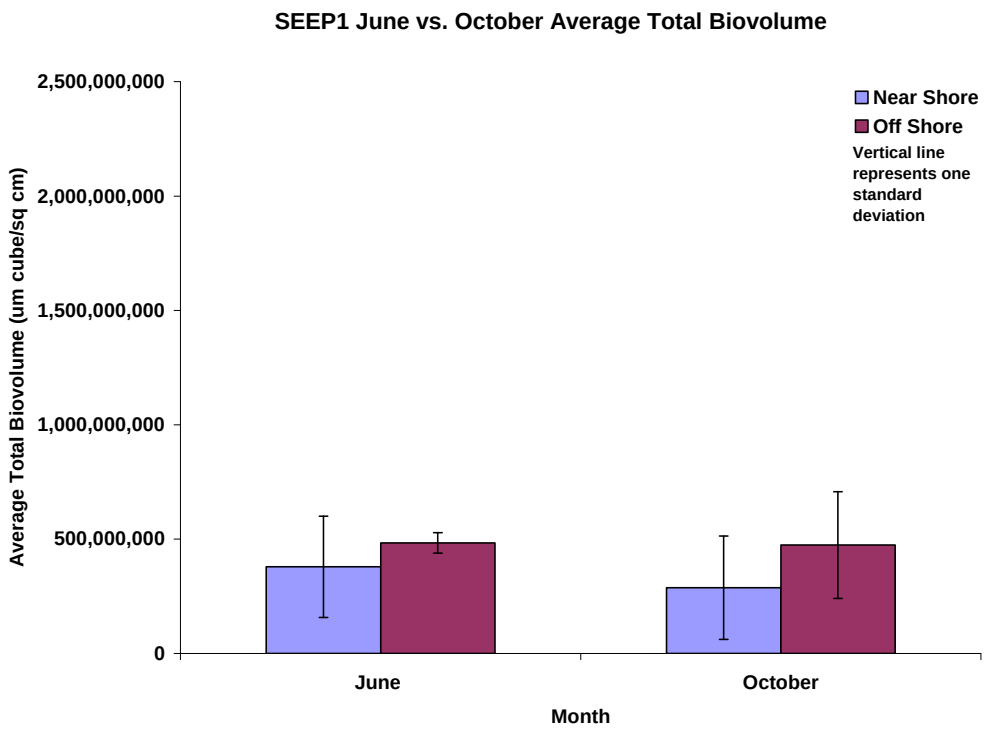


Figure G19. SEEP2 June vs. October average total biovolume for nearshore and offshore areas

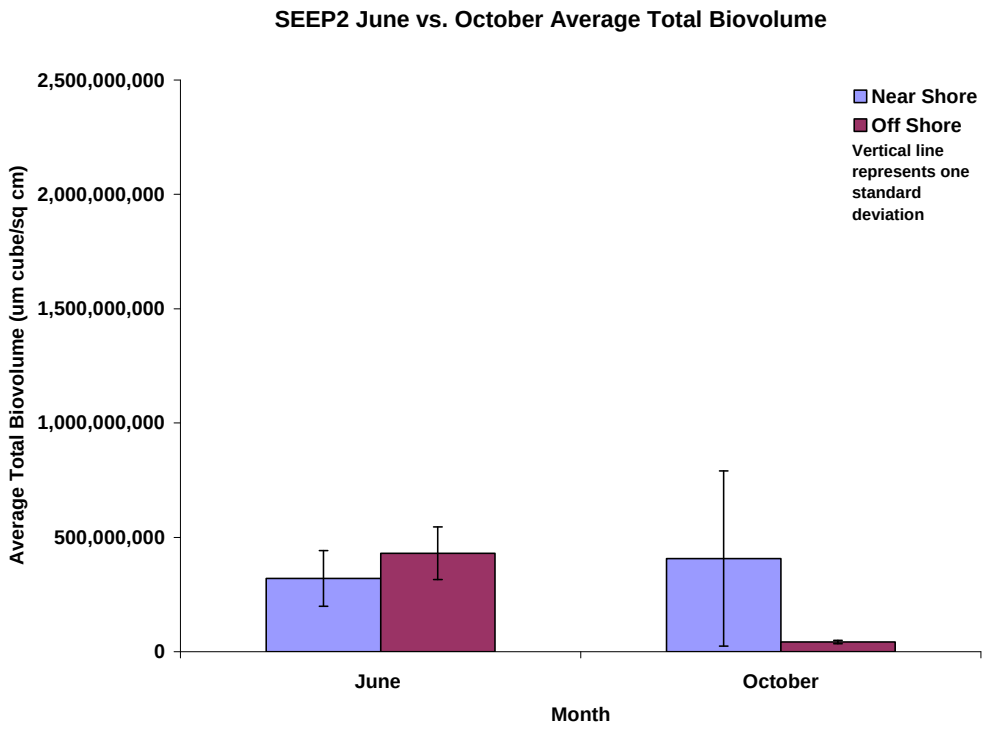


Figure G20. WCKD June vs. October average total biovolume for nearshore and offshore areas

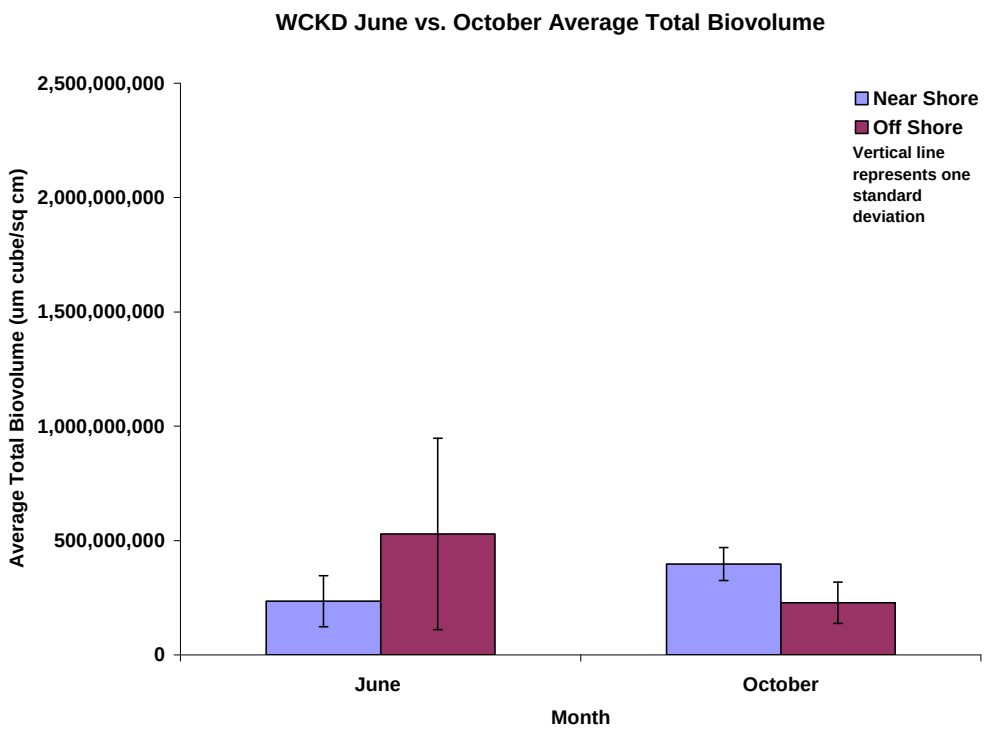


Figure G21. WREF June vs. October average total biovolume for nearshore and offshore areas

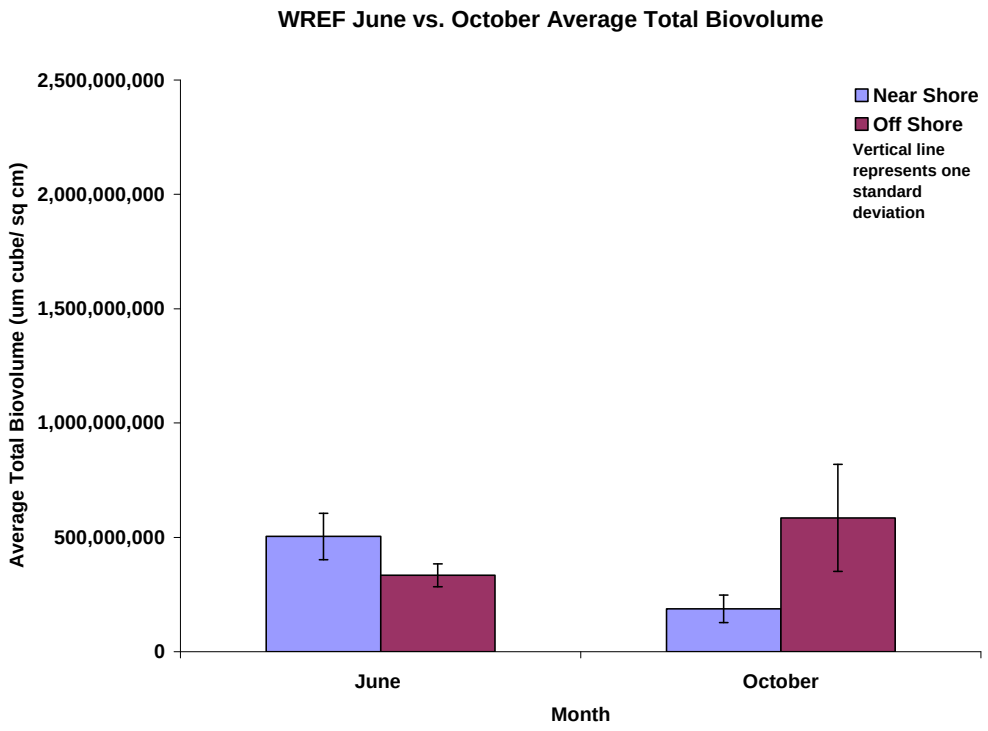


Figure G22. EREF June vs. October average total taxa richness for nearshore and offshore areas

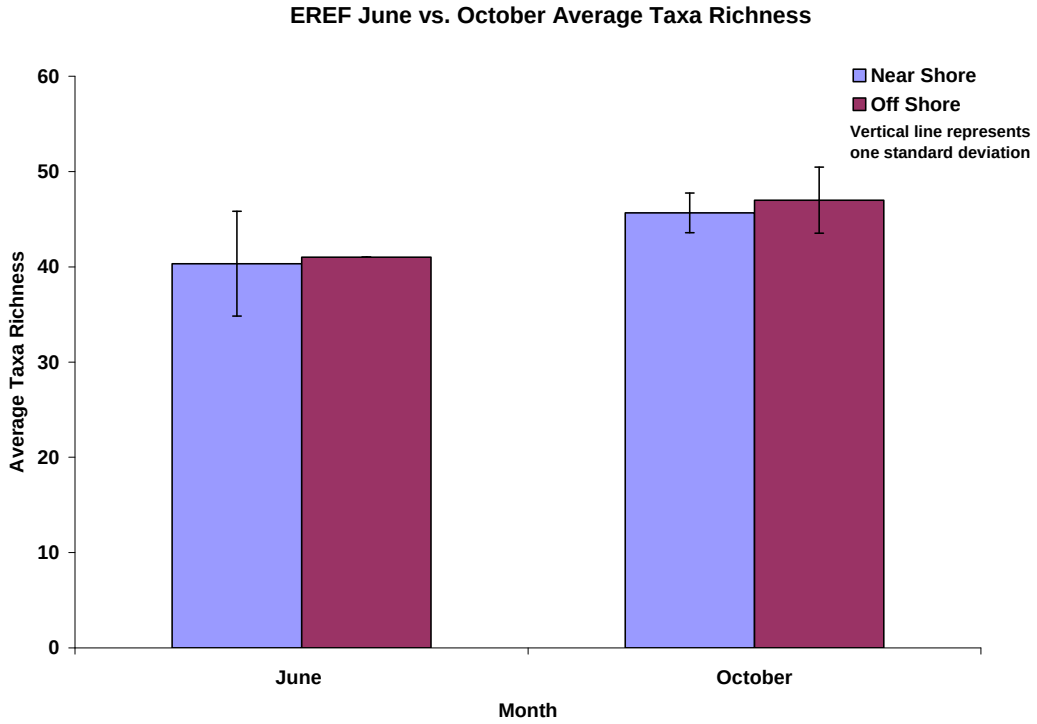


Figure G23. ECKD June vs. October average total taxa richness for nearshore and offshore areas

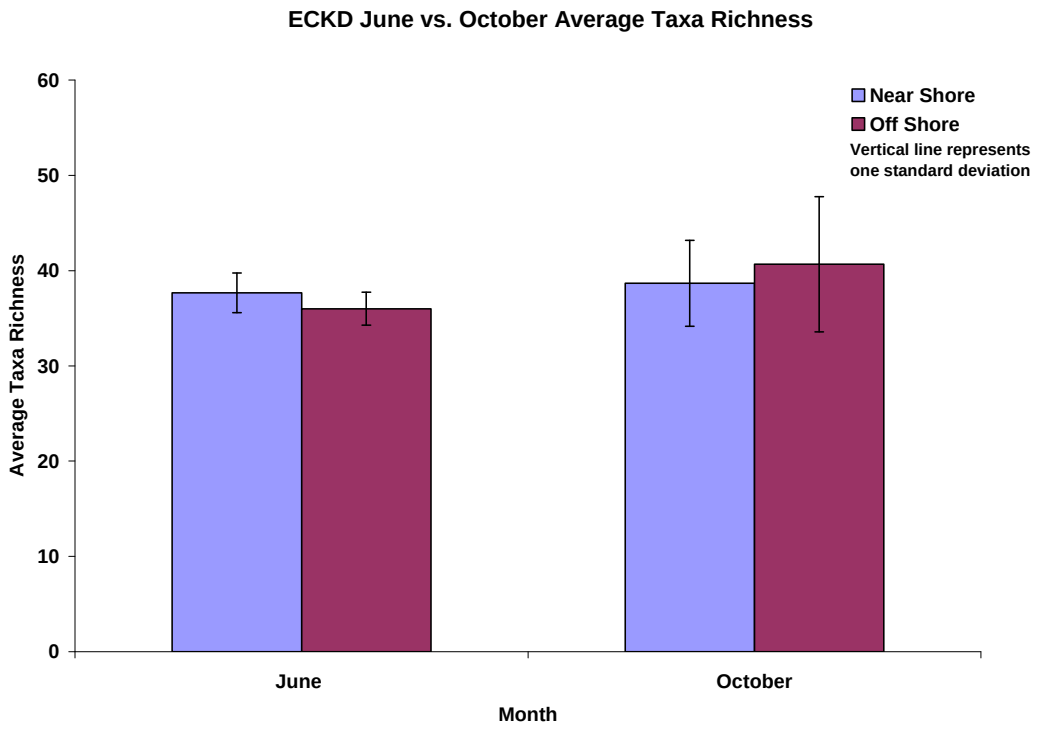


Figure G24. SEEP1 June vs. October average total taxa richness for nearshore and offshore areas

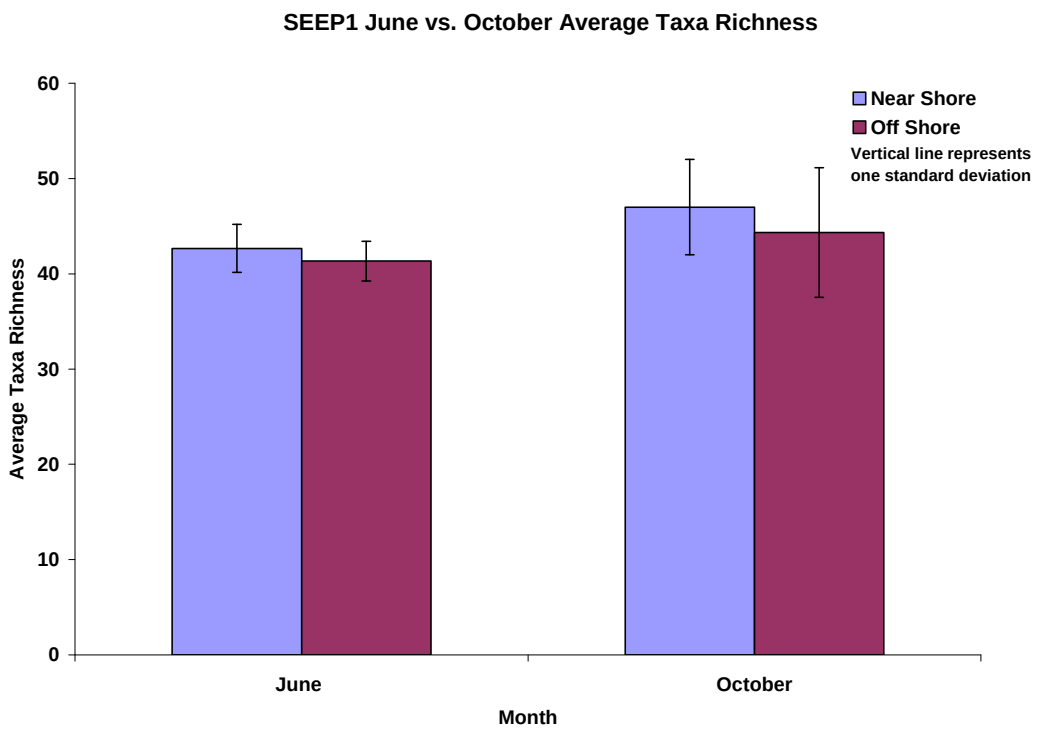


Figure G25. SEEP2 June vs. October average total taxa richness for nearshore and offshore areas

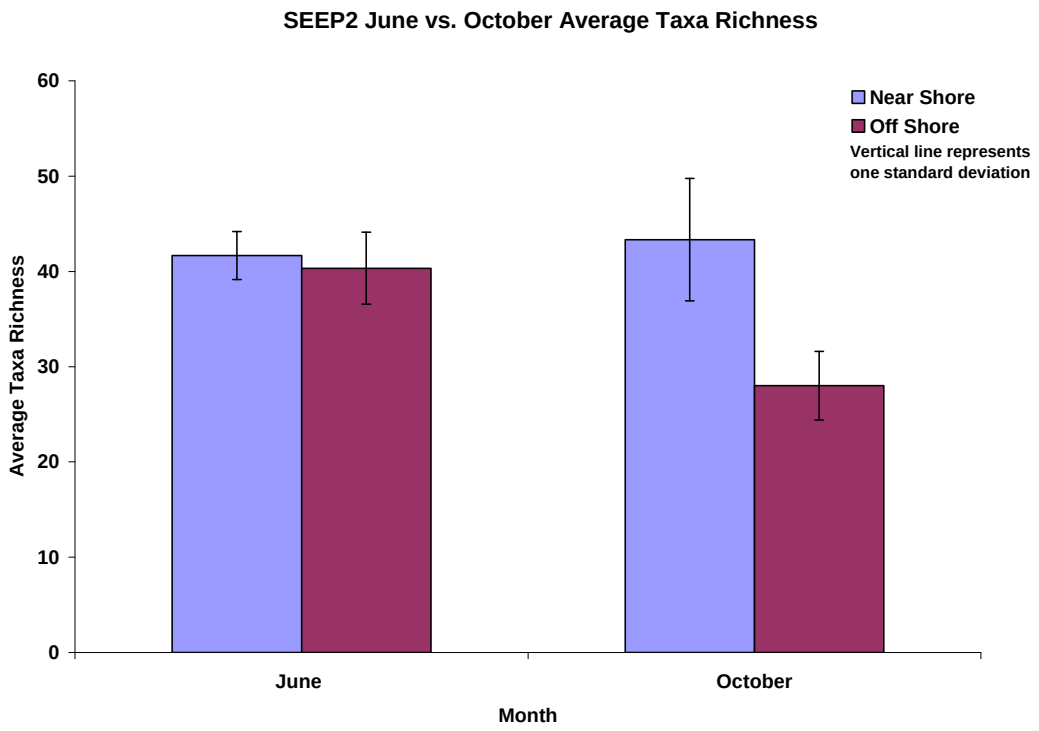


Figure G26. WCKD June vs. October average total taxa richness for nearshore and offshore areas

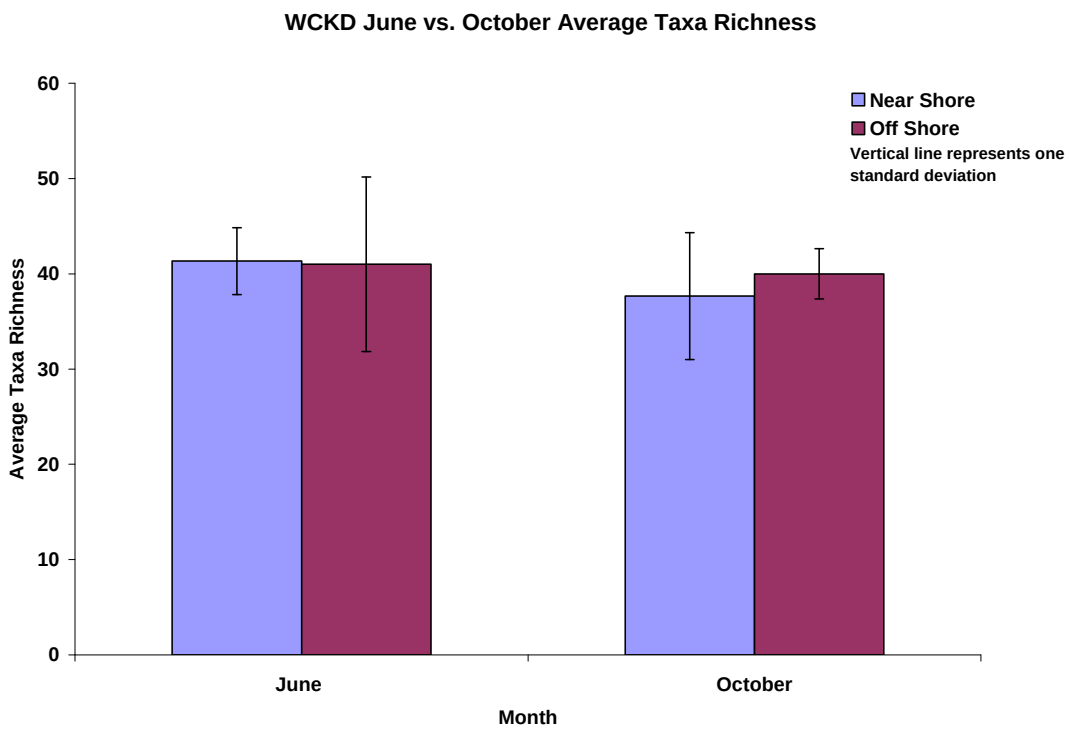
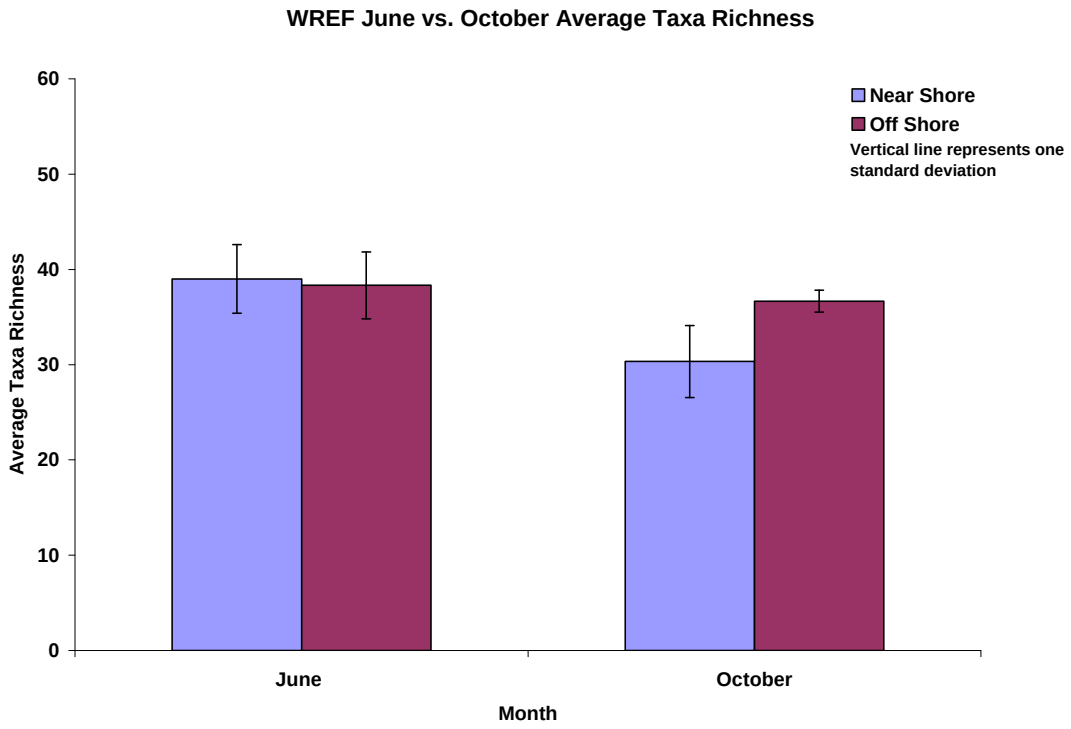


Figure G27. WREF June vs. October average total taxa richness for nearshore and offshore areas



Appendix H

Raw Physiochemical Data

Water temperature (C), specific conductance (µS/cm), dissolved oxygen (mg/L), pH, and turbidity (NTU) at basket sampler locations near Bay Harbor, May-June 2006.

Location/Date	Time	Temp	Sp. Cond.	DO	pH	Turbidity
EREF-NS						
May 17	1630	9.76	293	11.98	8.51	--[a]
May 26		11.81	272	15.55	8.65	1.29
June 1		15.82	274	12.28	8.72	3.82
June 9	1215	15.20	263	10.33	8.36	1.23
June 16	1150	11.44	249	15.48	8.60	0.73
June 23	1200	18.58	266	10.47	8.43	0.78
June 26	1300	19.84	300	10.48	8.57	0.92
Mean		14.64	274	12.37	8.55	1.46
EREF-OS						
May 17	1800	9.38	289	12.29	8.40	--[a]
May 26		11.36	272	15.17	8.52	0.62
June 1		14.68	266	12.23	8.53	1.52
June 9	1215	15.20	262	10.36	8.33	1.21
June 16	1157	10.85	249	15.09	8.52	0.49
June 23	1200	18.43	264	10.30	8.38	0.71
June 26	1300	19.44	292	9.87	8.46	0.67
Mean		14.19	271	12.19	8.45	0.87
ECKD-NS						
May 17	1415	9.66	286	12.53	8.28	0.44
May 26		10.88	267	15.00	8.67	2.40
June 1		14.49	271	11.92	8.51	2.01
June 9	1130	15.18	264	10.19	8.28	0.78
June 16	1117	10.57	249	15.52	8.50	0.36
June 23	1130	18.12	265	9.51	8.32	0.61
June 27	800	18.00	302	8.66	8.61	0.72
Mean		13.84	272	11.90	8.45	1.05
ECKD-OS						
May 17	1330	8.89	283	12.91	8.23	0.30
May 26		10.10	268	14.57	8.50	1.55
June 1		14.06	270	12.00	8.46	2.16
June 9	1130	15.06	261	10.53	8.25	0.84
June 16	1123	10.37	250	15.45	8.41	0.60
June 23	1130	18.02	263	9.46	8.29	0.41
June 27	800	18.01	289	8.63	8.39	0.49
Mean		13.50	269	11.94	8.36	0.91

Water temperature (C), specific conductance (µS/cm), dissolved oxygen (mg/L), pH, and turbidity (NTU) at basket sampler locations near Bay Harbor, May-June 2006.

Location/Date	Time	Temp	Sp. Cond.	DO	pH	Turbidity
SEEP1-NS						
May 16	1830	12.21	297	11.78	8.61	0.42
May 26		10.74	265	14.43	8.46	0.69
June 1		14.40	262	12.56	8.58	1.05
June 9	1045	14.66	260	10.30	8.37	2.95
June 16	1012	14.06	253	13.56	8.39	0.62
June 23		17.84	260	9.78	8.39	1.06
June 27	1530	20.76	300	10.50	8.40	0.97
Mean		14.95	271	11.84	8.46	1.11
SEEP1-OS						
May 16	1715	10.32	291	12.14	8.40	0.20
May 26		10.24	263	14.45	8.37	0.41
June 1		13.23	260	12.50	8.48	0.45
June 9	1045	14.63	261	10.57	8.33	3.73
June 16	1023	10.47	250	15.17	8.42	1.43
June 23		17.26	261	10.01	8.34	0.99
June 27	1530	19.89	279	10.16	8.28	0.51
Mean		13.72	266	12.14	8.37	1.10
SEEP2-NS						
May 16	1400	11.24	308	12.24	8.46	0.45
May 26		9.67	266	14.15	8.38	1.23
June 1		14.18	264	12.72	8.59	2.50
June 9	1015	14.63	260	10.31	8.32	6.46
June 16	943	12.09	250	13.49	8.39	0.56
June 23	952	16.80	261	9.85	8.31	0.98
June 28	800	17.40	300	8.59	8.07	1.09
Mean		13.72	273	11.62	8.36	1.90
SEEP2-OS						
May 16	1530	9.43	295	12.24	8.36	0.34
May 26		9.24	264	13.84	8.29	0.67
June 1		13.19	261	12.37	8.46	0.85
June 9	1015	14.62	260	10.39	8.32	2.24
June 16	946	10.60	248	14.44	8.42	5.43
June 23	930	16.90	261	9.78	8.29	0.60
June 28	800	17.58	288	9.03	8.11	0.52
Mean		13.08	268	11.73	8.32	1.52

Water temperature (C), specific conductance (µS/cm), dissolved oxygen (mg/L), pH, and turbidity (NTU) at basket sampler locations near Bay Harbor, May-June 2006.

Location/Date	Time	Temp	Sp. Cond.	DO	pH	Turbidity
WCKD-NS						
May 16	1045	10.24	356	12.52	8.15	0.75
May 26		9.64	268	13.71	8.23	0.60
June 1		13.40	275	12.53	8.43	0.62
June 9	930	14.55	261	10.35	8.30	2.27
June 16	855	12.36	250	14.34	8.40	1.36
June 23		16.99	262	9.62	8.27	1.47
June 28	1300	19.56	301	10.92	8.39	1.26
Mean		13.82	282	12.00	8.31	1.19
WCKD-OS						
May 16	1230	8.52	293	12.51	8.09	0.31
May 26		9.28	267	13.53	8.18	0.49
June 1		12.54	264	12.65	8.38	1.28
June 9	930	14.55	260	10.30	8.29	4.78
June 16	900	10.49	249	14.97	8.38	0.30
June 23		17.08	262	9.56	8.24	0.51
June 28	1300	19.10	283	10.51	8.34	0.80
Mean		13.08	268	12.00	8.27	1.21
WREF-NS						
May 17	1040	8.39	281	12.94	8.29	0.92
May 26		9.41	293	12.57	7.94	0.67
June 1		12.37	274	12.13	8.37	1.90
June 9	1445	16.55	263	9.69	8.38	3.44
June 16	755	12.21	251	13.71	7.25	1.36
June 23		16.52	263	9.50	8.22	0.63
June 29	800	16.91	272	9.61	8.14	2.83
Mean		13.19	271	11.45	8.08	1.68
WREF-OS						
May 17	1000	7.88	278	12.64	8.22	0.39
May 26		9.37	287	12.46	8.01	0.55
June 1		12.10	267	11.66	8.32	0.69
June 9	845	14.52	260	10.52	8.27	2.95
June 16	800	11.00	250	14.54	7.56	0.51
June 23		16.66	263	9.50	8.21	0.60
June 29	800	17.06	269	9.38	8.12	2.99
Mean		12.66	268	11.53	8.10	1.24

[a] - Heavy wave action precluded meaningful measurements

Water temperature (C), specific conductance (µS/cm), dissolved oxygen (mg/L), pH, and turbidity (NTU) at basket sampler locations near Bay Harbor, September-October 2006.

Location/Date	Time	Temp	Sp. Cond.	DO	pH	Turbidity
EREF-NS						
September 7	1030	19.71	273	10.52	8.51	1.15
September 15	1355	11.88	265	13.38	8.28	3.12
September 22	1111	15.64	272	11.25	8.44	0.54
September 29	1213	14.42	310	14.33	8.67	0.44
October 6	1211	14.58	280	14.64	8.91	1.05
October 13	1139	12.42	269	10.60	8.28	2.10
October 20	--[a]	--[a]	--[a]	--[b]	--[b]	--[a]
Ocotber 26	930	9.27	302	9.64	8.24	0.86
Mean		13.99	282	12.05	8.48	1.32
EREF-OS						
September 7	1020	19.79	266	10.45	8.52	1.00
September 15	1402	11.38	260	12.99	8.21	0.49
September 22	1117	15.92	273	10.73	8.41	0.48
September 29	1220	14.50	320	14.87	8.72	0.82
October 6	1218	14.55	294	13.52	8.81	0.69
October 13	1140	--[a]	--[a]	--[a]	--[a]	--[a]
October 20	--[a]	--[a]	--[a]	--[b]	--[b]	--[a]
Ocotber 26	943	9.43	292	9.23	8.17	0.65
Mean		14.26	284	11.97	8.47	0.69
ECKD-NS						
September 7	1130	20.09	271	11.21	8.67	1.04
September 15	1317	12.87	275	12.54	8.35	1.86
September 22	1044	14.42	284	10.29	8.23	0.68
September 29	1138	13.77	267	12.02	8.43	0.49
October 6	1130	14.25	266	9.86	8.43	0.33
October 13	1118	12.75	278	10.27	8.26	3.10
October 20	--[a]	--[a]	--[a]	--[b]	--[b]	--[a]
Ocotber 26	836	9.54	274	8.20	7.67	0.82
Mean		13.96	274	10.63	8.29	1.19

Water temperature (C), specific conductance (µS/cm), dissolved oxygen (mg/L), pH, and turbidity (NTU) at basket sampler locations near Bay Harbor, September-October 2006.

Location/Date	Time	Temp	Sp. Cond.	DO	pH	Turbidity
ECKD-OS						
September 7	1135	20.34	258	10.90	8.56	0.57
September 15	1326	11.08	264	12.48	8.12	1.41
September 22	1050	14.85	280	9.89	8.24	0.51
September 29	1144	14.18	265	11.92	8.45	0.51
October 6	1137	14.47	267	9.63	8.43	0.49
October 13	1121	12.76	280	10.07	8.26	2.18
October 20	--[a]	--[a]	--[a]	--[b]	--[b]	--[a]
Ocotber 26	842	9.75	273	8.30	7.90	0.56
Mean		13.92	270	10.46	8.28	0.89
SEEP1-NS						
September 7	1335	21.93	248	11.85	8.68	0.65
September 15	1035	10.14	264	11.78	8.13	0.56
September 22	948	14.79	284	9.90	8.24	0.44
September 29	1029	13.22	267	11.92	8.42	0.55
October 6	1040	13.07	268	9.64	8.42	0.48
October 13	1024	11.51	284	10.50	8.26	2.98
October 20	1055	10.11	280	--[b]	--[b]	0.38
Ocotber 24	1500	9.88	282	11.71	8.29	0.47
Mean		13.08	272	11.04	8.35	0.81
SEEP1-OS						
September 7	1340	20.87	256	11.08	8.58	0.79
September 15	1042	9.75	261	11.67	8.04	0.39
September 22	957	15.62	276	9.94	8.30	0.42
September 29	1036	14.32	268	11.38	8.40	0.67
October 6	1048	13.99	268	9.45	8.39	0.37
October 13	1027	11.72	273	10.53	8.25	2.84
October 20	1101	10.87	280	--[b]	--[b]	0.47
Ocotber 25	1700	10.29	272	10.41	8.48	0.38
Mean		13.43	269	10.64	8.35	0.79

Water temperature (C), specific conductance (µS/cm), dissolved oxygen (mg/L), pH, and turbidity (NTU) at basket sampler locations near Bay Harbor, September-October 2006.

Location/Date	Time	Temp	Sp. Cond.	DO	pH	Turbidity
SEEP2-NS						
September 6	1915	22.67	250	9.80	8.69	1.85
September 15	945	9.77	263	12.15	8.08	0.49
September 22	921	14.41	303	9.69	8.07	0.71
September 29	956	13.58	267	11.87	8.43	0.50
October 6	947	12.58	277	9.28	8.37	0.61
October 13	1003	11.86	280	10.20	8.25	1.92
October 20	1030	10.75	280	--[b]	--[b]	0.26
Ocotber 24	938	9.35	284	12.25	8.26	0.46
Mean		13.12	276	10.75	8.31	0.85
SEEP2-OS						
September 6	1920	22.08	252	10.19	8.62	0.49
September 15	957	9.46	261	12.29	8.04	0.41
September 22	928	15.15	278	9.39	8.18	0.54
September 29	1005	14.26	269	10.50	8.39	0.41
October 6	956	13.79	271	8.95	8.35	0.29
October 13	1006	11.98	275	10.42	8.25	2.10
October 20	1037	11.26	280	--[b]	--[b]	0.28
Ocotber 25	1350	10.43	273	10.23	8.43	0.19
Mean		13.55	270	10.28	8.32	0.59
WCKD-NS						
September 6	1615	24.67	251	11.13	8.83	3.17
September 15	912	9.96	290	9.71	7.88	1.56
September 22	850	14.06	284	9.18	8.02	0.93
September 29	903	12.85	280	11.08	8.28	0.45
October 6	901	11.69	291	8.91	8.25	0.65
October 13	935	11.27	279	10.61	8.24	2.60
October 20	949	10.51	293	--[b]	--[b]	0.26
Ocotber 25	900	10.32	277	9.38	8.06	0.30
Mean		13.17	281	10.00	8.22	1.24

Water temperature (C), specific conductance (µS/cm), dissolved oxygen (mg/L), pH, and turbidity (NTU) at basket sampler locations near Bay Harbor, September-October 2006.

Location/Date	Time	Temp	Sp. Cond.	DO	pH	Turbidity
WCKD-OS						
September 6	1620	23.39	252	11.35	8.72	3.08
September 15	914	9.36	261	11.09	7.96	0.51
September 22	857	14.98	277	9.49	8.20	0.44
September 29	915	13.67	273	10.62	8.29	0.67
October 6	912	11.86	304	8.73	8.19	0.55
October 13	941	11.26	290	10.47	8.23	2.18
October 20	956	10.69	297	--[b]	--[b]	0.40
Ocotber 25	906	10.36	277	9.27	8.06	0.51
Mean		13.20	279	10.15	8.24	1.04
WREF-NS						
September 6	1430	21.91	253	10.75	8.65	0.92
September 15	803	9.25	284	10.93	7.86	0.52
September 22	810	14.74	281	8.76	8.06	0.56
September 29	801	13.76	271	9.89	8.10	0.45
October 6	815	13.02	281	8.60	8.22	0.43
October 13	902	11.50	279	10.45	8.23	1.11
October 20	913	10.24	283	--[b]	--[b]	0.38
Ocotber 24	1630	11.24	276	11.97	8.28	0.52
Mean		13.21	276	10.19	8.20	0.61
WREF-OS						
September 6	1445	21.49	254	10.75	8.63	0.50
September 15	830	8.98	261	11.55	7.85	0.66
September 22	820	15.23	278	8.99	8.11	0.67
September 29	808	13.57	272	10.08	8.16	0.92
October 6	823	13.39	277	8.44	8.24	0.37
October 13	906	12.19	273	10.20	8.23	0.93
October 20	919	11.37	281	--[b]	--[b]	0.31
Ocotber 26	1100	11.48	284	10.71	8.59	0.31
Mean		13.46	273	10.10	8.26	0.58

[a] - Heavy wave action precluded meaningful measurements

[b] - No measurements due to meter malfunction.

Appendix I

Field Data Sheets

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area East Reference Site Code EREF-NS Sample Type: Rock Basket

Date: Set 5-17-06 Collected _____ Effort: Set 1530-1630 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.85	2.00	1.70	1.85	1.80	1.65	2.00	2.05
Ret.								
Basket Depth								
Set	1.30	1.30	1.35	1.25	1.20	1.00	1.55	1.50
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

1203

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	9.76	11.81	15.82	15.20	11.44	18.58	
Specific Cond.	293	272	274	263	249	266	
D.O.	11.85-12.10	15.55	12.28	10.33	15.48	10.47	
pH	8.51	8.65	8.72	8.36	8.60	8.43	
Turbidity		.63-6.96	3.82	1.03-1.42			

Substrate Characteristics (%)

Bedrock	
Boulder	60
Artifacts	
Lg. Gravel	40
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 22.238 N
84° 59.974 W

Photos

Date	#	Date	#
5-26-06	229 230 231	6-26-06	
6-1-06	211 212 218		
6-9-06	N/A		
6-16-06	205-210		
6-23-06	059-064		

Notes:

Turbidity & depth data not collected at the time the samplers were set due to wave conditions. For the same reason, photos of the baskets were not taken during the set. Storm blew in w/ NW winds making set difficult.
- Rich Henry w/ USFWS observed & helped w/ setting the rock baskets.
- Baskets set east of the mouth of a small creek running along the east boundary of the East CKD exclusion zone. Baskets set in depth similar to other sites.
- Algae more abundant and possibly more diverse both off-shore and near-shore compared to other areas
- Site apparently not surveyed. No marker
- DO fluctuating rapidly w/ heavy-wave conditions
- 5-26-06 Shallow (NS) has little growth - little to no movement
6-1-06 little to no movement - Baskets + balls covered 60-75% w/ Dark Brown Silt
only 10-15% or less growth - brown on baskets, Install spreaders, brush off baskets
Center baskets were disturbed less than outside baskets - Blocks also covered w/ DK Brown Silt
6-9-06 little to no movement - 30-50% growth on basket - silt on balls. Saw Fish

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area East Reference Site Code EREF - NS Sample Type: Rock Basket

Date: Set 5-17-06 Collected 1252- Effort: Set 1530-1630

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.85	2	1.7	1.85	1.8	1.65	2	2.05
Ret.	1.85	1.95	1.80	1.80	1.90	1.90	2.00	2.00
Basket Depth								
Set	1.3	1.3	1.35	1.25	1.2	1	1.55	1.5
Ret.	1.30	1.40	1.30	1.30	1.25	1.10	1.50	1.50
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve → 6/26/06
Time				11:47-12:25	11:50	1200	13:00
Temp.	9.76	11.81	15.82	15.2	11.44	18.58	19.84
Specific Cond.	293	272	274	263	249	266	300
D.O.	11.98 ~~11.85-12.10~~	15.55	12.28	10.33	15.48	10.47	10.48
pH	8.51	8.65	8.72	8.36	8.6	8.43	8.57
Turbidity	NA	~~0.63-1.96~~ 1.29	3.82 avg.	~~1.03-1.42~~ 1.23	~~0.58-0.89~~ 0.73	0.78	0.92

Substrate Characteristics (%)

Bedrock	
Boulder	60
Artifacts	
Lg. Gravel	40
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.238 N
84 deg. 59.974 W

Photos

Date	#	Date	#
5/17/2006	None		
5/26/2006	229,230,231	6/26/06	216,215,214
6/1/2006	211,212,213		
6/9/2006	None		
6/16/2006			

Notes:

5-16-06 - No survey marker was found, they must not have surveyed this location.
Turbidity and depth data not collected at the time of installation due to heavy wave action and rain. For the same reasons, photos of the baskets could not be taken at the time of installation. A storm blew in that made the trap sets difficult.
Strong NW winds, Rich Henery w/USF&WS observed and helped setting sampling arrays.
Sampling arrays were positioned to the east of the mouth of a small creek running along the east boundary of the ECKD exclusion zone. Baskets were set at similar depth as the other sampling locations.
Allgae more aboundant and possibly more diverse both OS and NS compared to other sampling locations.
DO fluctuating rapidly due to heavy wave action.
5-26-05 - Minor movement of sampling array observed. Only minor growth observed on baskets.
Brush off baskets. Mussels observed on undersides of rocks near sampling arrays,
6-1-06 - Little to no movement observed of sampling array, Balls covered with 60-75% dark brown silt.
only 10 to 15% dark brown growth on baskets. Installed spreaders and brush off baskets.
The center baskets were disturbed less than the outside baskets. Concrete blocks are also covered w/dk brwn silt
6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data.
The amount of silt on balls was hard to observe because of the heavy wave action. Baskets covered with 30-50% growth (brown). Brush off traps. No noticable movement of the sampling array. Observed lake trout or small mouth swimming around traps, appeared to be looking for food being washed in by heavy wave action.
6-16-06 - There does not appear to have been any movement of the sampling array.
There appears to be a dramatic decrease in the amount of algae and or paraphyton in the east reference area, possibly due to the heavy wave action at the end of last week or due to sluffing.

5-10% brown/green growth on baskets, 75-80% coverage of the balls with a lite coating of orange/brown silt.

No visable mussels. Very calm conditions. Brush off baskets.

90-95% of the algae on the rocks and substraight is gone between 1-ft of depth to shore line.

Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.

6-26-06

- Baskets in good shape. Coverage similar on 1, 2, 4, 5, 7, 8. # 3 noticeably less coverage. As such, #3 not selected for sample. Periphyton 1, 5, 7 Benthos 2, 4, 6

Calibration

YSI	Read	Cal
DO =	99.6	98.2
Sp Cond =	1000	1000
pH =	6.82	7.0
	10.15	10.0

Post. Cal.

YSI	Read	cal
pH =	9.98	10.00
	7.17	7.00
Sp. cond. =	1988	1000

Turbidity

100 NTU = 99.8

800 NTU = 798.0

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area East Reference Site Code EREF-05 Sample Type: Rock Basket

Date: Set 5-17-06 Collected _____ Effort: Set 1630-1800 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	~~1.85~~	~~2.00~~	~~1.70~~	~~1.85~~	~~1.80~~	~~1.65~~	~~2.00~~	~~2.05~~
Ret.	2.50	2.50	2.40	2.40	2.55	2.40	2.45	2.35
Basket Depth								
Set	~~1.30~~	~~1.30~~	~~1.35~~	~~1.25~~	~~1.30~~	~~1.00~~	~~1.55~~	~~1.50~~
Ret.	1.90	1.95	1.90	1.95	1.80	1.85	1.85	1.85
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	9.38	11.36	14.68	15.20	10.85	18.43	
Specific Cond.	289	272	266	262	249	264	
D.O.	12.29	15.17	12.23	10.36	15.09	10.30	
pH	8.4	8.52	8.53	8.33	8.52	8.38	
Turbidity		0.59-0.64	1.52 AVE	1.19-1.22			

Substrate Characteristics (%)

Bedrock	
Boulder	70
Artifacts	
Lg. Gravel	30
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 22.242 N
84° 59.975 W

Photos

Date	#	Date	#
5-26-06	226 227 228	6-23-06	265-267
6-1-06	208 209 210		
6-9-06	N/A		
6-16-06	241-245		

Notes:

*Turbidity, depth, + photos not taken due to wave conditions.
- Large zebra mussels present + relatively dense

5-26-06 alot of movement in Baskets - little growth
6-1-06 No Noticable movement - balls + baskets covered 60-75% w/ DK Brown Silt
Growth 15-20% on Basket DK Brown - Concrete blocks were also covered w/ Brown silt.
Install Spreaders, Brush off Baskets, Center Baskets disturbed less than outside Baskets.
6-9-06 little to no movement of Baskets, 30-40% Covered on baskets, some Silt on balls
6-16-06 No movement 0-5% b/g growth on baskets - 70-80% of balls covered w/ life film of silt. No Visable MUSSELS 0.45 - 0.53 - 0.51 - 0.47

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area_East Reference_____ Site Code___ EREF - OS Sample Type: Rock Basket

Date: Set 5-17-06 Collected_____ Effort: Set_ 1630-1800

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.5	2.5	2.4	2.4	2.55	2.4	2.45	2.35
Ret.	2.50	2.50	2.60	2.50	2.40	2.35	2.35	2.50
Basket Depth								
Set	1.9	1.95	1.9	1.95	1.8	1.85	1.85	1.85
Ret.	2.00	1.95	1.95	1.95	1.95	1.90	1.85	1.75
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve 6/26
Time				11:47-12:25	11:57	12:00	13:00
Temp.	9.38	11.36	14.68	15.2	10.85	18.43	19.44
Specific Cond.	289	272	266	262	249	264	292
D.O.	12.29	15.17	12.23	10.36	15.09	10.30	9.87
pH	8.4	8.52	853	8.33	8.52	8.39	8.46
Turbidity	NA	~~0.59-0.64~~ 0.62	1.52 avg.	~~1.49-1.22~~ 1.21	~~0.45-0.53~~ 0.49	0.71	0.67

Substrate Characteristics (%)

Bedrock	
Boulder	70
Artifacts	
Lg. Gravel	30
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.242 N
84 deg. 59.975 W

Photos

Date	#	Date	#
5/17/2006	None		
5/26/2006	226,227,228	6/26/06	220, 219, 218, 217
6/1/2006	208,209,210		
6/9/2006	None		
6/16/2006			

Notes:

5-16-06 - No survey marker was found, they must not have surveyed this location.
Turbidity and depth data not collected at the time of installation due to heavy wave action and rain. For the same reasons, photos of the baskets could not be taken at the time of installation. A storm blew in that made the trap sets difficult.
Strong NW winds, Rich Henery w/USF&WS observed and helped setting sampling arrays.
Sampling arrays were positioned to the east of the mouth of a small creek running along the east boundary of the ECKD exclusion zone. Baskets were set at similar depth as the other sampling locations.
Allgae more aboundant and possibly more diverse both OS and NS compared to other sampling locations.
Large zebra mussels observed and relatively dense.

5-26-05 - Sampling array was moved substatially by wave action. Only minor growth observed on baskets.
Brush off baskets. Mussels observed on undersides of rocks near sampling arrays,

6-1-06 - Little to no movement observed of sampling array, Baskets and balls covered with 60-75% covered with dark brown silt. only 15 to 20% dark brown growth on baskets. Installed spreaders and brush off baskets.
The center baskets were disturbed less than the outside baskets. Concrete blocks are also covered w/dk brwn silt

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data.
The amount of silt on balls was hard to observe because of the heavy wave action. Baskets covered with 30-40% growth (brown). Brush off traps. No noticable movement of the sampling array. Observed lake trout or small mouth swimming around traps, appeared to be looking for food being washed in by heavy wave action.

6-16-06 - There does not appear to have been any movement of the sampling array.
There appears to be a dramatic decrease in the amount of algae and or paraphyton in the east reference area, possibly due to the heavy wave action at the end of last week or due to sluffing.

0-5% brown/green growth on baskets, 70-80% coverage of the balls with a lite coating of orange/brown silt.

No visable mussels. Very calm conditions. Brush off baskets.

90-95% of the algae on the rocks and substraight is gone between 1-ft of depth to shore line.

Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.

6-26-06

Baskets in good shape. Coverage similar among all eight, As such

Periphyton 1, 3, 5 + Benthos 2, 4, 6

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area East CKD Site Code ECKD-NS Sample Type: Rock Basket

Date: Set 5-17-06 Collected _____ Effort: Set 1330-1415 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.7	1.7	1.85	1.7	1.6	1.6	1.6	1.5
Ret.								
Basket Depth								
Set	1.1	1.1	1.25	1.1	1.0	1.0	1.0	0.95
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	9.66	10.88	14.49	15.18	10.57	18.12	
Specific Cond.	286	267	271	264	249	265	
D.O.	12.53	15.00	11.92	10.19	15.52	9.51	
pH	8.28	8.65	8.57	8.29	8.50	8.32	
Turbidity	0.44	1.78-3.03	2.07 Avg	0.67-0.88			

Substrate Characteristics (%)

Bedrock	70
Boulder	10
Artifacts	
Lg. Gravel	20
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 22.205N
85° 00.256 W

Photos

Date	#	Date	#
5-17-06	223, 222, 221	6-23-06	5-pic
5-26-06	235 236 237		
6-1-06	217 218 219		
6-9-06	N/A		
6-16-06	5-6 pics		

Notes:

- No Shore marker found, site apparently was not surveyed.
- Near Shore, substrate covered w/ white chalky material. Near shore samplers set approximately at the border of the furthest extent of the material in depth similar to other sites
- Very little living on rocks near-shore. More off-shore. Density of zebra mussels very low. None observed.

5-26-06 Little to No movement of Array - slight 2-4" waves Coming Strait in & the water is chalky less growth on basket - only brown No green growth

6-1-06 the baskets are covered w/ 50-60% growth brown - no green - ~~little to no~~ No Noticable movement - little to No silt on balls 5-10% - Noticed more after I brushed off the baskets. Baskets were brushed off after installing the Spreaders. Center baskets were disturbed less than outside baskets

6-1-06 little to no movement - 30-50% Cover of w/ brown growth on baskets - minor growth silt on balls

6-16-06 no movement - No growth on baskets - 5-25% orange growth on balls - no mussels

0.23 - 0.45 - 0.43 - 0.48

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area_East CKD_____ Site Code___ ECKD - NS Sample Type: Rock Basket

Date: Set___5-17-06_____ Collected 6/27/06 Effort: Set_ 1330-1415 1000-

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.7	1.7	1.85	1.7	1.6	1.6	1.6	1.5
Ret.	1.65	1.72	1.82	1.76	1.72	1.66	1.54	1.60
Basket Depth								
Set	1.1	1.1	1.25	1.1	1	1	1	0.95
Ret.	1.10	1.18	1.32	1.18	1.16	1.00	0.98	0.98
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve → 6/27/06
Time				11:00-11:47	11:17	1130	0800
Temp.	9.66	10.88	14.49	15.18	10.57	18.12	18.00
Specific Cond.	286	267	271	264	249	265	302
D.O.	12.53	15	11.92	10.19	15.52	9.51	8.66
pH	8.28	8.67	8.51	8.28	8.5	8.32	8.61
Turbidity	0.44 avg.	1.~~78-3.03~~ 2.40	2.01 avg.	~~0.67-0.88~~ 0.78	0.~~23-0.48~~ 0.36	0.61	0.72 1.0-0.61-0.65-0.62

Substrate Characteristics (%)

Bedrock	70
Boulder	10
Artifacts	
Lg. Gravel	20
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.205 N
85 deg. 00.256 W

Photos

Date	#	Date	#
5/17/2006	221,222,223		
5/26/2006	235,236,237	6-27-06	212,211,210
6/1/2006	217,218,219		
6/9/2006	None		
6/16/2006			

Notes:

5-16-06 - No survey marker was found, they must not have surveyed this location.
Near shore substrate covered with white chalky material. Near shore sampling array set approximately at the boundary of the furthest off shore extent of the material in depth similar to the other NS sampling arrays.
Little to no life observed on rocks near shore, more off shore. Density of zebra mussels very low, none observed

5-26-05 - Sampling array was moved slightly due to wave action and had to be repositioned. The waves are coming straight in toward the shore line and making the water chalky from the white material. Little growth (brown) on baskets, brush off baskets. No mussels observed,

6-1-06 - Little to no movement observed of sampling array, 50-60% brown growth on baskets.
some (5-10%)silt on each balls. Brushed off baskets after the spreaders were installed. No baskets were removed from the water. The center baskets were disturbed less than the outside baskets.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data.
some (5-10%)silt on each balls, the baskets were covered with 30-50% growth (brown). Brush off traps.
No noticable movement of the sampling array.

6-16-06 - There does not appear to have been any movement of the sampling array.
There appears to be a decrease in the amount of algae and or paraphyton in the east CKD area, possibly due to the heavy wave action at the end of last week or due to sluffing.
No growth on baskets, 5-15% coverage of the balls with a lite coating of orange silt.
No visable mussels. Very calm conditions. Brush off baskets.
Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.

6-27-06 - Paraphyton - 1,3,5 Benthos - 2,4,6 Coverage similar to EREF, possibly slightly less

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area East CKD Site Code ECKD-05 Sample Type: Rock Basket

Date: Set 5-17-06 Collected _____ Effort: Set 1230-1330 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.5	2.4	2.45	2.4	2.3	2.3	2.1	2.15
Ret.								
Basket Depth								
Set	1.85	1.75	1.8	1.85	1.8	1.7	1.5	1.5
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06 11:23	6-23-06 11:25	Retrieve
Temp.	8.89	10.10	14.06	15.06	10.37	18.02	
Specific Cond.	283	268	270	261	250	263	
D.O.	12.91	14.51	12.00	10.53	15.45	9.46	
pH	8.23	8.50	8.46	8.25	8.41	8.29	
Turbidity	0.30	1.38-1.71	2.1 avg	.80-.87			

Substrate Characteristics (%)

Bedrock	80
Boulder	15
Artifacts	
Lg. Gravel	5
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 22.209 N
85° 00.257 W

Photos

Date	#	Date	#
5-17-06	226, 225, 224	6-23-06	6 pics
5-26-06	232 233 234		
6-1-06	214 215 216		
6-9-06	NEA		
6-16-06	4-5 pics		

237?

Notes: 5-26-06 Little to No movement of the baskets – more growth on OS than NS little to no green growth – water a little cloudy – Sculpin swimming around baskets
6-1-06 baskets have 40-50% brown growth on them – little to No silt on balls
little to no movement of Sampling Array, installed Spreaders, brush off baskets,
Center Baskets were disturbed less than outside baskets.
6-9-06 Little to no movement – 20-30% growth on basket – minor silt on balls

6-16-06 – No movement – 0-5% growth on baskets – 5-15% orange on balls – no mussels
0.40 – 0.67 – 0.74 – 0.80

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area_East CKD_____ Site Code___ ECKD - OS Sample Type: Rock Basket

Date: Set___5-17-06_____ Collected_6-27-06 Effort: Set_ 1230-1330 1000 - 1200

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.5	2.4	2.45	2.4	2.3	2.3	2.1	2.15
Ret.	2.40	2.4	2.35	2.40	2.25	2.30	2.11	2.20
Basket Depth								
Set	1.85	1.75	1.8	1.85	1.8	1.7	1.5	1.5
Ret.	1.80	1.85	1.80	1.90	1.85	1.64	1.60	1.55
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve → 6/27/06
Time				11:00-11:47	11:23	1130	0800
Temp.	8.89	10.1	14.06	15.06	10.37	18.02	18.01
Specific Cond.	283	268	270	261	250	263	289
D.O.	12.91	14.57	12	10.53	15.45	9.46	8.63
pH	8.23	8.5	8.46	8.25	8.41	8.29	8.39
Turbidity	0.3 avg.	~~1.38-1.71~~ 1.55	2.16 avg.	~~0.80-0.87~~ 0.84	~~0.40-0.80~~ 0.6	0.41	0.49 0.47-0.48-0.47-0.53

Substrate Characteristics (%)

Bedrock	80
Boulder	15
Artifacts	
Lg. Gravel	5
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.209 N
85 deg. 00.257 W

Photos

Date	#	Date	#
5/17/2006	224,225,226		
5/26/2006	232,233,234	6-27-06	209,208,207
6/1/2006	214,215,216		
6/9/2006	None		
6/16/2006			

Notes:

5-16-06 - No survey marker was found, they must not have surveyed this location.
Near shore substrate covered with white chalky material. Near shore sampling array set approximately at the boundary of the furthest off shore extent of the material in depth similar to the other OS sampling arrays.
Little to no life observed on rocks near shore, more off shore. Density of zebra mussels very low, none observed
5-26-05 - Little to no movement of sampling array observed. More growth on OS baskets than NS Baskets.
The water is slightly chalky. Scuplin observed swimming around baskets.
brush off baskets. No mussels observed,
6-1-06 - Little to no movement observed of sampling array, 40-50% brown growth on baskets.
Little to no silt observed on balls. Brushed off baskets after the spreaders were installed. No baskets were removed from the water. The center baskets were disturbed less than the outside baskets.
6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data.
Minor amounts of silt absorved on balls, the baskets were covered with 20-30% growth (brown). Brush off traps.
No noticable movement of the sampling array.
6-16-06 - There does not appear to have been any movement of the sampling array.
There appears to be a decrease in the amount of algae and or paraphyton in the east CKD area, possibly due to the heavy wave action at the end of last week or due to sluffing.
0-5% brown/green growth on baskets, 5-15% coverage of the balls with a lite coating of orange silt.
No visable mussels. Very calm conditions. Brush off baskets.
Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.

Paraphyton - 1,3,5 Benthos - 2,4,6 Coverage similar to EREF, possibly slightly less

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area SEEP 1 Site Code SEEP1-NS Sample Type: Rock Basket

Date: Set 5-16-06 Collected _____ Effort: Set 1715-1830 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.65	1.7	1.65	1.7	1.7	1.75	1.7	1.7
Ret.								
Basket Depth								
Set	1.1	1.1	1.0	1.1	1.05	1.1	1.1	1.1
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

10:17 1030

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	12.21	10.74	14.40	14.66	14.06	17.84	
Specific Cond.	297	265	262	260	253	260	
D.O.	11.78	14.43	12.56	10.30	13.56	9.78	
pH	8.61	8.46	8.58	8.37	8.39	8.39	
Turbidity	0.42	0.63-0.74	1.05 AVG	2.74-3.15			

Substrate Characteristics (%)

Bedrock	
Boulder	20
Artifacts	
Lg. Gravel	80
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 21.710 N
85° 02.690 W

Photos

Date	#	Date	#
5-16-06	238, 237, 236	6-23-06	5 pics
5-26-06	241 242 243		
6-1-06	223 224 225		
6-9-06	None		
6-16-06	5 pics		

Notes:

- Only observed juv. zebra mussels in low density
5-26-06 - Little ~~to no~~ movement of Trap - More brown/green growth than previous 3-site to west. No Zeebs. - Brush off Traps
6-1-06 15-20% Growth ~~mostly brown, less than~~ 50% green / 50% Brown - Brown silt on balls 10-15% Covera
No Noticable movement. Brush off baskets after we installed Spreaders. Center Baskets were disturbed less than outside Baskets
6-9-06 Little to No movement of Baskets - baskets covered w/ 60-75% brown growth balls have some silt on them
6-16-06 No movement - 50-75% b/g growth - 5-50% coverage of balls orange
No MUSSELS - 2-3 Sculpin around basket @ OS basket
0.63-0.63-0.61-0.60

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area Seep 1 Site Code Seep 1 - NS Sample Type: Rock Basket

Date: Set 5-16-06 Collected 6-27-06 Effort: Set 1715-1830 1530 - 1630

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.65	1.7	1.65	1.7	1.7	1.75	1.7	1.7
Ret.	1.90	1.75	1.80	1.80	1.90	1.85	1.80	1.85
Basket Depth								
Set	1.1	1.1	1	1.1	1.05	1.1	1.1	1.1
Ret.	1.30	1.10	1.2	1.30	1.25	1.30	1.25	1.25
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve 6/27/06
Time				10:33-11:00	10:12		15:30
Temp.	12.21	10.74	14.4	14.66	14.06	17.84	20.76
Specific Cond.	297	265	262	260	253	260	300
D.O.	11.78	14.43	12.56	10.3	13.56	9.78	10.50
pH	8.61	8.46	8.58	8.37	8.39	8.39	8.40
Turbidity	0.42 avg.	~~0.63-0.74~~ 0.69	1.05 avg.	~~2.74-3.15~~ 2.95	~~0.60-0.63~~ 0.62	1.06	0.97 0.67-1.82-0.74-0.65

Substrate Characteristics (%)

Bedrock	
Boulder	20
Artifacts	
Lg. Gravel	80
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.710 N
85 deg. 02.690 W

Photos

Date	#	Date	#
5/17/2006	236,237,238	6-23-06	036-040
5/26/2006	241,242,243	6-27-06	261,260,259,258,257,256 01-04
6/1/2006	223,224,225		
6/9/2006	None		
6/16/2009	184 - 187		

Notes:

5-16-06 - Only observed juvinal zebra mussels in low density

5-26-05 - Sampling array was moved slightly due to wave action and had to be repositioned. More growth observed on sampling arrays than the previous 3-sampling locations to the west (brown/green). No mussels observed, Brush off baskets.

6-1-06 - No noticable movement of sampling array, 15-20% green/brown growth on baskets, some brown silt on balls (10-15%). Brushed off baskets after the spreaders were installed. No baskets were removed from the water. The center baskets were disturbed less than the outside baskets.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data. some silt on each balls, the baskets were covered with 60-75% growth (brown). Brush off traps. No noticable movement of the sampling array.

6-16-06 - There does not appear to have been any movement of the sampling array. 50-75% brown/green growth on baskets, 5-50% coverage of the balls with coating of orange silt. No visable mussels. Very calm conditions. Brush off baskets. Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.

6-27-06 1,3,5-Paraphyton 2,4,6-Benthos
Noticeably more periphyton growth than ECKD + EREF. Appears to be more benthos and of greater variety than ECKD + EREF
mottled/slimy sculpin captured in sep 6

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area SEEP 1 Site Code SEEP1-OS Sample Type: Rock Basket

Date: Set 5/16/06 Collected _____ Effort: Set 1600-1715 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.5	2.6	2.3	2.4	2.2	2.35	2.35	2.45
Ret.								
Basket Depth								
Set	2.0	1.95	1.9	1.7	1.65	1.65	1.7	1.75
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

1023 1031

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	10.32	10.24	13.23	14.63	10.47	17.36	
Specific Cond.	291	263	260	261	250	261	
D.O.	17.14	14.45	12.50	10.57	15.17	10.01	
pH	8.40	8.37	8.48	8.33	8.42	8.34	
Turbidity	0.20	0.29-0.53	0.45 Avg	3.43-4.02			

Substrate Characteristics (%)

Bedrock	90
Boulder	3
Artifacts	
Lg. Gravel	7
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 21.720 N
85° 02.603 W

Photos

Date	#	Date	#
5-16-06	235, 234, 233	6-23-06	Spics
5-26-06	238 239 240		
6-1-06	220 221 222		
6-9-06	None		
6-16-06			

1036

Several pics + Sculpin

Notes:

- Few zebra mussels observed. Mostly Small

5-26-06 Little movement of trap Some brown/green growth No Zebra - Brush off traps

6-1-06 minor movement of Basket/array - less growth than the NS, mostly green, minor silt on balls - less than NS. Prevel off baskets 3-5% after installing spreaders, Center baskets were disturbed less than outside baskets

6-9-06 little to no movement - baskets covered w/ 75-90% brown growth - Turbidity in water was so high that I could barely tell if growth on balls

6-16-06 - No movement - 50-75% Coverage of Baskets g/b growth - balls - 5-10% orange silt No mussels visable - 1 sculpin 1.16 - 2.17 - 0.90 - 0.68

2-3 Sculpin around baskets

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area Seep 1 Site Code Seep 1 - OS Sample Type: Rock Basket

Date: Set 5-16-06 Collected 6-27-06 Effort: Set 1600-1715 1300-1530

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.5	2.6	2.3	2.4	2.2	2.35	2.35	2.45
Ret.	2.70	2.90	2.60	2.50	2.45	2.35	2.45	2.50
Basket Depth								
Set	2	1.95	1.9	1.7	1.65	1.65	1.7	1.75
Ret.	2.15	2.10	2.10	1.95	1.90	1.85	1.95	2.00
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve → 6/27/06
Time				10:33-11:00	10:23		15:30
Temp.	10.32	10.24	13.23	14.63	10.47	17.26	19.89
Specific Cond.	291	263	260	261	250	261	279
D.O.	12.14	14.45	12.5	10.57	15.17	10.01	10.16
pH	8.4	8.37	8.48	8.33	8.42	8.34	8.28
Turbidity	0.2 avg.	0.29-0.53 0.41	0.45 avg.	~~3.43-4.02~~ 3.73	~~0.68-2.17~~ 1.43	0.99	0.51

0.44 - 0.56 - 0.56 - 0.48

Substrate Characteristics (%)

Bedrock	90
Boulder	3
Artifacts	
Lg. Gravel	7
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.720 N
85 deg. 02.603 W

Photos

Date	#	Date	#
5/17/2006	233,234,235	6-22-06	04 1-045
5/26/2006	238,239,240	6-27-06	255, 254, 253 252, 251, 250 07-012
6/1/2006	220,221,222		
6/9/2006	None		
6/16/2006	188-195		

Notes:

5-16-06 - Only observed juvinal zebra mussels in low density

5-26-05 - Sampling array was moved slightly due to wave action and had to be repositioned. Some brown/green growth on baskets, brush off baskets. No mussels observed,

6-1-06 - Minor amount of movement observed of sampling array, less growth on OS baskets than NS baskets (mostly green) Minor amounts of silt on balls. Brushed off baskets after the spreaders were installed. No baskets were removed from the water. The center baskets were disturbed less than the outside baskets.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data. some silt on each balls, the baskets were covered with 75-90% growth (brown). Brush off traps. No noticable movement of the sampling array. Turbidity was so high due to wave action that it was difficult to see the sampling array at times.

6-16-06 - There does not appear to have been any movement of the sampling array. 50-75% brown/green growth on baskets, 5-80% coverage of the balls with coating of orange silt. No visable mussels. Very calm conditions. Brush off baskets. Saw sculpins or darters around baskets. Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.

6-27-06 1,3,5 - Paraphyton 2,4,6 - Benthos Zebra mussel juvenile obs on spheres (few) Noticeably more growth than ECKD + EREF. Appears to be more benthos and of greater variety than ECKD + EREF

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area Seep 2 Site Code SEEP2-NS Sample Type: Rock Basket

Date: Set 5-16-06 Collected _____ Effort: Set 1245-1400 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth	~~1.25~~							
Set	1.25	1.65	1.8	1.8	1.9	1.75	1.45	1.55
Ret.								
Basket Depth								
Set	0.75	0.9	0.95	1.10	1.05	1.05	0.85	0.8
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6.9.06	6-16-06 943	6-23-06 952	Retrieve -6-28-06
Temp.	11.24	9.67	14.18	14.63	12.09	16.80	
Specific Cond.	308	266	264	260	250	261	
D.O.	12.24	14.15	12.72	10.31	13.49	9.85	
pH	8.46	8.38	8.59	8.32	8.39	8.31	
Turbidity	0.45	1.03-1.43	2.50 Avg	2.28-2.62 103			

Substrate Characteristics (%)

Bedrock	
Boulder	100
Artifacts	
Lg. Gravel	
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 21.784N
85° 02.897W

Photos

Date	#	Date	#
5-16-06	244,243,242,241	6-23-06	5 pics
5-26-06	247 248 249	6-28-06	
6-1-06	227		
6.9-06	None		
6-116-06	5 pics		

Took pics 3-4 of Control trap

Notes:

- few zebra mussels obs. mostly juv.

5-26-06 - little to no movement of the Array - Some brown/green growth - No noticable zebz

6-1-06 No Noticable movement 10-20% growth on basket - some brown/organce silt on balls 5-10% brush off baskets after attach Spreaders. Center baskets were disturbed less than outside baskets

6-9-06 little to no movement of Baskets, growth on basket 25-50% Covered (brown) - minor amount of silt on balls - the Wheescue displacing all but a couple of inches of H_2O over the top of the baskets

- Could see 30-40% silt on balls after I brush them off

6-16-06 no movement Baskets covered 50-90% b/g growth - balls 5-~~50%~~ 75%+ Covered w/orange silt balls on top have less than lower balls

no mussels - its becoming increasingly difficult to scrub off baskets

0.50 - 0.54 - 0.63 - 0.60

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area Seep 2 Site Code Seep2 - NS Sample Type: Rock Basket

Date: Set 5-16-06 Collected 6-28-06 Effort: Set 1245 - 1400

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.25	1.65	1.8	1.8	1.9	1.75	1.45	1.55
Ret.	1.80	1.95	1.75	2.05	2.15	2.05	~~1.85~~	1.80
Basket Depth								
Set	0.75	0.9	0.95	1.1	1.05	1.05	0.85	0.8
Ret.	1.20	1.25	1.35	1.45	1.60	1.35	1.20	1.15
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve 6/28/06
Time				10:00-10:30	9:43	0952	0800
Temp.	11.24	9.67	14.18	14.63	12.09	16.80	17.40
Specific Cond.	308	266	264	260	250	261	300
D.O.	12.24	14.15	12.72	10.31	13.49	9.85	8.59
pH	8.46	8.38	8.59	8.32	8.39	8.31	8.07
Turbidity	0.45 avg.	~~1.03-1.43~~ 1.23	2.50 avg.	~~2.62-10.3~~ 6.46	~~0.50-0.63~~ 0.56	0.98	1.09

1.23; 1.09, 0.93, 1.10

Substrate Characteristics (%)

Bedrock	
Boulder	100
Artifacts	
Lg. Gravel	
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.784 N
85 deg. 02.897 W

Photos

Date	#	Date	#
5/17/2006	241,242,243,244	6-23-06	
5/26/2006	247,248,249	6-28-06	252, 251, 250
6/1/2006	227		
6/9/2006	None		
6/16/2006	170-173		

024-028

249, 248, 247, 2 additional pics taken; poor quality

013-016

Notes:

5-16-06 - Few zebra mussels observed, mostly juvinals

5-26-05 - Little to no movement of the sampling array, some brown/green growth, no noticable mussels

6-1-06 - No noticable movement of sampling array, 10-20% growth on baskets, some brown/orange silt on balls (5-10%). Brushed off baskets after the spreaders were installed. No baskets were removed from the water. The center baskets were disturbed less than the outside baskets.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data. 20-30% of each ball was covered with silt, the baskets were covered with 25-50% growth (brown). Brush off traps. No noticable movement of the sampling array.

6-16-06 - There does not appear to have been any movement of the sampling array. 50-90% brown/green growth on baskets, 5-75% coverage of the balls with coating of orange silt. No visable mussels. Very calm conditions. Brush off baskets. Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets. It is becoming increasingly difficult to scrub or remove the growth off the top of the baskets.

- Coverage less than seep 1 but more than EREF & ECRD, Benthos more like Seep 1
- OS more variable to NS
- periphyton 1, 3, 5 benthos 2, 4, 6
- More filamentous algae on NS than probably what we've seen anywhere else
- Zebra mussels few & small in baskets. None on nation

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area SEEP 2 Site Code SEEP2-OS Sample Type: Rock Basket

Date: Set 5/16/06 Collected _____ Effort: Set 1400-1530 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.5	2.5	2.2	2.35	2.24	2.25	2.30	2.25
Ret.								
Basket Depth								
Set	1.8	1.8	1.65	1.70	1.65	1.55	1.6	1.58
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

946 1000

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	9.43	9.24	13.19	14.62	10.60	16.90	
Specific Cond.	295	264	261	260	248	261	
D.O.	12.24	12.84	12.37	10.39	14.44	9.78	
pH	8.36	8.29	8.46	8.32	8.42	8.29	
Turbidity	0.34	0.56-0.78	.85 Avg	2.06-2.41			

Substrate Characteristics (%)

Bedrock	
Boulder	100
Artifacts	
Lg. Gravel	
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 21.790 N
85° 02.893 W

Photos

Date	#	Date	#
5-16-06	240, 239, 238,	6-23-06	7 pics
5-26-06	244 245 246		
6-1-06	276		
6-9-06	NONE		
6-16-06	5-6 pics		

Notes:

- few Zebra mussels obs mostly inv

5-16-06 Array was moved quite alot - one basket (#4) was outside of Array - No zebra less growth on OS baskets - Re adjust Basket - put more Rocks to hold it.

6-1-06 No noticable movement. 5-10% brown/green 3-5% brown silt on balls brush off basket after attach spreaders. Center baskets were disturbed less than outside Baskets.

6-9-06 little to no movement of Baskets - 50-75% growth on baskets - minor amounts of silt on balls

6-16-06 No movement - Baskets 50-85% covered w/growth - balls 5-20% orange silt hard to see w/growth on baskets - No mussels - its becoming increasingly difficult to Scrub growth off outside of Basket 1.73-6.29-7.31-7.39

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area Seep 2 Site Code Seep2 - OS Sample Type: Rock Basket

Date: Set 5-16-06 Collected 6-28-06 Effort: Set 1400-1530

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.5	2.5	2.2	2.35	2.24	2.25	2.3	2.25
Ret.	2.50	2.75	2.[illegible]	2.45	2.50	2.40	2.50	2.50
Basket Depth								
Set	1.8	1.8	1.65	1.7	1.65	1.55	1.6	1.58
Ret.	1.95	2.15	2.05	2.05	1.90	1.85	1.85	2.00
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve → 6/28
Time				10:00-10:30	9:46	0930	0800
Temp.	9.43	9.24	13.19	14.62	10.6	16.9	17.58
Specific Cond.	295	264	261	260	248	261	288
D.O.	12.24	13.84	12.37	10.39	14.44	9.78	9.03
pH	8.36	8.29	8.46	8.32	8.42	8.29	8.11
Turbidity	0.34 avg.	~~0.56-0.78~~ 0.67	.85 avg.	~~2.06-2.41~~ 2.24	~~1.73-7.39~~ 5.43	0.60	0.52 (0.65, 0.46, 0.48, 0.49)

Substrate Characteristics (%)

Bedrock	
Boulder	100
Artifacts	
Lg. Gravel	
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.790 N
85 deg. 02.893 W

Photos

Date	#	Date	#
5/17/2006	238,239,240	6-23-06	029-035
5/26/2006	244,245,246	6-28-06	246,245,243 242,241
6/1/2006	226		019-024
6/9/2006	None		
6/16/2006			

5-16 025-028 5-26 016-018 6-1 047 6-16 174-183

Notes:

5-16-06 - Few zebra mussels observed, mostly juvinals

5-26-05 - Sampling array was moved a lot by by wave action and had to be repositioned. Basket #4 was found outside of the sampling array. Add more rocks at ends of sampling array, brush off baskets, some brown/green growth, less growth on OS than NS baskets, no noticable mussels

6-1-06 - No noticable movement of sampling array, 5-10% green/brown growth on baskets, some brown silt on balls (3-5%). Brushed off baskets after the spreaders were installed. No baskets were removed from the water. The center baskets were disturbed less than the outside baskets.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data. minor amounts of silt on each balls, the baskets were covered with 50-75% growth (brown). Brush off traps. No noticable movement of the sampling array.

6-16-06 - There does not appear to have been any movement of the sampling array. 50-85% brown/green growth on baskets, 5-20% coverage of the balls with coating of orange silt. No visable mussels. Very calm conditions. Brush off baskets. Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets. It is becoming increasingly difficult to scrub or remove the growth off the top of the baskets.

- coverage ~~less~~ than seep 1 but more than EREF & ECKD, Benthos more
- OS more variable than NS
- Zebra mussels (two very small) obs. on ~~balls~~ spheres, Baetid mayflies & Caenid/Leptohyphid mayflies, tipulid, & midges on spheres. No zebra mussels obs on native

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area West CKD Site Code WCKD-NS Sample Type: Rock Basket

Date: Set 5/16/06 Collected _____ Effort: Set 1002-1045 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth (ft)								
Set	1.38	1.41	1.49	1.60	1.61	1.50	1.50	1.49
Ret.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.98	0.94
Basket Depth (ft)								
Set	0.82	0.89	0.90	1.08	1.08	0.98	0.98	0.94
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

8:55 (9:03)

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp. (°C)	10.24	9.64	~~12.54~~	14.55	17.36	16.99	
Specific Cond.	356	268	~~264~~	261	250	262	
D.O. mg/L	12.52	13.71	~~12.44~~	10.35	14.34	9.62	
pH	8.15	8.23	~~8.58~~	8.30	8.40	8.27	
Turbidity NTU	0.75 (NTU)	0.57-0.62		2.14-2.40			

13.40
2.75
12.53
8.43
.62 AVE

Substrate Characteristics (%)

Bedrock	98
Boulder	
Artifacts	
Lg. Gravel	2
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 27.242 N
84° 54.975 W

Photos

Date	#	Date	#
5/16/06	250, 249, 245	6-23-06	2-5 pics
5/26/06	253 254 255		
6-1-06	226 227		
6-9-06	N/A		
6-16-06	5 pic		

Notes:

- Due to the lack of boulders, we used struts to stabilize the assembly & to keep the Shock cords from pulling it together.
- few zebra mussels

5-26-06 - Due to spreaders - there does not appear to have been any movement - Brush off traps - more brown/green growth on shallow baskets than OS baskets - No visable mussels

6-1-06 Some green growth 10% - 20% more brown than green - Some brown/orange silt on balls & brush/rit traps. No Noticable movement from last week.

6-9-06 Minor silt on balls - Baskets are moving gently w/current - brown growth on baskets Brush off Baskets

6-16-06 No movement - Baskets 10-30% green growth - balls little to no silt - Lower balls have more growth/silt than upper balls - No mussels Darters + Goldies

0.50 - 0.55 - 0.59 - 0.57

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area West CKD Site Code WCKD - NS Sample Type: Rock Basket

Date: Set 5-16-06 Collected 6-28-06 Effort: Set 1002 - 1045

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.38	1.41	1.49	1.6	1.61	1.5	1.5	1.49
Ret.	1.44	1.46	1.54	1.60	1.58	1.58	1.58	1.56
Basket Depth								
Set	0.82	0.89	0.9	1.08	1.08	0.98	0.98	0.94
Ret.	0.88	0.92	0.94	1.06	1.04	1.00	1.00	0.98
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve 6/28/06
Time				9:13-9:50	8:55		13:00
Temp.	10.24	9.64	13.4	14.55	12.36	16.99	19.56
Specific Cond.	356	268	275	261	250	262	301
D.O.	12.52	13.71	12.53	10.35	14.34	9.62	10.92
pH	8.15	8.23	8.43	8.3	8.4	8.27	8.39
Turbidity	0.75 avg.	~~0.57-0.62~~ 0.60	0.62 avg.	~~2.14-2.40~~ 2.27	~~1.18-1.53~~ 1.36	~~1.47~~	1.26 ~~1.15 1.16 1.16~~ 1.25

Substrate Characteristics (%)

Bedrock	98
Boulder	
Artifacts	
Lg. Gravel	2
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.242 N
84 deg. 59.975 W

Photos

Date	#	Date	#
5/17/2006	250,249,245		
5/26/2006	253,254,255	6-28-06	241-243
6/1/2006	226,227		
6/9/2006	None		
6/16/2006			

Notes:

5-16-06 - Due to the lack of boulders on the bottom, we installed spreaders to stabalize the sampling array and to keep the shock cords (bungies) from pulling it together.

5-26-05 - Due to the previously installed spreaders, there does not appear to have been any movement of the traps due to the wave action. Brushed off baskets, there is more brown green growth NS array than the OS array, no vissable mussels.

6-1-06 - No apparent movemt in the sampling array due to the waves. Predominately brown/green growth (algae ?) on 20 - 30% of the baskets, some brown/green silt on balls, brush off baskets.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data. Minor silt on balls, brush off traps, no noticable movement of the sampling array; however, the baskets appear to be rocking gently with the wave action. Brown growth present on baskets.

6-16-06 - There does not appear to have been any movement of the sampling array. 10-30% brown/green growth on baskets, little to no silt on balls. No visable mussels. Very calm conditions. Brush off baskets. Observed darters and golbies near baskets. Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.

- a little filamentous green on spheres
Paramphytom — 1,3,5 Benthos 2,4,6
- Few zebra mussels on spheres, all small juveniles
none obs. on native substrate.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area West ChD Site Code WCKD-OS Sample Type: Rock Basket

Date: Set 5/16/06 Collected 6/28/06 Effort: Set 1045-12:30 Collect

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.15	2.14	2.25	2.36	2.36	2.30	2.00	2.10
Ret.	[illegible]							
Basket Depth								
Set	1.64	1.55	1.60	1.7	1.70	1.66	1.58	1.60
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

9:00 9:10

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	8.52	9.28	12.54	14.55	10.49	17.08	
Specific Cond.	293	267	264	260	249	262	
D.O.	12.51	13.53	12.65	10.30	14.97	9.56	
pH	8.09	8.18	8.38	8.29	8.38	8.24	
Turbidity (NTU)	0.31	0.46-0.52	1.28	2.93-6.63			

Substrate Characteristics (%)

Bedrock	60
Boulder	7
Artifacts	[illegible]
Lg. Gravel	23
Sm. Gravel	10
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 21.889 N
85° 03.630 W

Photos

Date	#	Date	#
5/16/06	248, 247, 246	6-23-06	6 pics
5/26/06	250 251 252		
6-1-06	224 225		
6-9-06	None		
6-16-06	5 pic		

Notes:

- Used struts like the near-shore assembly
- few zebra mussels observed

5-26-06 little to no movement of Traps - Brush them off - less growth on OS than NS
No Vissable mussels

6-1-06 10-20% green/brown growth - NS has more growth than OS.
brush off traps - No Noticable movement. Some Silt on balls

6.9-06 No movement in Baskets - Baskets are covered more than 50% w/Growth (brown)
balls have little Silt on them.

6-16-06 No movement - baskets 5-15% g/b growth - balls 5-20 covered w/Silt (orange)
Less growth on top balls - more on Lower balls - no mussels - saw Darter/~~[illegible]~~ + golbyies
balls on E. END has more growth than West end 0.27 - 0.31 - 0.30 - 0.32

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area West CKD Site Code WCKD - OS Sample Type: Rock Basket

Date: Set 5-16-06 Collected 6/28/06 1200 Effort: Set 1045 - 1230

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.15	2.14	2.25	2.36	2.3	2.3	2	2.1
Ret.	2.16	2.20	2.22	2.22	2.26	2.34	2.32	2.20
Basket Depth								
Set	1.64	1.55	1.6	1.7	1.7	1.66	1.58	1.6
Ret.	1.68	1.70	1.74	1.72	1.76	1.74	1.72	1.68
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve 6/28/06
Time				9:13-9:50	9:00		13:00
Temp.	8.52	9.28	12.54	14.55	10.49	17.08	19.10
Specific Cond.	293	267	264	260	249	262	283
D.O.	12.51	13.53	12.65	10.3	14.97	9.56	10.51
pH	8.09	8.18	8.38	8.29	8.38	8.24	8.34
Turbidity	0.31avg.	~~0.46-0.52~~ 0.49	1.28 avg.	~~2.93-6.63~~ 4.78	~~0.27-0.32~~ 0.3	0.51	0.80

0.67 - 0.98 - 0.74 - 0.80

Substrate Characteristics (%)

Bedrock	60
Boulder	7
Artifacts	
Lg. Gravel	23
Sm. Gravel	10
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.889 N
85 deg. 03.630 W

Photos

Date	#	Date	#
5/17/2006	248,247,246		
5/26/2006	250,251,252	6-28-06	228-233
6/1/2006	224,225		
6/9/2006	None		
6/16/2006			

Notes:

5-16-06 - Due to the lack of boulders on the bottom, we installed spreaders to stabalize the sampling array and to keep the shock cords (bungies) from pulling it together. Few zebra mussels observed.

5-26-05 - Due to the previously installed spreaders, there does not appear to have been any movement of the traps due to the wave action. Brushed off baskets, there is more growth NS array than the OS array, no vissable mussels.

6-1-06 - No apparent movemt in the sampling array due to the waves. Predominately brown/green growth (algae ?) on 10 - 20% of each basket, some silt on balls, brush off baskets. NS array has more growth than OS array.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data. Minor silt on balls, baskets covered with more than 50% (brwn) growth, brush off traps, no noticable movement of the sampling array.

6-16-06 - There does not appear to have been any movement of the sampling array.

5-15% brown/green growth on baskets, 5-20% coverage of the balls with coating of orange silt.

No visable mussels. Very calm conditions. Brush off baskets. Saw darters, sculpins, and golbies near baskets

Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.

Baskets and balls have more growth on the east end of the sampling array than on the west end.

Less paraphyton on baskets, possibly more on balls, more paraphyton on N/S on the baskets
- Few zebra mussels on Spheres + a few on native substrate. All small juveniles
- a little filamentous green on Spheres
Paraphyton 1,3,5 Benthos 2,4,6

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area West Reference Site Code WREF - NS Sample Type: Rock Basket

Date: Set 5-17-06 Collected _____ Effort: Set 1000-1040 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.75	1.85	1.75	1.85	1.65	1.9	1.9	1.8
Ret.								
Basket Depth								
Set	1.1	1.1	1.1	1.2	0.95	1.0	1.05	1.05
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

7:55

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	8.39	9.41	12.37	16.55	12.21	16.52	
Specific Cond.	281	293	274	263	251	263	
D.O.	12.94	12.57	12.13	9.69	13.71	9.50	
pH	8.29	7.94	8.37	8.38	7.25	8.22	
Turbidity	0.49-1.36	0.68-0.65	1.90 Avg	3.44			

Substrate Characteristics (%)

Bedrock	
Boulder	80
Artifacts	
Lg. Gravel	20
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

16.55
263
969
838

GPS Coordinates

45° 21.912 N
85° 03.887 W

Photos

Date	#	Date	#
5-17-06	232, 231, 230	6-23-06	261 - Spics
5-26-06	259 260 261		
6-1-06	229		
6-9-06	— N/A		
6-16-06	Spics +2		

-69

Notes:

* Could not get consistent turbidity reading during set likely due to excessive floc. (i.e. algae) stirred up by wave action
- Set samplers west of Lots 9 & 10 and west of little creek that flows into bay. Samplers set almost due north of golf Course green adjacent to shore
- floc. algae very thick particularly near shore. Near shore assembly set on border of cleaner water + highly turbid water
- Zebra mussels relatively dense + larger compared to CKD + Seep areas

5-26-05 Sampling array is moved due to Wave action - Pictures 261, 260, 259
Has to reposition (reposition trap) pile more rocks on concrete blocks
Did not need to brush off the baskets.

6-1-06 No apparent movement, Predominately brown growth - brush off traps - minor silt on balls, install spreaders - No Baskets were out of the water when we put spreaders on, but the 2 center baskets were disturbed less than outside Baskets (diatoms?)

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area West Reference Site Code WREF - NS Sample Type: Rock Basket

Date: Set 5-17-06 Collected 6-29-06 Effort: Set 1000-1040

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.75	1.85	1.75	1.85	1.65	1.9	1.9	1.8
Ret.	1.75	1.80	1.75	1.90	1.70	1.70	1.65	1.70
Basket Depth								
Set	1.1	1.1	1.1	1.2	0.95	1	1.05	1.05
Ret.	1.20	1.10	1.15	1.20	0.95	1.00	1.10	1.10
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve → 6/29/06
Time				14:30-15:00	7:55		0800
Temp.	8.39	9.41	12.37	16.55	12.21	16.52	16.91
Specific Cond.	281	293	274	263	251	263	272
D.O.	12.94	12.57	12.13	9.69	13.71	9.50	9.61
pH	8.29	7.94	8.37	8.38	7.25	8.22	8.14
Turbidity	~~0.49 - 1.36~~ 0.92	~~0.68 - 0.65~~ 0.67	1.90 avg.	3.44 avg.	~~1.18-1.53~~ 1.36	0.63	2.83 - 3.07 - 2.88 - 2.55

Substrate Characteristics (%)

Bedrock	
Boulder	80
Artifacts	
Lg. Gravel	20
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.912 N
85 deg. 03.887 W

Photos

Date	#	Date	#
5/17/2006	232,231,230		
5/26/2006	259,260,261	6-29-06	220-228
6/1/2006	229		
6/9/2006	None		
6/16/2006			

Notes:

Could not get consistant turbidity during set most likely due to excessive floc. (i.e. algae) stirred up by wave action. Set samplers west of lots 9 & 10 and west of little creek that flows into bay from golf course. Samplers set almost due north of golf course green adjacent to shore line. Floc. Algae very thick particulate near shore. Near shore assembly set on boulders of clearer water and highly turbid water. Zebra mussels relatively dense and larger compared to CKD and Seep areas

5-26-05 - Sampling array was moved due to wave action, had to reposition sampling array and pile more rocks on the ends to keep it in place. Did not brush off baskets because they were disturbed from repositioning.

6-1-06 - No apparent movemt in the sampling array due to the waves. Predominately brown growth (algae ?) on baskets, this was brushed off. Minor amounts of noticable silt (diatoms ?) on balls within baskets, installed spreaders. While installing the spreaders, no baskets were removed from the water, and the center baskets were disturbed less than the baskets on either end.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data and take pictures, the digital camera got wet and stopped working. The baskets were covered approximately 20- 30% with green/brown growth (algae ?) that was brushed off. Some of the balls have a lite film of silt or diatoms on them. Some balls have more growth or silt on them than others. There is a change in the NS temperature and OS temp because they were taken approx 6 hrs apart.

6-16-06 - There does not appear to have been any movement of the sampling array. 30-60% brown/green growth on baskets, 5-85% coverage of the balls with coating of orange silt. Can see mussels between the rocks around the baskets. Very calm conditions. Brush off baskets.

- 1 med. sized Zebra on peri. basket 1
- Filamentous green more dense than all other sites
- Zebra mussels more dense than any other site
- Due to high waves, we cut the cables
- Basket 5 was mis-handled so we used 7

Periphyton - 1, 3, ~~X7~~ Benthos - 2, 4, 6

High wave action on both NS and OS baskets

Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.
It is becoming increasingly difficult to scrub or remove the growth off the top of the baskets.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area West Reference Site Code WREF-05 Sample Type: Rock Basket

Date: Set 5-17-06 Collected _____ Effort: Set 915-1000 Collect _____

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.45	2.35	2.6	2.35	2.7	2.35	2.55	2.45
Ret.								
Basket Depth								
Set	1.7	1.75	1.65	1.7	1.9	1.8	1.7	1.65
Ret.								
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5-26-06	6-1-06	6-9-06	6-16-06	6-23-06	Retrieve
Temp.	7.88	9.37	12.10	14.52	11.00	16.66	
Specific Cond.	278	287	267	260	250	263	
D.O.	12.64	12.46	11.66	10.52	14.54	9.50	
pH	8.22	8.01	8.32	8.27	7.56	8.21	
Turbidity	0.39	0.52-0.58	.69 AVG	2.95 AVG			

800

Substrate Characteristics (%)

Bedrock	10
Boulder	80
Artifacts	
Lg. Gravel	10
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45° 21.916N
85° 03.892W

Photos

Date	#	Date	#
5-17-06	229, 228, 227	6-23-06	
5-26-06	256 257 258		
6-1-06	228		
6-9-06	NONE		
6-16-06	138-134		

+1

Notes:

- Large zebra mussels observed, Small zebra mussels fairly dense

- 5-26-06 Trap moved by wave action - repositioned Rocks on concrete Blocks
  - Did not need to brush traps off probably due to them moving around
  - Mussels quite prevelent as they seem to start at a certain depth

6-1-06 No apparent movement predominantly green growth. Some silt on balls
- Brush off traps after we installed Spreaders. 2 center Baskets were disturbed less than hot side baskets when we installed Spreaders

6-16-06 No movement - Baskets are 25-100% covered w/ algae growth - balls 5-85% covered baskets/balls on W end are more covered than east end - balls + baskets on W end are almost 100% - balls are less covered on top than deeper.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area West Reference Site Code WREF - OS Sample Type: Rock Basket

Date: Set 5-17-06 Collected 6-29-06 Effort: Set 915-1000

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.45	2.35	2.6	2.35	2.7	2.35	2.55	2.45
Ret.	2.50	2.10	2.40	2.45	2.55	2.35	2.55	2.50
Basket Depth								
Set	1.7	1.75	1.65	1.7	1.9	1.8	1.7	1.65
Ret.	1.65	1.65	1.85	1.90	2.00	1.95	1.85	1.80
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	5/26/2006	6/1/2006	6/9/2006	6/16/2006	6/23/2006	Retrieve 6/29/06
Time				8:30-9:00	8:00		0800
Temp.	7.88	9.37	12.1	14.52	11	16.66	17.06
Specific Cond.	278	287	267	260	250	263	269
D.O.	12.64	12.46	11.66	10.52	14.54	9.50	9.38
pH	8.22	8.01	8.32	8.27	7.56	8.21	8.12
Turbidity	0.39 avg.	~~0.52-0.58~~ 0.55	0.69 avg.	2.95 avg.	~~0.37-0.65~~ .51	0.60	2.99 3.42 - 3.01 - 2.53

Substrate Characteristics (%)

Bedrock	10
Boulder	80
Artifacts	
Lg. Gravel	10
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.916 N
85 deg. 03.892 W

Photos

Date	#	Date	#
5/17/2006	229,228,227		
5/26/2006	256,257,258	6-29-06	222-213
6/1/2006	228		
6/9/2006	None		
6/16/2006			

Notes:

Large zebra mussels observed, small zebra mussels fairly dense.

5-26-05 - Sampling array was moved due to wave action, had to reposition sampling array and pile more rocks on the ends to keep it in place. Did not brush off baskets because they were disturbed from repositioning. Zebra mussels more prevalent near OS array than near NS array, they seam to be more prevalent once the water reaches a certain depth.

6-1-06 - No apparent movemt in the sampling array due to the waves. Predominately green growth (algae ?) on baskets, this was brushed off. Minor amounts of noticable silt (diatoms ?) on balls within baskets, installed spreaders. While installing the spreaders, no baskets were removed from the water, and the center baskets were disturbed less than the baskets on either end.

6-9-06 - 2- to 3-ft waves were rolling over the tops of the sampling arrays which made it difficult to collect data and take pictures, the digital camera got wet and stopped working. The baskets were covered approximately 20- 30% with green/brown growth (algae ?) that was brushed off. Some of the balls have a lite film of silt or diatoms on them. Some balls have more growth or silt on them than others.

There is a change in the NS temperature and OS temp because they were taken approx 6 hrs apart.

6-16-06 - There does not appear to have been any movement of the sampling array. 25-100% brown/green growth on baskets, 5-85% coverage of the balls with coating of orange silt. No visable mussels. Very calm conditions. Brush off baskets.

- Zebra mussels more dense than any other site
- Filamentous green less den than ~~all other sites~~ near shore

Periphyton - 1,3,5 Benthos - 2,4,6 Due to high waves, we cut the cables.

Balls in the top side of baskets have less silt on them than balls toward the bottom of the baskets.
It is becoming increasingly difficult to scrub or remove the growth off the top of the baskets.
Baskets and balls have more growth on the west end of the sampling array than on the east end.
Baskets and balls on the west end are almost completely covered.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: East Reference Near Shore Site Code: EREF - NS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: 10/26/06 Effort: Set: 9:00 - 10:30 Collect: 1000 —

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.98	1.96	2	1.9	1.74	2.06	2.04	2.02
Ret.	1.36	1.32	1.44	1.4	1.42	0.88	1.50	1.40
Basket Depth								
Set	1.3	1.28	1.3	1.26	1.18	1.14	1.32	1.4
Ret.	0.92	0.74	0.76	0.7	0.68	0.42	0.92	0.82
Disturbed	No							
Debris	~~H~~ L	H						
Silt/Solids	L	H						
Benthos/Algae	—	B	A	B	A	B	A	—

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/26/06
Time	10:15	13:55	11:11	12:13	12:11	11:39	0930
Temp.	19.71	11.88	15.64	14.42	14.58	12.42	9.27
Specific Cond.	273	265	272	310	280	269	302
D.O.	10.52	13.38	11.25	14.33	14.64	10.6	9.64
pH	8.51	8.28	8.44	8.67	8.91	8.28	8.24
Turbidity	1.15	3.12	0.54	0.44	1.05	2.1	0.86

10/20 No measurements

Substrate Characteristics (%)

Bedrock	
Boulder	60
Artifacts	
Lg. Gravel	40
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.238 N
84 deg. 59.974 W

Photos

Date	#	Date	#
9/7/2006	None	10/13/2006	None
9/15/2006	p9150073-78	10/26/06	128, 127, 126, 125
9/22/2006	p9220072-77		
9/29/2006	p9290069-79		
10/6/2006	pa060071-78		

R, M, L #1

Notes:

9/7/2006

Water level at the time of deployment appeared to be higher, much higher than the previous set and retrival in May through June

2006 respectively.

Dark Green Periphyton very abundant.

Turbidity values may be higher due to deployment activities.

Used boat to set traps

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, Wave action is picking up.

Baskets covered with 10-40% green algae, no growth, or silt on balls.

A lot of green algae/paraphyton on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight, but mussel shells are visable on bottom between rocks.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: East Reference Near Shore Site Code: EREF - NS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: 10/26/06 Effort: Set: 9:00 - 10:30 Collect: _____

Discolored leachate is leaching out of ground along shoreline between ECKD and EREF. Plume of discolored water is
moving easterly toward the EREF area. pH of 9.0 to 11.15 recorded at seep area.

9/22/2006

No apparent movement of baskets or sampling arrays.

The wave action is beginning to calm down a little, wind coming out of the east, water is way down - blowing out of the bay.

Baskets covered with 0-3% green algae, 5-10% green/brown discoloration on balls.

Balls on the bottom of the baskets appear to be more discolored than the ones on the top of the baskets.

A lot of green algae/paraphyton on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight, but mussel shells are visable on bottom between rocks.

9/29/2006

Leachate pools appear to be darker or more concentrated along the fence at shoreline - 10.45-11.22pH.

No apparent movement of baskets or sampling arrays.

The water was calm with a slight wind coming out of the northeast and becoming more easterly.

Baskets covered with 0-1% green algae.

Balls are almost completely covered with golden brown algae.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

All of the rocks throughout the study area are covered with dark green to golden brown algae. Brush off baskets.

No obvious zebra mussels on the substraight, but mussel shells are visable on bottom between rocks.

Water appears to be way down.

Algae was very difficult to scrub off the baskets.

10/6/2006

No apparent movement of baskets or sampling arrays.

The water is becoming choppy again with the wind coming out of the west.

Baskets and balls covered with 50 to 100% dark brown to golden brown, greenish growth.

Leachate pools appear to be darker or more concentrated along the fence at shoreline - 10.25-11.11pH.

Dark brown to golden brown, greenish growth covering everything (non-filimentous) rocks and sampling array. Brush off baskets.

Algae is a different color than any other sampling location. PH is getting higher every week.

Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.

The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.

Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.

Baskets covered with 0% algae, good growth on balls, 15-20% less growth than last week.

There is less growth on the balls probably due to all the wave action over the past week.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

Little to no green algae on rocks around the sampling array. Brush off baskets. 9.43 26.64 21-22

Could not take pictures because of waves and weather. 32.1

10/26/06
Basket collections - Growth similar to OS though slightly lighter, especially on basket #1. See off-shore notes
- Tissue collections - 2 reps taken. Rep A = W. Rep B = E. Both reps had Both zebra & Quagga mussels. Quagga mussels were collected at B. Reps, no zebras were collected. B [illegible] Rep A sizes ranged from 3.88mm - 23.87mm, most were between 10-12mm. Rep [illegible] sized ranged from 9.43mm - 26.64mm; most were between 21-22mm, Rep A had [illegible]
Sampling units: Due to weight, the unistrut-brick setup was placed up near the tree line, directly S. from sampling site. It was [illegible] as EREFBRIK.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: East Reference Off Shore Site Code: EREF - OS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: 10/26/06 Effort: Set: 9:00 - 10:30 Collect: 0900 –

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.48	2.48	2.44	2.44	2.5	2.39	2.36	2.46
Ret.	1.98	2.06	1.98	1.84	1.84	1.88	1.80	1.76
Basket Depth								
Set	1.92	1.9	1.84	1.86	1.82	1.86	1.78	1.8
Ret.	1.42	1.44	1.34	1.36	1.34	1.36	1.2	1.24
Disturbed	No							
Debris	H							
Silt/Solids	H							
Benthos/Algae	A	B	A	B	A	B	–	–

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/26/06
Time	10:20	14:02	11:17	12:20	12:18	11:40	0943
Temp.	19.79	11.38	15.92	14.5	14.55	NA	9.43
Specific Cond.	266	260	273	320	294	NA	292
D.O.	10.45	12.99	10.73	14.87	13.52	NA	9.23
pH	8.52	8.21	8.41	8.72	8.81	NA	8.17
Turbidity	1	0.49	0.48	0.82	0.69	NA	0.65

10/20 No Measurements

Substrate Characteristics (%)

Bedrock	
Boulder	70
Artifacts	
Lg. Gravel	30
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.242 N
84 deg. 59.975 W

Photos

Date	#	Date	#
9/7/2006	None	10/13/2006	None
9/15/2006	None due to waves		124,123,122 121 R, M, L, #1
9/22/2006	p9220078-83		
9/29/2006	p9290069-79		
10/6/2006	pa060079-84		

Notes:

9/7/2006

Water level at the time of deployment appeared to be higher, much higher than the previous set and retrival in May through June 2006 respectively.

Dark Green Periphyton very abundant.

Turbidity values may be higher due to deployment activities.

Used boat to set traps

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, Wave action is picking up.

Baskets covered with 5-10% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight, but mussel shells are visable on bottom between rocks.

Discolored leachate is leaching out of ground along shoreline between ECKD and EREF. Plume of discolored

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: East Reference Off Shore Site Code: EREF - OS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: _____ Effort: Set: 9:00 - 10:30 Collect: _____

water is moving easterly toward the EREF area. pH of 9.0 to 11.15 recorded at seep area.

9/22/2006

No apparent movement of baskets or sampling arrays.

The wave action is beginning to calm down a little, wind coming out of the east, water is way down - blowing out of the bay.

Baskets covered with 0-3% green algae, 5-10% green/brown discoloration on balls.

Balls on the bottom of the baskets appear to be more discolored than the ones on the top of the baskets.

A lot of green algae/paraphyton on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight, but mussel shells are visable on bottom between rocks.

9/29/2006

Leachate pools appear to be darker or more concentrated along the fence at shoreline - 10.45-11.22pH.

No apparent movement of baskets or sampling arrays.

The water was calm with a slight wind coming out of the northeast and becoming more easterly.

Baskets covered with 0-1% green algae.

Balls are almost completely covered with golden brown algae.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

All of the rocks throughout the study area are covered with dark green to golden brown algae. Brush off baskets.

No obvious zebra mussels on the substraight, but mussel shells are visable on bottom between rocks.

Water appears to be way down.

Algae was very difficult to scrub off the baskets.

10/6/2006

No apparent movement of baskets or sampling arrays.

The water is becoming choppy again with the wind coming out of the west.

Baskets and balls covered with 75 to 100% dark brown to golden brown, greenish growth.

Baskets in the center of the sampling array appear to be covered more than the baskets at either ends.

Leachate pools appear to be darker or more concentrated along the fence at shoreline - 10.25-11.11pH.

Dark brown to golden brown, greenish growth covering everything (non-filimentous) rocks and sampling array.

Brush off baskets.

Algae is a different color than any other sampling location. PH is getting higher every week.

Collected pH reading just to the west of the stream outfall, 10-15' off shore = 9.15-9.20.

Water appears to be way down.

10/13/2006

The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.

Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.

Could not get to OS sampler due to rough wave conditions.

Could not take pictures because of waves and weather.

10/24/06
Basket collections - Growth heavy on all baskets + balls. Distinctly different growth compared to other sites, Dark reddish brown as opposed to green or light - yellow-brown at other sites. Substrate looks similar to how it looked during Jan. 06 recon.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: East CKD Near Shore Site Code: ECKD - NS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: 10/26/06 Effort: Set: 10:30 - 12:00 Collect: 8:00

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.58	1.58	1.76	1.72	1.6	1.48	1.48	1.44
Ret.	1.08	1.14	1.23	1.20	1.16	1.08	0.95	0.96
Basket Depth								
Set	1.02	1.06	1.12	1.12	1.04	0.9	0.88	0.82
Ret.	0.52	0.60	0.74	0.60	0.54	0.46	0.40	0.40
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae	A	B	A	B	—	—	A	B

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/26/06	10/20
Time	11:30	13:17	10:44	11:38	11:30	11:18	0836	11:44
Temp.	20.09	12.87	14.42	13.77	14.25	12.75	9.54	11.16
Specific Cond.	271	275	284	267	266	278	274	279
D.O.	11.21	12.54	10.29	12.02	9.86	10.27	8.20	1.80 ?
pH	8.67	8.35	8.23	8.43	8.43	8.26	7.62	8.91 ?
Turbidity	1.04	1.86	0.68	0.49	0.33	3.1	0.82	0.30

Substrate Characteristics (%)

Bedrock	70
Boulder	10
Artifacts	
Lg. Gravel	20
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.205 N
85 deg. 00.256 W

Photos

Date	#	Date	#
9/7/2006	None	10/13/2006	None
9/15/2006	p9150060-65		
9/22/2006	p9220060-65		
9/26/2006	p9290055-61		
10/6/2006	pa060054-59		

Notes:

9/7/2006

Water level at the time of deployment appeared to be lower than the previous set and retrival in May through June 2006 respectively.

Periphyton fairly abundant.

White coating on substraight appears to be far less than in May 2006, white coating is still noticable close to the shore line. Transplated zebra mussels are still alive. Live zebra mussels (not from transplant) observed at ECKD.

Most of the zebra mussels are no more than 1/2 inch long.

Used boat to set traps

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, Wave action is picking up.

Baskets covered with 50-70% green algae, no growth, or silt on balls.

Very little green algae on rocks around the sampling array. Brush off baskets.

Rep A: Range: 6.47 → 14.79, 5.7 grams Total, Mostly 9-10mm Mix of Species
Rep B: Range: 4.56 → 21.56 Mostly 5mm
Transfer: Range: 2.93 → 26.47 Mostly 22..

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: East CKD Near Shore Site Code: ECKD - NS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: _____ Effort: Set: 10:30 - 12:00 Collect: _____

No obvious zebra mussels on the substraight.

9/22/2006

No apparent movement of baskets or sampling arrays.

The wave action is beginning to calm down a little, wind coming out of the east, water is way down - blowing out of the bay.

Baskets covered with 5-7% green algae, very slight green discoloration on balls.

Balls on the bottom of the baskets appear to be more discolored than the ones on the top of the baskets.

Very little green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight.

9/29/2006

No apparent movement of baskets or sampling arrays.

The water was calm with a slight wind coming out of the northeast and becoming more easterly.

Baskets covered with 0-2% green algae.

Slight to some growth on balls.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

Some green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight.

Water appears to be way down.

Algae was very difficult to scrub off the baskets.

Green algae growing on rocks along the shore line where it was white in the past.

10/6/2006

No apparent movement of baskets or sampling arrays.

The water was calming down again, partly cloudy with a slight wind switching back to out of the west.

Baskets covered with 0-5% green algae.

Slight to some green/orange growth on balls. Growth on the balls is equal on both ends and middle.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

Algae present on the rocks around the sampling array, similar coverage to the WREF &WCKD. Brush off baskets.

Juvinal Zebra mussels becoming more apparent on the bottom of the rocks, still few and far between.

Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.

The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.

Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.

Baskets covered with 0% algae, slight to some green growth on balls, growth becoming darker.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

Little to no green algae on rocks around the sampling array. Brush off baskets.

Could not take pictures because of waves and weather.

10/26/06 - Calibration of YSI 556 #3: Conductivity 1001 µS/cm = 1000 µS/cm
pH: 10 = 10, 7.04 = 7, 9.29 = 4, 100% 106.7 = 98.2

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: East CKD Off Shore Site Code: ECKD - OS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: 10/26/06 Effort: Set: 10:30 - 12:00 Collect: 0830

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.36	2.36	2.38	2.34	2.22	2.26	2	2
Ret.	1.78	1.88	1.76	1.78	1.82	1.64	1.80	1.70
Basket Depth								
Set	1.74	1.78	1.7	1.76	1.68	1.66	1.52	1.48
Ret.	1.24	1.27	1.18	1.24	1.18	1.15	1.12	1.12
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae	A	B	A	B	A	—	—	B

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/26/06
Time	11:35	13:26	10:50	11:44	11:37	11:21	0842
Temp.	20.34	11.08	14.85	14.18	14.47	12.76	9.75
Specific Cond.	258	264	280	265	267	280	273
D.O.	10.9	12.48	9.89	11.92	9.63	10.07	8.30
pH	8.56	8.12	8.24	8.45	8.43	8.26	7.90
Turbidity	0.57	1.41	0.51	0.51	0.49	2.18	0.56

10/20
11:49
11.22
279
1.84?
9.26?
0.34

Substrate Characteristics (%)

Bedrock	80
Boulder	15
Artifacts	
Lg. Gravel	5
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.209 N
85 deg. 00.257 W

Photos

Date	#	Date	#
9/7/2006	None	10/13/2006	None
9/15/2006	p9150066-72		
9/22/2006	p9220066-71		
9/29/2006	p9290062-68		
10/6/2006	pa060060-70		

Notes:

9/7/2006

Water level at the time of deployment appeared to be lower than the previous set and retrival in May through June 2006 respectively.

Periphyton fairly abundant.

White coating on substraight appears to be far less than in May 2006, white coating is still noticable close to the shore

line. Transplated zebra mussels are still alive. Live zebra mussels (not from transplant) observed at ECKD.

Most of the zebra mussels are no more than 1/2 inch long.

Used boat to set traps

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, Wave action is picking up.

Baskets covered with 20-50% green algae, no growth, or silt on balls.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: East CKD Off Shore Site Code: ECKD - OS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: _____ Effort: Set: 10:30 - 12:00 Collect: _____

Very little green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.

9/22/2006

No apparent movement of baskets or sampling arrays.
The wave action is beginning to calm down a little, wind coming out of the east, water is way down - blowing out of the bay.
Baskets covered with 2-5% green algae, very slight green discoloration on balls.
Balls on the bottom of the baskets appear to be more discolored than the ones on the top of the baskets.
Very little green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.

9/29/2006

No apparent movement of baskets or sampling arrays.
The water was calm with a slight wind coming out of the northeast and becoming more easterly.
Baskets covered with 0-2% green algae.
Slight to some growth on balls.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.
Water appears to be way down.
Algae was very difficult to scrub off the baskets.
Green algae growing on rocks along the shore line where it was white in the past.

10/6/2006

No apparent movement of baskets or sampling arrays.
The water was calming down again, partly cloudy with a slight wind switching back to out of the west.
Baskets covered with 0-7% green algae.
Slight to some green/orange growth on balls. More growth on the balls in the center of the array than on the ends.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Algae present on the rocks around the sampling array, similar coverage to the WREF &WCKD. Brush off baskets.
Juvinal Zebra mussels becoming more apparent on the bottom of the rocks, still few and far between.
Took two sets of photos due to wave action.
Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.
The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.
Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.
Baskets covered with 0% algae, moderate to good growth on balls, growth becoming darker.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Little to no green algae on rocks around the sampling array. Brush off baskets.
Could not take pictures because of waves and weather.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: Seep 1 Near Shore Site Code: SEEP 1 - NS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: 10/24/2006 Effort: Set: 12:40 - 14:00 Collect: 1230 - 1330

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.5	1.52	1.48	1.56	1.52	1.58	1.56	1.56
Ret.								
Basket Depth								
Set	0.94	0.94	0.88	0.98	0.92	1.02	0.94	0.94
Ret.								
Disturbed	NO							
Debris	Light							
Silt/Solids	Light							
Benthos/Algae	A	B	A	B	A	B	—	—

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/24/06	
Time	13:35	10:35	9:48	10:29	10:40	10:24	1500	10/20 10:55
Temp.	21.93	10.14	14.79	13.22	13.07	11.51	9.88	10.11
Specific Cond.	248	264	284	267	268	284	282	280
D.O.	11.85	11.78	9.9	11.92	9.64	10.5	11.71	1.82 ?
pH	8.68	8.13	8.24	8.42	8.42	8.26	8.29	9.06 ?
Turbidity	0.65	0.56	0.44	0.55	0.48	2.98	0.47	0.38

Substrate Characteristics (%)

Bedrock	
Boulder	20
Artifacts	
Lg. Gravel	80
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.710 N
85 deg. 02.690 W

Photos

Date	#	Date	#
9/7/2006	None	10/13/2006	None
9/15/2006	p9150048-53	10/24/06	None
9/22/2006	p9220045-52		
9/29/2006	p9290041-46		
10/6/2006	pa060042-47		

Notes:

9/7/2006

Water level at the time of deployment appeared to be lower than the previous set and retrival in May through June 2006 respectively.

Water level rising due to moderate NW wind piling up water on south shore.

Water depth readings are fairly inaccurate due to wave action.

Periphyton fairly abundant, wave action is building and causing turbidity to increase.

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, no waves - water like glass.

Baskets covered with 30-50% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight.

9/22/2006

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: Seep 1 Near Shore Site Code: SEEP 1 - NS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: 10/24/2006 Effort: Set: 12:40 - 14:00 Collect: 1230 – 1330

No apparent movement of baskets or sampling arrays.
The wave action is beginning to calm down a little, wind coming out of the east, water is way down - blowing out of the bay.
Baskets covered with 5-10% green algae, very slight green discoloration on balls.
Balls on the bottom of the baskets appear to be more discolored than the ones on the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.

9/29/2006

No apparent movement of baskets or sampling arrays.
The water was calm with a slight wind coming out of the northeast and becoming more easterly.
Baskets covered with 3-10% green algae.
Slight to very slight green growth on balls. Growth on the balls is equal on both ends and middle.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.
Water appears to be way down.
Algae was very difficult to scrub off the baskets.

10/6/2006

No apparent movement of baskets or sampling arrays.
The water was calming down again, partly cloudy with a slight wind switching back to out of the south.
Baskets covered with 2-3% green algae.
Slight to very slight green growth on balls. Growth on the balls is equal on both ends and middle.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Algae present on the rocks around the sampling array, similar coverage to the WREF &WCKD.
Brush off baskets.
Zebra mussels becoming more apparent on the rocks, still few and far between.
Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.
The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.
Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.
Baskets covered with 0% algae, slight to some green growth on balls, growth becoming darker.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Little to no green algae on rocks around the sampling array. Brush off baskets.
Could not take pictures because of waves and weather.

Mussel Tissue Collection 10/24/06

1400-1500 took 2 reps, Rep A = E Rep B = W. size ranges A: 23.60 mm - 14.3 mm; most in the 10-12 mm range. Rep B size ranged from 4.42 mm – 13.99 mm, most in the 8-10 mm range. All appear to be Quagga. Rep A weight 31.9 g. Rep B weight 32

Benthic Quals: Took 20 min's. Kicked + sweeps in 10 areas around nearshore + off-shore samplers, picked up individual rocks + picked specimens.

Basket collections: waves too big to retrieve off-shore samplers, though near-shore conditions were o.k. for retrieval

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: Seep 1 Off Shore Site Code: SEEP 1 - OS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: 10/25/2006 Effort: Set: 12:40 - 13:45 Collect: 1630 - 1730

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore)							
	1	2	3	4	5	6	7	8
Total Depth								
Set	2.48	2.5	2.3	2.26	2.08	2.08	2.16	2.3
Ret.	2.12	2.1	1.90	1.70	1.80	1.72	1.78	1.96
Basket Depth								
Set	1.84	1.86	1.76	1.68	1.56	1.56	1.64	1.76
Ret.	1.46	1.38	1.36	1.20	1.14	1.2	1.24	1.30
Disturbed	No							
Debris	M	M	M	M	M	L	M	M
Silt/Solids	M	M	M	M	M	L	M	M
Benthos/Algae	A	B	A	B	A	—	—	B

Parameters	Water Quality Measurement Periods (weekly during colonization period)							
	Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/25/06	10/20
Time	13:40	10:42	9:57	10:36	10:48	10:27	1700	11:01
Temp.	20.87	9.75	15.62	14.32	13.99	11.72	10.29	10.87
Specific Cond.	256	261	276	268	268	273	272	280
D.O.	11.08	11.67	9.94	11.38	9.45	10.53	10.41	1.86 ?
pH	8.58	8.04	8.3	8.4	8.39	8.25	8.48	9.12
Turbidity	0.79	0.39	0.42	0.67	0.37	2.84	0.38	0.47

Substrate Characteristics (%)

Bedrock	90
Boulder	3
Artifacts	
Lg. Gravel	7
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.720 N
85 deg. 02.603 W

Photos

Date	#	Date	#
9/7/2006	None	10/13/2006	None
9/15/2006	p9150054-59	10/25/06	134, 133, 132
9/22/2006	p9220053-59		
9/29/2006	p9290047-54		
10/6/2006	pa060048-53		

L, R, #1

Notes:

9/7/2006

Water level at the time of deployment appeared to be lower than the previous set and retrival in May through June 2006 respectively.

Water level rising due to moderate NW wind piling up water on south shore.

Water depth readings are fairly inaccurate due to wave action.

Periphyton fairly abundant, wave action is building and causing turbidity to increase.

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, no waves - water like glass.

Baskets covered with 3-7% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight.

9/22/2006

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: Seep 1 Off Shore Site Code: SEEP 1 - OS Sample Type: Rock Basket

Date Set: 9-7-06 Date Collect: _____ Effort: Set: 12:40 - 13:45 Collect: _____

No apparent movement of baskets or sampling arrays.
The wave action is beginning to calm down a little, wind coming out of the east, water is way down - blowing out of the bay.
Baskets covered with 5-7% green algae, very slight green discoloration on balls.
Balls on the bottom of the baskets appear to be more discolored than the ones on the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.

9/29/2006

No apparent movement of baskets or sampling arrays.
The water was calm with a slight wind coming out of the northeast and becoming more easterly.
Baskets covered with 5-10% green algae.
Very slight to no growth on balls.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.
Water appears to be way down.
Algae was very difficult to scrub off the baskets.

10/6/2006

No apparent movement of baskets or sampling arrays.
The water was calming down again, partly cloudy with a slight wind switching back to out of the south.
Baskets covered with 3-5% green algae.
Slight to very slight green growth on balls. Growth on the balls is equal on both ends and middle.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Algae present on the rocks around the sampling array, similar coverage to the WREF &WCKD. Brush off baskets.
Zebra mussels becoming more apparent on the rocks, still few and far between.
Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.
The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.
Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.
Baskets covered with 0% algae, slight to some green growth on balls, less growth than NS array.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Little to no green algae on rocks around the sampling array. Brush off baskets.
Could not take pictures because of waves and weather.

10/25/06
Basket Collections – growth moderate on most baskets & balls. Substantially more than @ SEEP 2 - OS

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: Seep 2 Near Shore Site Code: Seep 2- NS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collect: 10/24/06 Effort: Set: 17:00 - 19:20 Collect: 0830 - 1000

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.36	1.24	1.58	1.78	1.72	1.66	1.45	1.55
Ret.	1.10	1.00	1.1	1.24	1.24	1.20		
Basket Depth								
Set	0.76	0.74	0.88	1.06	1.1	1.02	0.82	0.94
Ret.	0.60	0.60	0.60	0.72	0.70	0.70		
Disturbed	No							
Debris	light							
Silt/Solids	light							
Benthos/Algae	A	B	A	B	A	B		

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/24/06	
Time	19:15	9:45	9:21	9:56	9:47	10:03	0938	10/20
Temp.	22.67	9.77	14.41	13.58	12.58	11.86	9.35	10:30
Specific Cond.	250	263	303	267	277	280	284	10.75
D.O.	9.8	12.15	9.69	11.87	9.28	10.2	12.25	280
pH	8.69	8.08	8.07	8.43	8.37	8.25	8.26	1.80?
Turbidity	1.85	0.49	0.71	0.5	0.61	1.92	0.46	9.12?
								0.26

Substrate Characteristics (%)

Bedrock	
Boulder	100
Artifacts	
Lg. Gravel	
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.784 N
85 deg. 02.897 W

Photos

Date	#	Date	#
9/6/2006	None	10/13/2006	None
9/15/2006	p9150036-41	10/24/2006	"
9/22/2006	p9220031-37		
9/29/2006	p9290026-33		
10/6/2006	pa060028-34		

Notes:

9/6/2006

Water level rising due to moderate NW wind piling up water on south shore.

Water depth readings are fairly inaccurate due to wave action.

Periphyton fairly abundant, wave action is building and causing turbidity to increase.

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, no waves - water like glass.

Baskets covered with 20-30% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight.

9/22/2006

No apparent movement of baskets or sampling arrays.

The water was slightly choppy with the wind coming out of the east, water is way down - blowing out of the bay.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: Seep 2 Near Shore Site Code: Seep 2- NS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collect: 10/24/06 Effort: Set: 17:00 - 19:20 Collect: 0830 - 1000

Baskets covered with 5-15% green algae, very slight green discoloration on balls.
Balls on the bottom of the baskets appear to be more discolored than the ones on the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.

9/29/2006

No apparent movement of baskets or sampling arrays.
The water was calm with a slight wind coming out of the northeast and becoming more easterly.
Baskets covered with 5-20% green algae, slightly more growth on th east end.
Slight to very slight green growth on balls. Growth on the balls is equal on both ends and middle.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.
Water appears to be way down. Some of the baskets are only 4-5" below the top of the water surface.
Algae was very difficult to scrub off the baskets.

10/6/2006

No apparent movement of baskets or sampling arrays.
The water was calm, partly cloudy with a slight wind coming out of the south and shifting to out of the west slightly.
Baskets covered with 5-10% green algae, more on west end than east end of array.
Slight to some green growth on balls.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Slightly more growth on the balls in the baskets on the west end than on the east end of the the array.
Less alge on on rocks around the sampling array at this sampling location than at WREF &WCKD.
Brush off baskets.
King salmon swimming between NS and OS sampling arrays.
Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.
The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.
Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.
Baskets covered with 0% algae, slight to some green growth on balls, growth becoming darker.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Little to no green algae on rocks around the sampling array. Brush off baskets.
Could not take pictures because of waves and weather.

10/24/2006
Basket Collections - Waves to big to take off-shore samplers though conditions were O.K. for near-shore. Due to waves, depth measurements were problematic. Growth on ~~[illegible]~~ balls as much or slightly less than June collections
Benthic Quals - Took 30 min Kicked + sweeps in 10 areas around the near-shore + off-shore assemblies, picked up individual rocks + hand picked specimens.
Mussel Tissue - Took 2 reps. Rep. A = W + Rep. B = E. Mussels in both reps. similar sizes. Rep. A size ranged 4.39 - 13.23 mm with most in the 9-10 mm range. Rep B size ranged 4.69 - 17.16 mm with most in the 9-10 mm range. All appear to be quagga

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: Seep 2 Off Shore Site Code: SEEP2 - OS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collect: 10-25-2006 Effort: Set: 17:00 - 19:20 Collect: 1330-1530

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	2.38	2.38	2.26	2.42	2.3	2.1	2.16	2.42
Ret.	2.06	2.02	1.98	2.04	2.06	1.78	1.8	1.8
Basket Depth								
Set	1.42	1.68	1.64	1.74	1.66	1.3	1.48	1.72
Ret.	1.24	1.48	1.4	1.36	1.28	1.04	1.1	1.18
Disturbed	No							
Debris	L							
Silt/Solids	L							
Benthos/Algae	A	B	A	B	A	B	—	—

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/25/06	
Time	**19:20**	**9:57**	**9:28**	**10:05**	**9:56**	**10:06**	13:50	10/20
Temp.	22.08	9.46	15.15	14.26	13.79	11.98	10.43	10:37
Specific Cond.	252	261	278	269	271	275	273	11.26
D.O.	10.19	12.29	9.39	10.5	8.95	10.42	10.23	280
pH	8.62	8.04	8.18	8.39	8.35	8.25	8.43	1.71 ?
Turbidity	0.49	0.41	0.54	0.41	0.29	2.1	0.19	9.18 ?
								0.28

Substrate Characteristics (%)

Bedrock	
Boulder	100
Artifacts	
Lg. Gravel	
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.790 N
85 deg. 02.893 W

Photos

Date	#	Date	#
9/6/2006	None	10/13/2006	None
9/15/2006	p9150042-47	10/25/06	137 - 135
9/22/2006	p9220038-44		
9/29/2006	p9290034-40		
10/6/2006	pa060035-41		

L, R, #1

Notes:

9/6/2006

Water level rising due to moderate NW wind piling up water on south shore.

Water depth readings are fairly inaccurate due to wave action.

Periphyton fairly abundant, wave action is building and causing turbidity to increase.

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, no waves - water like glass.

Baskets covered with 20-40% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight.

9/22/2006

No apparent movement of baskets or sampling arrays.

The water was slightly choppy with the wind coming out of the east, water is way down - blowing out of the bay.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: Seep 2 Off Shore Site Code: SEEP2 - OS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collect: _____ Effort: Set: 17:00 - 19:20 Collect: _____

Baskets covered with 5-7% green algae, very slight green discoloration on balls.
Balls on the bottom of the baskets appear to be more discolored than the ones on the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.

9/29/2006

No apparent movement of baskets or sampling arrays.
The water was calm with a slight wind coming out of the northeast and becoming more easterly.
Baskets covered with 5-15% green algae.
Slight to very slight green growth on balls. Growth on the balls is equal on both ends and middle.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.
Water appears to be way down.
Algae was very difficult to scrub off the baskets.

10/6/2006

No apparent movement of baskets or sampling arrays.
The water was becoming choppy, partly cloudy with a slight wind coming out of the east.
Baskets covered with 3-5% green algae.
Slight to very slight green growth on balls. Growth on the balls is equal on both ends and middle.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Becoming difficult to see growth on baskets due to wind picking up out of the east.
Less alge on on rocks around the sampling array at this sampling location than at WREF &WCKD.
Brush off baskets.
King salmon swimming between NS and OS sampling arrays.
Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.
The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.
Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.
Baskets covered with 0% algae, slight to some green growth on balls, no more growth than last week.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Little to no green algae on rocks around the sampling array. Brush off baskets.
Could not take pictures because of waves and weather.

10/25/2006
- Growth on baskets almost non-existant

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: West CKD Near Shore Site Code: WCKD - NS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collect: 10/25/06 Effort: Set: 15:00 - 16:30 Collect: 0930 -

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.22	1.26	1.32	1.4	1.46	1.36	1.36	1.38
Ret.	1.2	1.0	1.08	1.02	1.0	1.06	1.0	1.04
Basket Depth								
Set	0.7	0.72	0.74	0.82	0.82	0.76	0.76	0.78
Ret.	0.42	.38	0.49	0.5	0.46	0.62	0.56	0.58
Disturbed	No							
Debris	M							
Silt/Solids	M	M	M		M	M		L
Benthos/Algae	A	B	A	—	A	B	—	B

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/25/06	10/20
Time	16:15	9:12	8:50	9:03	9:01	9:35	09:00	0949
Temp.	24.67	9.96	14.06	12.85	11.69	11.27	10.32	10.51
Specific Cond.	251	290	284	280	291	279	277	293
D.O.	11.13	9.71	9.18	11.08	8.91	10.61	9.38	1.77 ?
pH	8.83	7.88	8.02	8.28	8.25	8.24	8.06	9.08 ?
Turbidity	3.17	1.56	0.93	0.45	0.65	2.6	0.3	0.26

Substrate Characteristics (%)

Bedrock	98
Boulder	
Artifacts	
Lg. Gravel	2
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 22.242 N
84 deg. 59.975 W

Photos

Date	#	Date	#
9/6/2006	None	10/13/2006	None
9/15/2006	p9150024-29	10/25/06	None
9/22/2006	p9220017-22		
9/29/2006	p9290013-19		
10/6/2006	pa060015-20		

Notes:

9/6/2006

Water level at the time of deployment appeared to be lower than the previous set and retrival in May through June 2006 respectively.

Periphyton fairly abundant, wave action is building and causing turbidity to increase.

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, no waves - water like glass.

Baskets covered with 20-25% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight.

9/22/2006

No apparent movement of baskets or sampling arrays.

The water was slightly choppy with the wind coming out of the northeast and becoming more easterly.

6.4 - 24.6 mm B 4.59 - 14.25 A

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: West CKD Near Shore Site Code: WCKD - NS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collect: _____ Effort: Set: 15:00 - 16:30 Collect: _____

Baskets covered with 10-15% green algae, very slight discoloration on balls.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.

9/29/2006

No apparent movement of baskets or sampling arrays.
The water was calm with a slight wind coming out of the northeast and becoming more easterly.
Baskets covered with 20-60% green algae, more on the west end of sampling array than on east end.
Slight green growth on balls. Slightly more growth on the balls in the baskets on the east end of the sampling array.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.
Water appears to be way down.
Algae was very difficult to scrub off the baskets.
Leachate pools were present along the shore line - 9.1pH.

10/6/2006

No apparent movement of baskets or sampling arrays.
The water was calm, partly cloudy with a slight wind coming out of the south.
Baskets covered with 25-30% green algae, slight to some green growth on balls.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Slightly more growth on the balls in the east end of the sampling array than on the west end.
Some green algae on rocks around the sampling array. Brush off baskets.
Zebra mussels juvinals are present on the underside of the rocks.
Water appears to be way down.
Leachate pools were present along the shore line - 8.02-8.34pH.
Algae was very difficult to scrub off the baskets.

10/13/2006

No apparent movement of baskets or sampling arrays.
The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.
Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.
Baskets covered with 3-5% green algae, slight to some green growth on balls, growth becoming darker.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
Could not take pictures because of waves and weather.

10/23/06 Mussel Collections
1700-1800 Collected 2 reps east + west of rock basket samplers. Majority of the Mussels appear to be Quagga mussels. Those from Rep. A (most eastern) were noticeably smaller than those from Rep B (west most). Rep. A mussels range from 4.6 - 14.3 mm. Most were 8-12mm. Rep B mussels range 6.4 - 24.6 mm with most around 15-20 mm. Collected ~33 g for each rep.

10/25/06 #3
YSI 556 Calibration: Spec Cond. read 1023 µS/cm, cal to 1000 µS/cm; pH read 9.88/6.81/4.10, cal to 10/7/4; DO% read 125.5% cal to 100.0%
Basket Collections - Growth moderate

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: West CKD Off Shore Site Code: WCKD - OS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collect: 10/25/06 Effort: Set: 15:00 - 16:30 Collect: 0900 –

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore)							
	1	2	3	4	5	6	7	8
Total Depth								
Set	1.94	2.02	2.04	2.04	2.08	2.06	2.12	2.02
Ret.	1.68	1.84	1.78	1.7	1.8	1.88	1.9	1.76
Basket Depth								
Set	1.36	1.38	1.36	1.42	1.42	1.48	1.52	1.46
Ret.	1.16	1.22	1.2	1.1	1.26	1.28	1.26	1.14
Disturbed	No							
Debris	L							
Silt/Solids	M	L	L	L	M	L		
Benthos/Algae	A	B	A	B	A	B	—	—

Parameters	Water Quality Measurement Periods (weekly during colonization period)							
	Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/25/06	10/20
Time	16:20	9:14	8:57	9:15	9:12	9:41	9:06	9:56
Temp.	23.39	9.36	14.98	13.67	11.86	11.26	10.36	10.69
Specific Cond.	252	261	277	273	304	290	277	297
D.O.	11.35	11.09	9.49	10.62	8.73	10.47	9.27	1.75 ?
pH	8.72	7.96	8.2	8.29	8.19	8.23	8.06	9.06 ?
Turbidity	3.08	0.51	0.44	0.67	0.55	2.18	0.51	0.40

Substrate Characteristics (%)

Bedrock	60
Boulder	7
Artifacts	
Lg. Gravel	23
Sm. Gravel	10
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.889 N
85 deg. 03.630 W

Photos

Date	#	Date	#
9/6/2006	None	10/13/2006	None
9/15/2006	p9150030-35	10/25/06	None
9/22/2006	p9220023-30		
9/29/2006	p9290020-25		
10/6/2006	pa060021-27		

Notes:

9/6/2006

Water level at the time of deployment appeared to be lower than the previous set and retrival in May through June 2006 respectively.

Periphyton fairly abundant, wave action is building and causing turbidity to increase.

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, no waves - water like glass.

Baskets covered with 20-25% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

No obvious zebra mussels on the substraight.

9/22/2006

No apparent movement of baskets or sampling arrays.

The water was slightly choppy with the wind coming out of the northeast and becoming more easterly.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: West CKD Off Shore Site Code: WCKD - OS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collect: _____ Effort: Set: 15:00 - 16:30 Collect: _____

Baskets covered with 10-20% green algae, very slight green discoloration on balls.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.

9/29/2006

No apparent movement of baskets or sampling arrays.
The water was calm with a slight wind coming out of the northeast and becoming more easterly.
Baskets covered with 15-40% green algae, more on the west end of sampling array than on east end.
Slight to some green growth on balls. Slightly more growth on the balls in the baskets on the ends of the sampling array.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
No obvious zebra mussels on the substraight.
Water appears to be way down.
Algae was very difficult to scrub off the baskets.

10/6/2006

No apparent movement of baskets or sampling arrays.
The water was calm, partly cloudy with a slight wind coming out of the south and shifting to out of the west slightly.
Baskets covered with 3-10% green algae, some green growth on balls.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Slightly more growth on the balls/baskets on the ends of the array than the baskets in the middle.
Some green algae on rocks around the sampling array. Brush off baskets.
Zebra mussels juvinals are present on the underside of the rocks.
Water appears to be way down.
Leachate pools were present along the shore line - 8.02-8.34pH.
Algae was very difficult to scrub off the baskets.

10/13/2006

No apparent movement of baskets or sampling arrays.
The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.
Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.
Baskets covered with 1-3% green algae, slight to some green growth on balls, growth becoming darker.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
Could not take pictures because of waves and weather.

10/25/06
Basket collections - Growth variable from moderate to light.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: West Reference Near Shore Site Code: WREF - NS Sample Type: Rock Basket

Date Set: ~~5-17-06~~ 9/6/06 Date Collected: ~~6-29-06~~ 10/24 Effort: Set: ~~1000 - 1040~~ 1015 - 1445 Collect: 1600 - 1700

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth	1.15	1.1	1.1	1.2	1.2	1.2	1.0	1.2
Set	1.34	1.58	1.26	1.36	1.26	1.22	1.26	1.56
Ret.								
Basket Depth								
Set	0.74	0.74	0.7	0.76	0.5	0.52	0.54	0.88
Ret.	0.4	0.4	0.4	0.6	0.5	0.4	0.3	0.5
Disturbed	No							
Debris	Light	Very light	Light			Very Light		Mod
Silt/Solids	Light	Very Light	Light			Very Light		Mod
Benthos/Algae	A	—	A	B	A	B	—	B

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10-24-06	10/20
Time	14:30	8:03	8:10	8:01	8:15	9:02	16:30	9:13
Temp.	21.91	9.25	14.74	13.76	13.02	11.5	10.24	11.24
Specific Cond.	253	284	281	271	281	279	276	283
D.O.	10.75	10.93	8.76	9.89	8.6	10.45	11.97	1.70 ?
pH	8.65	7.86	8.06	8.1	8.22	8.23	8.28	8.98 ?
Turbidity	0.92	0.52	0.56	0.45	0.43	1.11	0.52	0.38

Substrate Characteristics (%)

Bedrock	
Boulder	80
Artifacts	
Lg. Gravel	20
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.912 N
85 deg. 03.887 W

Photos

Date	#	Date	#
9/6/2006	None	10/13/2006	None
9/15/2006	p9150012-17	10/24/2006	None
9/22/2006	p9220001-09		
9/29/2006	p9290001-06		
10/6/2006	pa060001-07		

Notes:

9/6/2006

Water level at the time of deployment appeared to be lower than the previous set and retrival in May through June 2006 respectively.

Zebra mussels were abundant especially at the Off Shore location.

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, no waves - water like glass.

Baskets covered with 20-25% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

Zebra mussels were abundant especially at the Off Shore location.

9/22/2006

No apparent movement of baskets or sampling arrays.

The water was slightly choppy with the wind coming out of the northeast and becoming more easterly.

Rep A: Range 10.57 - 21.47, Mostly ~ 14 mm
Rep B: Range 6.64 - 21.48, Mostly ~ 13 mm
Rep D: Range 7.43 - 18.84, Mostly ~ 10-14 mm

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: West Reference Near Shore Site Code: WREF - NS Sample Type: Rock Basket

Date Set: 5-17-06 Date Collected: 6-29-06 Effort: Set: 1000 - 1040 Collect: _____

Baskets covered with 5-10% green algae, no growth, or silt on balls.
Some green algae on rocks around the sampling array. Brush off baskets.
Zebra mussels were abundant especially at the Off Shore location.

9/29/2006

No apparent movement of baskets or sampling arrays.
The water was calm with a slight wind coming out of the northeast and becoming more easterly.
Baskets covered with 3-5% green algae, slight to very slight growth on balls.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
Zebra mussels were abundant especially at the Off Shore location.
Water appears to be way down.

10/6/2006

No apparent movement of baskets or sampling arrays.
The water was calm, partly cloudy with a slight wind coming out of the south.
Baskets covered with 0-2% green algae, slight to some green growth on balls.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
Zebra mussels were abundant especially at the Off Shore location.
Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.
The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.
Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.
Baskets covered with 0% algae, slight to some green growth on balls, growth becoming darker.
Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.
Some green algae on rocks around the sampling array. Brush off baskets.
Zebra mussels were abundant especially at the Off Shore location.
Could not take pictures because of waves and weather.

10/24/06
Mussel Tissue: Rep A = W; Rep B = E. Rep A size range 10.57-21.47mm with the majority in the 13-14mm range. Rep B size range 6.64mm-21.48mm with the majority around 12-13mm. A Duplicate sample was also taken, from areas near both Rep A + B. The size range was: 7.43-18.84mm with most ranging from 10-14mm. Most appear to be Quagga mussels.
Benthic Quals: Took 30min. kicked + sweeps, picked up rocks, scrubbed rocks + sweep, 10 areas around near-shore + off-shore assemblies. Picked up individual rocks + hand picked specimen.
Basket collections
Near-shore baskets collected. Due to waves, off-shore samplers were not retrieved.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: West Reference Off Shore Site Code: WREF - OS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collected: 10/26 Effort: Set: 10:15 - 14:45 Collect: 1100

Depth (ft)	Replicates (numbered consecutively L to R when facing the shore) 1	2	3	4	5	6	7	8
Total Depth								
Set	1.8	2.06	2.06	2.06	2.12	1.96	2.26	1.86
Ret.	1.52	1.63	1.94	1.86	2.14	1.98	1.96	1.62
Basket Depth								
Set	1.18	1.2	1.36	1.44	1.58	1.46	1.54	1.3
Ret.	1.14	1.04	1.30	1.30	1.42	1.38	1.30	1.06
Disturbed								
Debris								
Silt/Solids								
Benthos/Algae								

Parameters	Water Quality Measurement Periods (weekly during colonization period) Set	9/15/2006	9/22/2006	9/29/2006	10/6/2006	10/13/2006	10/26/06
Time	**14:45**	**8:30**	**8:20**	**8:08**	**8:23**	**9:06**	1100
Temp.	21.49	8.98	15.23	13.57	13.39	12.19	11.48
Specific Cond.	254	261	278	272	277	273	284
D.O.	10.75	11.55	8.99	10.08	8.44	10.2	10.71
pH	8.63	7.85	8.11	8.16	8.24	8.23	8.59
Turbidity	0.5	0.66	0.67	0.92	0.37	0.93	0.31

10/20
0919
11.37
281
1.69 ?
9.07 ?
0.31

Substrate Characteristics (%)

Bedrock	10
Boulder	80
Artifacts	
Lg. Gravel	10
Sm. Gravel	
Sand	
Silt	
Hardpan	
Detritus	
Muck	

GPS Coordinates

45 deg. 21.916 N
85 deg. 03.892 W

Photos

Date	#	Date	#
9/6/2006	None	10/13/2006	None
9/15/2006	p9150018-23	10/24/2006	None
9/22/2006	p9220010-16	10/26/06	NONE
9/29/2006	p9290007-12		
10/6/2006	pa060008-14		

due to dark skies

Notes:

9/6/2006

Water level at the time of deployment appeared to be lower than the previous set and retrival in May through June 2006 respectively.

Zebra mussels were abundant especially at the Off Shore location.

9/15/2006

No apparent movement of baskets or sampling arrays.

The weather was very calm and sunny, no waves - water like glass.

Baskets covered with 5-10% green algae, no growth, or silt on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

Zebra mussels were abundant especially at the Off Shore location.

9/22/2006

No apparent movement of baskets or sampling arrays.

The water was slightly choppy with the wind coming out of the northeast and becoming more easterly.

BAY HARBOR ALGAE & MACROINVERTEBRATE FIELD SHEET

Area: West Reference Off Shore Site Code: WREF - OS Sample Type: Rock Basket

Date Set: 9-6-06 Date Collected: Effort: Set: 10:15 - 14:45 Collect: _____

Baskets covered with 5-10% green algae, very slight to no growth on balls.

Some green algae on rocks around the sampling array. Brush off baskets.

Zebra mussels were abundant especially at the Off Shore location.

9/29/2006

No apparent movement of baskets or sampling arrays.

The water was calm with a slight wind coming out of the northeast and becoming more easterly.

Baskets covered with 3-5% green algae, slight to very slight growth on balls.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

Some green algae on rocks around the sampling array. Brush off baskets.

Zebra mussels were abundant especially at the Off Shore location.

Water appears to be way down.

10/6/2006

No apparent movement of baskets or sampling arrays.

The water was calm, partly cloudy with a slight wind coming out of the south.

Baskets covered with 0-2% green algae, slight to some green growth on balls.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

Some green algae on rocks around the sampling array. Brush off baskets.

Zebra mussels were abundant especially at the Off Shore location.

Water appears to be way down.

10/13/2006

No apparent movement of baskets or sampling arrays.

The wind has been coming out of the west-northwest for the past several days; therefore, the water in the bay was way up.

Water was rough, 2-4' waves, cloudy, rain/sleet/snow, wind at 40-knotsout of the southwest becoming westerly.

Baskets covered with 0% algae, slight to some green growth on balls, growth becoming darker.

Balls on the bottom of the baskets appear to have more growth than the balls at the top of the baskets.

Some green algae on rocks around the sampling array. Brush off baskets.

Zebra mussels were abundant especially at the Off Shore location.

Could not take pictures because of waves and weather.

Appendix J

Columbia Analytical Services Mussel Tissue Lab Report

1317 South 13th Avenue P.O. Box 479 Kelso, Washington 98626 (360) 577-7222 (360) 636-1068 fax

Columbia Analytical Services INC.
An Employee - Owned Company

December 27, 2006 Service Request No: K0609519

Ishway Murarka
Ish,Inc.
804 Salem Woods Drive Suite 801B
Raleigh, NC 27615

RE: Bay Harbor Mussel Tissue

Dear Ishway:

Enclosed are the results of the sample(s) submitted to our laboratory on November 01, 2006. For your reference, these analyses have been assigned our service request number K0609519.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAC standards. Exceptions are noted in the case narrative report where applicable. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3358. You may also contact me via Email at LHuckestein@kelso.caslab.com.

Respectfully submitted,

Columbia Analytical Services, Inc.

Lynda Huckestein
Client Services Manager

LH/lmb

NELAP Accredited ACIL Seal of Excellence Award 100% Recycled

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
B	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.
*	The duplicate analysis not within control limits. See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a chromatographic interference.
X	See case narrative.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

Columbia Analytical Services, Inc.
Kelso, WA
State Certifications, Accreditations, and Licenses

Program	Number
Alaska DEC UST	UST-040
Arizona DHS	AZ0339
Arkansas - DEQ	88-0637
California DHS	2286
Colorado DPHE	-
Florida DOH	E87412
Hawaii DOH	-
Idaho DHW	-
Indiana DOH	C-WA-01
Louisiana DEQ	3016
Louisiana DHH	LA050010
Maine DHS	WA0035
Michigan DEQ	9949
Minnesota DOH	053-999-368
Montana DPHHS	CERT0047
Nevada DEP	WA35
New Jersey DEP	WA005
New Mexico ED	-
North Carolina DWQ	605
Oklahoma DEQ	9801
Oregon - DHS	WA200001
South Carolina DHEC	61002
Utah DOH	COLU
Washington DOE	C1203
Wisconsin DNR	998386840
Wyoming (EPA Region 8)	-

Case Narrative

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Ish, Inc.	**Service Request No.:**	K0609519
Project:	Bay Harbor Mussel Tissue	**Date Received:**	11/1/2006
Sample Matrix:	Tissue		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for samples designated for Tier III validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt

Fourteen tissue samples were received for analysis at Columbia Analytical Services on 11/1/2006. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored frozen at –20°C upon receipt at the laboratory.

Sample Homogenization and Freeze-Drying

The samples were homogenized using a blender in the laboratory. After homogenization of the whole body tissue, a representative aliquot was removed for freeze drying. The Mercury determinations were performed on freeze dried tissue. Note that additional milling of the freeze dried material to a homogenous meal was performed prior to the metals work.

Total Mercury by EPA Method 1631E

No anomalies associated with the analysis of these samples were observed.

Approved by LAA **Date** 12/27/06

Chain of Custody Documentation

Columbia Analytical Services INC.
An Employee-Owned Company

CHAIN OF CUSTODY

Sediment and Tissue Chemistry

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • FAX (360) 636-1068

SR#: K0609519

PAGE 1 OF 2 COC #

PROJECT NAME: Bay Harbor Mussel Tissue

PROJECT NUMBER:

PROJECT MANAGER: Dr. Ishwar Murska

COMPANY/ADDRESS: 804 Salem Woods Dr, Ste. 201B, Raleigh, NC 27615

PHONE #: 408-892-3233 FAX #:

SAMPLER'S SIGNATURE: EA Engineering 847-372-6532

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☐ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☐ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☐ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☐ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1		Hg EPA 1631				REMARKS
WREF-A	10/24/06	1630																			X					31.9 grams
WREF-B	10/24/06	1630																								32.3 grams
WREF-Dup.	10/24/06	1630																								32.4 grams
WCKD-A	10/23/06	1730																								33.5 grams
WCKD-B	10/23/06	1730																								33.8 grams
SEEP2-A	10/24/06	0900																								38.7 grams
SEEP2-B	10/24/06	1030																								35.2 grams
SEEP1-A	10/24/06	1430																								31.9 grams
SEEP1-B	10/24/06	1430																								32.4 grams
ECKD-A	10/26/06	1200																								5.7 grams

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

X III. Data Validation Report (includes all raw data)

___ IV. CLP Deliverable Report

___ V. EDD

INVOICE INFORMATION

P.O. #

Bill To: Ish Inc.

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.

___ 5 Day

___ Standard (10-15 working days)

___ Provide FAX Results

30 Days

Requested Report Date

Circle which metals are to be analyzed:

SMS Metals: As Cd Cr Cu Pb Hg Ag Zn

CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

Mussel tissue

- At all locations, except ECKD, mussels are all quagga mussels. At ECKD, mussels are 50% zebra mussels + 50% quagga mussels. ECKD Transplant mussels were all quagga mussels

RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:		RECEIVED BY:	
Signature	Date/Time 1301 10/30/06	Signature	Date/Time 11/1/06 1402	Signature	Date/Time	Signature	Date/Time
Printed Name: Martin E. Sneen	Firm: EA	Printed Name: Blank	Firm: CAS	Printed Name	Firm	Printed Name	Firm

Columbia Analytical Services INC.
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CHAIN OF CUSTODY

Sediment and Tissue Chemistry

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SR#: K026095T9

PAGE 2 OF 2 COC #

PROJECT NAME: Bay Harbor Mussel Tissue

PROJECT NUMBER:

PROJECT MANAGER: Dr. Ishwar Murala

COMPANY/ADDRESS: 804 Salem Woods Dr, Ste. 201B, Raleigh, NC 27615

PHONE #: 408-892-3233 FAX #:

SAMPLER'S SIGNATURE: EA Engineering 847-372-6332

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☐ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☐ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☐ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☐ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1		Hg EPA 1631				REMARKS
ECKD-B	10/26/06	1200																			X				4.0 grams
ECKD-Transplant	10/26/06	1200																			↓				32.7 grams
EREF-A	10/26/06	1030																			↓				31.8 grams
EREF-B	10/26/06	1030																			↓				32.7 grams

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

X III. Data Validation Report (includes all raw data)

___ IV. CLP Deliverable Report

___ V. EDD

INVOICE INFORMATION

P.O. #

Bill To: Ish Inc.

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.

___ 5 Day

___ Standard (10-15 working days)

___ Provide FAX Results

30 Days

Requested Report Date

Circle which metals are to be analyzed:

SMS Metals: As Cd Cr Cu Pb Hg Ag Zn

CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

Mussel tissue

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date/Time: 10/30/06 - 1301	Signature: [signature] Date/Time: 11/1/06 1400	Signature: Date/Time:	Signature: Date/Time:
Printed Name: Martin E. Sneen Firm: EA	Printed Name: Klaus Firm: EAI	Printed Name: Firm:	Printed Name: Firm:

000.9

Columbia Analytical Services Inc.
Cooler Receipt and Preservation Form

PC LH

Project/Client EA Deerfield Service Request K06 09519

Cooler received on 11/1/06 and opened on 11/1/06 by [illegible]

1. Were custody seals on outside of coolers? Y N
   If yes, how many and where? 1 front
2. Were custody seals intact? Y N
3. Were signature and date present on the custody seals? Y N
4. Is the shipper's airbill available and filed? If no, record airbill number: _____ Y N
5. COC#

Temperature of cooler(s) upon receipt: (°C)	0.3			
Temperature Blank: (°C)				

Were samples hand delivered on the same day as collection? Y N

6. Were custody papers properly filled out (ink, signed, etc.)? Y N
7. Type of packing material present ice-bags.
8. **Did all bottles arrive in good condition (unbroken)?** Y N
9. Were all bottle labels complete (i.e analysis, preservation, etc.)? Y N
10. Did all bottle labels and tags agree with custody papers? Y N
11. **Were the correct types of bottles used for the tests indicated?** Y N
12. Were all of the preserved bottles received at the lab with the appropriate pH? ~~Y~~ N
13. Were VOA vials checked for absence of air bubbles, and if present, noted below? ~~Y~~ N
14. Were the 1631 Mercury bottles checked for absence of air bubbles, and if present, noted below? ~~Y~~ N 1.
15. Did the bottles originate from CAS/K or a branch laboratory? Y N
16. **Are CWA Microbiology samples received with >1/2 the 24hr. hold time remaining from collection?** ~~Y~~ N
17. Was C12/Res negative? ~~Y~~ N

Explain any discrepancies: 1- from Client.

RESOLUTION:

Samples that required preservation or received out of temperature:

Sample ID	Reagent	Volume	Lot Number	Bottle Type	Rec'd out of Temperature	Initials

Metals

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ish,Inc.
Project: Bay Harbor Mussel Tissue
Sample Matrix: Tissue

Service Request: K0609519
Date Collected: 10/24/06
Date Received: 11/1/06

Solids, Total

Prep Method: NONE
Analysis Method: Freeze Dry
Test Notes:

Units: PERCENT
Basis: Wet

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
WREF-A	K0609519-001	12/19/06	55.6	
WREF-B	K0609519-002	12/19/06	49.5	
WREF-DUP.	K0609519-003	12/19/06	47.9	
WCKD-A	K0609519-004	12/19/06	49.9	
WCKD-B	K0609519-005	12/19/06	52.7	
SEEP2-A	K0609519-006	12/19/06	48.0	
SEEP2-B	K0609519-007	12/19/06	50.0	
SEEP1-A	K0609519-008	12/19/06	45.5	
SEEP1-B	K0609519-009	12/19/06	49.7	
ECKD-A	K0609519-010	12/19/06	40.5	
ECKD-B	K0609519-011	12/19/06	69.4	
ECKD-TRANSPLANT	K0609519-012	12/19/06	52.9	
EREF-A	K0609519-013	12/19/06	48.3	
EREF-B	K0609519-014	12/19/06	53.8	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Ish,Inc.
Project: Bay Harbor Mussel Tissue
Sample Matrix: Tissue

Service Request: K0609519
Date Collected: 10/24/06
Date Received: 11/1/06
Date Extracted: NA
Date Analyzed: 12/19/06

Duplicate Summary
Total Metals

Sample Name: WREF-A
Lab Code: K0609519-001D
Test Notes:

Units: PERCENT
Basis: Wet

Analyte	Prep Method	Analysis Method	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Solids, Total	NA	Freeze Dry	55.6	52.4	54.0	6	

Columbia Analytical Services, Inc.

Sample Number(s):	Service Request Number(s):
As Listed	K0609519

TISSUE COMPOSITION DATA

Laboratory ID	Weight (g)	Tare (g)			Matrix	Length	
K9519-1	22.84	79.71					
-2	24.84	80.22					
-3	24.02	80.26					
-4	25.26	78.93					
-5	24.40	79.03					
-6	30.41	79.61					
-7	30.43	78.39					
-8	23.42	80.22					
-9	27.89	81.10					
-10	5.67	80.56					
-11	1.88	80.28					
-12	25.77	80.22					
-13	24.82	80.57					
-14	21.53	80.76					

12/19/06

Comments:

Analyst:	Date: 12/19/06
Reviewed:	Date:

R:\ICP\misc\digforms\TISSUEBENCHSHT

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ish,Inc.
Project: Bay Harbor Mussel Tissue
Sample Matrix: Tissue

Service Request: K0609519
Date Collected: 10/23-26/06
Date Received: 11/1/06

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
WREF-A	K0609519-001	2.0	40	12/26/06	12/27/06	3.4	
WREF-B	K0609519-002	2.0	40	12/26/06	12/27/06	5.4	
WREF-DUP.	K0609519-003	2.0	40	12/26/06	12/27/06	4.0	
WCKD-A	K0609519-004	2.0	40	12/26/06	12/27/06	6.1	
WCKD-B	K0609519-005	2.0	40	12/26/06	12/27/06	3.4	
SEEP2-A	K0609519-006	2.0	40	12/26/06	12/27/06	4.4	
SEEP2-B	K0609519-007	2.0	40	12/26/06	12/27/06	3.6	
SEEP1-A	K0609519-008	2.0	40	12/26/06	12/27/06	4.0	
SEEP1-B	K0609519-009	2.0	40	12/26/06	12/27/06	3.8	
ECKD-A	K0609519-010	2.0	40	12/26/06	12/27/06	7.7	
ECKD-B	K0609519-011	2.0	40	12/26/06	12/27/06	5.1	
ECKD-TRANSPLANT	K0609519-012	2.0	40	12/26/06	12/27/06	3.3	
EREF-A	K0609519-013	2.0	40	12/26/06	12/27/06	5.5	
EREF-B	K0609519-014	2.0	40	12/26/06	12/27/06	3.5	
Method Blank 1	K0609519-MB1	1.0	20	12/26/06	12/27/06	ND	
Method Blank 2	K0609519-MB2	1.0	20	12/26/06	12/27/06	ND	
Method Blank 3	K0609519-MB3	1.0	20	12/26/06	12/27/06	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Ish,Inc.	**Service Request:**	K0609519
Project:	Bay Harbor Mussel Tissue	**Date Collected:**	10/24/06
Sample Matrix:	Tissue	**Date Received:**	11/1/06
		Date Extracted:	12/26/06
		Date Analyzed:	12/27/06

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	WREF-A		Units:	ng/g
Lab Code:	K0609519-001S,	K0609519-001SD	Basis:	Dry
Test Notes:				

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Mercury	METHOD	1631E	2.0	351	389	3.4	308	334	87	85	70-130	8	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Ish,Inc.	**Service Request:**	K0609519
Project:	Bay Harbor Mussel Tissue	**Date Collected:**	10/26/06
Sample Matrix:	Tissue	**Date Received:**	11/1/06
		Date Extracted:	12/26/06
		Date Analyzed:	12/27/06

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	EREF-B		Units:	ng/g
Lab Code:	K0609519-014S,	K0609519-014SD	Basis:	Dry
Test Notes:				

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Mercury	METHOD	1631E	2.0	355	389	3.5	309	348	86	89	70-130	12	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Ish,Inc.	**Service Request:**	K0609519
Project:	Bay Harbor Mussel Tissue	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	12/26/06
		Date Analyzed:	12/27/06

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial)

Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.65	93	70-130	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Ish,Inc.	**Service Request:**	K0609519
Project:	Bay Harbor Mussel Tissue	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	12/26/06
		Date Analyzed:	12/27/06

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.38	88	70-130	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Ish,Inc.	**Service Request:**	K0609519
Project:	Bay Harbor Mussel Tissue	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	12/26/06
		Date Analyzed:	12/27/06

Quality Control Sample (QCS) Summary
Total Metals

Sample Name:	Quality Control Sample	Units:	ng/g
Lab Code:	K0609519-QCS	Basis:	Dry
Test Notes:			

Source: Dolt -3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Acceptance Limits	Result Notes
Mercury	METHOD	1631E	3370	3140	93	2580-4210	

Service Request # K9519
MS/MSD with # K9519
StarLims # 74577

1631 Soil Data Review Form

	Yes	No	NA
1. 20 samples (or less) in batch	X		
2. MS/MSD every 10 samples	X		
3. Current Calibration factor used	X		
4. Calibration data included	X		
5. Method blank below MRL	X		
6. Verification Standards ran	X		
7. Mean of Bubbler Blanks less than 25 pg	X		
8. OPR, QCS in control (70-130%)	X		
9. MS/MSD recovery 70-130%	X		
10. Spike RPD within 30%	X		
11. All samples within the linear range	X		
12. Dilution factors calculated	X		
13. Bench sheet signed	X		
14. Reagent Blank below 20 pg	X		
15. Verification Standards Passed (75-123%)	X		

Comments

Primary Reviewed by [signature] Date 12/27/06

Secondary Reviewed by [signature] Date 12/27/06

Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

Run Duration:	2.25	Integration Mode:	Total Hg
Heating Time:	1.75	Integration Type:	Peak Area
Retention Start Time:	1.0	Result Units:	µg/Kg
Retention Stop Time:	1.75		
Calibration File:	Curve 10-31-06.brd		

Analytical Batch
KA0626570

Reagents

Name	Lot Number
BrCl	RE2-4-G
SnCl+HCl	AF1-6-A

Standards

Name	Concentration	Lot Number
VER STD	10000ppb	AF1-25-J
OPR STD	40000ppb	AF1-25-L

Comments

PMT: 635
OFFSET: 5,064
NOISE: 493

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Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

12/27/06

Run	Run Type	Name/ID	Method Blank	Peak	Peak Area	Analyzed Result (pg)	Final Result (µg/Kg)	QA Results	Criteria	Notes
~~1~~	~~QCS~~	~~VER-1~~		~~1~~	~~7,804,766~~	~~760~~	~~7.60~~	~~152~~	~~77-123~~	~~reject~~
2	QCS	VER-2		1	4,761,831	463	4.63	92.7	77-123	accept
3	MBA	MB-1		1	230,096	17.0	0.340	0.340	< 1	accept
4	MBA	MB-2		1	169,828	11.1	0.223	0.223	< 1	accept
5	OPR	OPR-1		1	2,444,761	233	4.65	93.0	70-130	accept
6	IPR	DOLT-3		1	83,827,551	8,150	3,140	93.0	77-123	accept
7	S	K9519-01		1	635,875	56.5	3.41		< HS	accept
8	MS	K9519-01		1	56,388,167	5,480	308	86.7	70-130	accept
9	MSD	K9519-01		1	55,223,089	5,370	334	85.0	70-130	accept
10	S	K9519-02		1	995,527	91.5	5.36		< HS	accept
11	CB	BB (VER)		1	66,544	6.48		6.48	< 50	accept
12	S	K9519-03		1	758,063	68.4	3.96		< HS	accept
13	S	K9519-04		1	1,199,910	111	6.12		< HS	accept
14	S	K9519-05		1	697,785	62.5	3.39		< HS	accept
15	S	K9519-06		1	864,333	78.7	4.39		< HS	accept
16	S	K9519-07		1	649,368	57.8	3.60		< HS	accept
17	S	K9519-08		1	710,006	63.7	4.03		< HS	accept
18	S	K9519-09		1	764,739	69.0	3.82		< HS	accept
19	S	K9519-10		1	1,390,406	130	7.67		< HS	accept
20	S	K9519-11		1	952,892	87.3	5.08		< HS	accept
21	S	K9519-12		1	658,903	58.7	3.32		< HS	accept
22	S	K9519-13		1	985,992	90.6	5.51		< HS	accept
23	S	K9519-14		1	682,552	61.0	3.54		< HS	accept
24	MS	K9519-14		1	55,987,973	5,440	309	86.0	70-130	accept
25	MSD	K9519-14		1	57,436,569	5,580	348	88.5	70-130	accept
26	MBA	MB-3		1	78,748	2.26	0.0453	0.0453	< 1	accept
27	OPR	OPR-2		1	2,307,451	219	4.38	87.7	70-130	accept
28	QCS	VER-3		1	5,410,263	526	5.26	105	77-123	accept
29	CB	BB (VER)		1	44,407	4.32		4.32	< 50	accept

HgGuru ver 3.0 (c) 2003 Brooks Rand LLC

Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

Run	Run Type	Name/ID	Method Blank	Peak	Peak Area	Analyzed Result (pg)	Final Result (µg/Kg)	QA Results	Criteria	Notes
					no runs					

HgGuru ver 3.0 (c) 2003 Brooks Rand LLC

Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

Bias and Precision

Run Type	Name/ID	Final Result	Units	Spike Level	Source Result	% REC	% REC Limit	RPD	RPD Limit	Notes
MS	K9519-01	308	µg/Kg	351	3.41	86.7	70-130			accept
	K9519-14	309	µg/Kg	355	3.54	86.0	70-130			accept
MSD	K9519-01	334	µg/Kg	389	3.41	85.0	70-130	8.25	< 30	accept
	K9519-14	348	µg/Kg	389	3.54	88.5	70-130	11.8	< 30	accept
IPR	DOLT-3	3,140	µg/Kg	3370		93.0	77-123			accept
OPR	OPR-1	4.65	µg/Kg	5		93.0	70-130			accept
	OPR-2	4.38	µg/Kg	5		87.7	70-130			accept
QCS	~~VER-1~~	~~7.60~~	~~µg/Kg~~	~~5~~		~~152~~	~~77-123~~			~~reject~~
	VER-2	4.63	µg/Kg	5		92.7	77-123			accept
	VER-3	5.26	µg/Kg	5		105	77-123			accept

12/27/06

Calibration

QA Sample Type	Name/ID	Analyzed Result	Units	Spike Level	% REC	% REC Limit	RSD	RSD Limit	Notes
Calibration	20	19.8	pg	20	99.0	75-125			accept
	500	531	pg	500	106	75-125			accept
	2000	2,030	pg	2000	101	75-125			accept
	5000	5,410	pg	5000	108	75-125			accept
	20000	19,400	pg	20000	97.0	75-125			accept
	10	9.75	pg	10	97.5	75-125			accept
	50	47.6	pg	50	95.2	75-125			accept
	200	195	pg	200	97.5	75-125			accept
Calibration Factor		0.0000973	pg/PA				4.50	< 15	accept
Calibration Date		10/31/06							

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Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

Blank Summary

QA Sample Type	Name/ID	Analyzed Result	Units	Criteria	StDev	StDev Limit	Notes
CB	BB (VER)	6.48	pg	< 50			accept
	BB (VER)	4.32	pg	< 50			accept
Average		5.40	pg	< 25	1.52	< 10	accept
MBA	MB-1	0.340	µg/Kg	< 1			accept
	MB-2	0.223	µg/Kg	< 1			accept
	MB-3	0.0453	µg/Kg	< 1			accept
Average		0.203	µg/Kg		0.148		

Comments

PMT: 635
OFFSET: 5,064
NOISE: 493

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Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

Run	Name/ID	Final Result (µg/Kg)	Notes
7	K9519-01	3.41	accepted
10	K9519-02	5.36	accepted
12	K9519-03	3.96	accepted
13	K9519-04	6.12	accepted
14	K9519-05	3.39	accepted
15	K9519-06	4.39	accepted
16	K9519-07	3.60	accepted
17	K9519-08	4.03	accepted
18	K9519-09	3.82	accepted
19	K9519-10	7.67	accepted
20	K9519-11	5.08	accepted
21	K9519-12	3.32	accepted
22	K9519-13	5.51	accepted
23	K9519-14	3.54	accepted

HgGuru ver 3.0 (c) 2003 Brooks Rand LLC

Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

Run	Run Type	Name/ID	Method Blank	Sample Vol/Wt	Dilution Vol (ml)	Analyzed Vol (ml)	Expected Value	Notes
~~1~~	~~QCS~~	~~VER-1~~		~~100~~	~~100~~	~~100~~	~~5~~	12/27/06
2	QCS	VER-2		100	100	100	5	
3	MBA	MB-1		400	40	5		
4	MBA	MB-2		400	40	5		
5	OPR	OPR-1		400	40	5	5	
6	IPR	DOLT-3		208	40	0.5	3370	
7	S	K9519-01		265	40	2.5		
8	MS	K9519-01		285	40	2.5	351	
9	MSD	K9519-01		257	40	2.5	389	
10	S	K9519-02		273	40	2.5		
11	CB	BB (VER)		100	100	100		
12	S	K9519-03		276	40	2.5		
13	S	K9519-04		291	40	2.5		
14	S	K9519-05		295	40	2.5		
15	S	K9519-06		287	40	2.5		
16	S	K9519-07		257	40	2.5		
17	S	K9519-08		253	40	2.5		
18	S	K9519-09		289	40	2.5		
19	S	K9519-10		271	40	2.5		
20	S	K9519-11		275	40	2.5		
21	S	K9519-12		283	40	2.5		
22	S	K9519-13		263	40	2.5		
23	S	K9519-14		276	40	2.5		
24	MS	K9519-14		282	40	2.5	355	
25	MSD	K9519-14		257	40	2.5	389	
26	MBA	MB-3		400	40	5		
27	OPR	OPR-2		400	40	5	5	
28	QCS	VER-3		100	100	100	5	
29	CB	BB (VER)		100	100	100		

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Columbia Analytical Services
Metals Digestion Sheet

StarLims Number:	42894		
Method :	**1631EApp.**	Analysis for :	**CVAFS**

Sample	Matrices	Dry	Wet	Initial Weight (g)	Final Volume (ml)	Matrix
VER-1	Water		x	100ml	100ml	0.5% BrCl
VER-2	Water		x	100ml	100ml	0.5% BrCl
Method Blank		x		0.4000	40	0.02N BrCl
Method Blank		x		0.4000	40	0.02N BrCl
Method Blank		x		0.4000	40	0.02N BrCl
OPR-1		x		0.4000	40	0.02N BrCl
DOLT-3		x		0.216	40	0.02N BrCl
K9519-01	Freeze Dry			0.265	40	0.02N BrCl
K9519-01MS				0.285	40	0.02N BrCl
K9519-01DMS				0.257	40	0.02N BrCl
K9519-02				0.273	40	0.02N BrCl
K9519-03				0.276	40	0.02N BrCl
K9519-04				0.291	40	0.02N BrCl
K9519-05				0.295	40	0.02N BrCl
K9519-06				0.287	40	0.02N BrCl
K9519-07				0.257	40	0.02N BrCl
K9519-08				0.253	40	0.02N BrCl
K9519-09				0.289	40	0.02N BrCl
K9519-10				0.271	40	0.02N BrCl
K9519-11				0.275	40	0.02N BrCl
K9519-12				0.283	40	0.02N BrCl
K9519-13				0.263	40	0.02N BrCl
K9519-14				0.276	40	0.02N BrCl
K9519-14MS				0.282	40	0.02N BrCl
K9519-14DMS				0.257	40	0.02N BrCl
OPR-2				0.4000	40	0.02N BrCl
VER-3	Water		x	100ml	100ml	0.5% BrCl

H_2SO_4= 43212 **HNO3=** MS6 - 9 - F **BrCl =** RE2 - 4 - G
AF1 - 25 - L *(40ppm)* **OPR: 0.05ml** **QCS: 0.2ml (10ppm)** AF1-25-K

1st MS / DMS: 0.1ml (AFI-23-H)
2nd MS / DMS: 0.1ml

Comments:

Time Digestion Started:

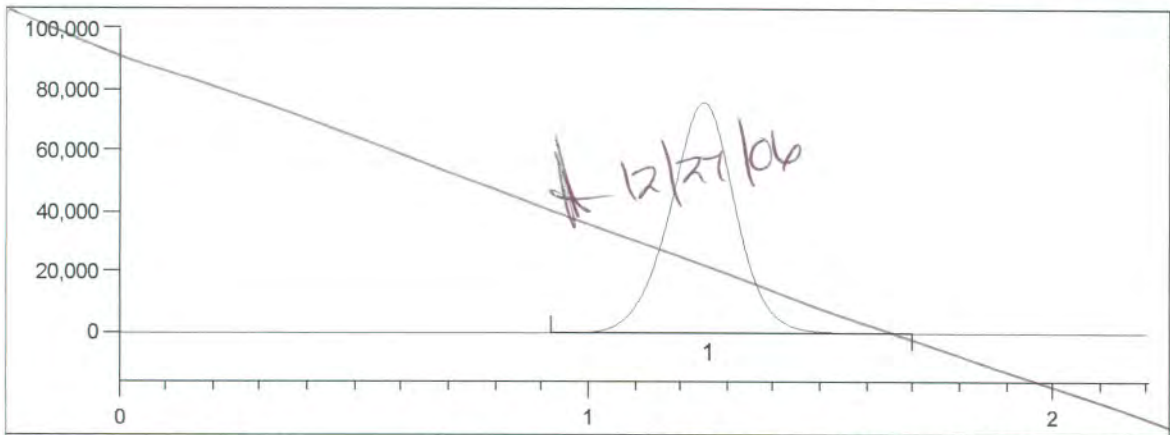
Analyst [signature] **Date** 12/26/06

1631Dig.XLS
6/17/2004

Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

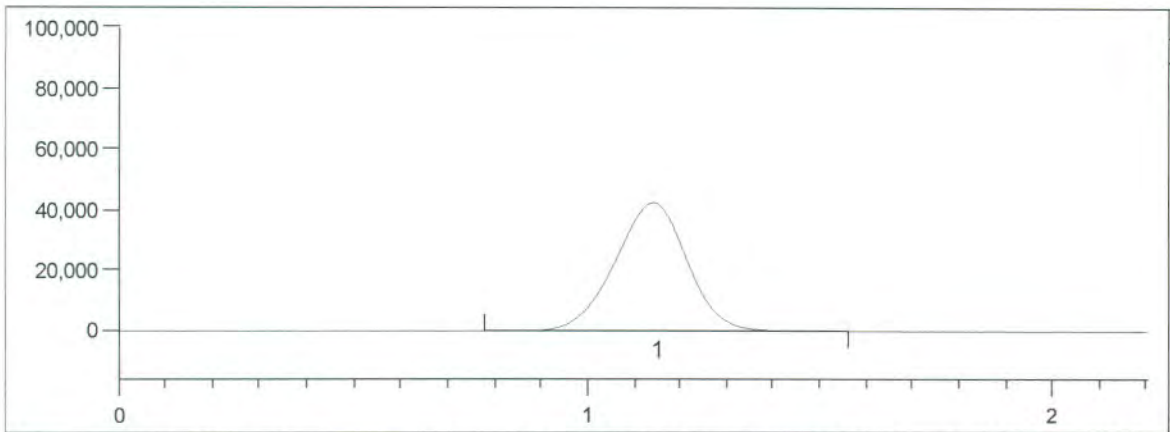


Date:	12/27/06
Time:	8:45 AM

Peak	rt	Area
1	1.27	7,804,766

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
1	QCS	VER-1		1	7,804,766	760	7.60	152	77-123	reject

Notes:

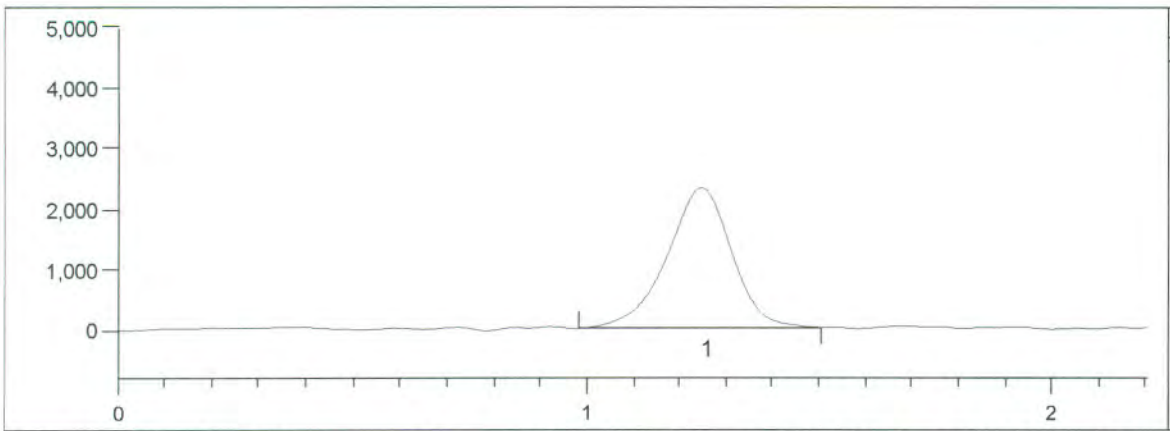


Date:	12/27/06
Time:	9:11 AM

Peak	rt	Area
1	1.16	4,761,831

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
2	QCS	VER-2		1	4,761,831	463	4.63	92.7	77-123	accept

Notes:



Date:	12/27/06
Time:	9:14 AM

Peak	rt	Area
1	1.27	230,096

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
3	MBA	MB-1		1	230,096	17.0	0.340	0.340	< 1	accept

Notes:

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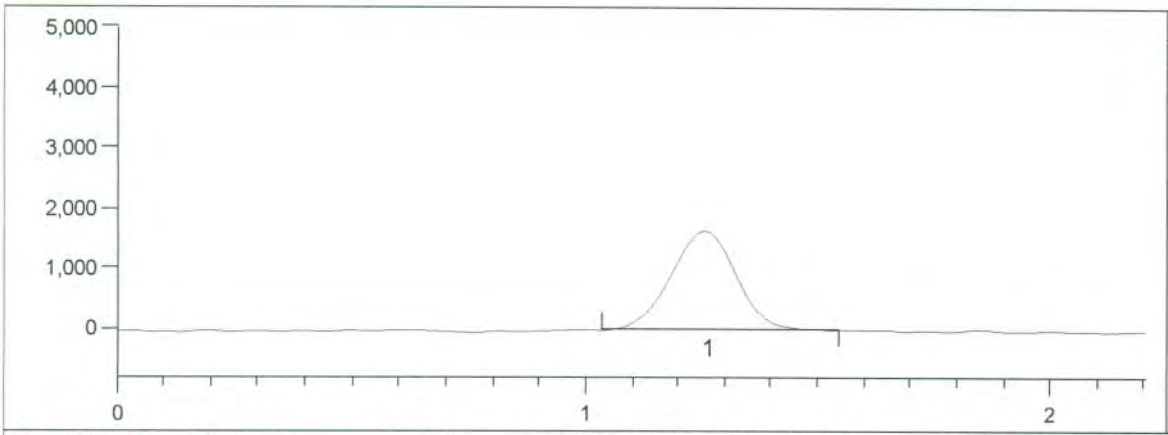
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

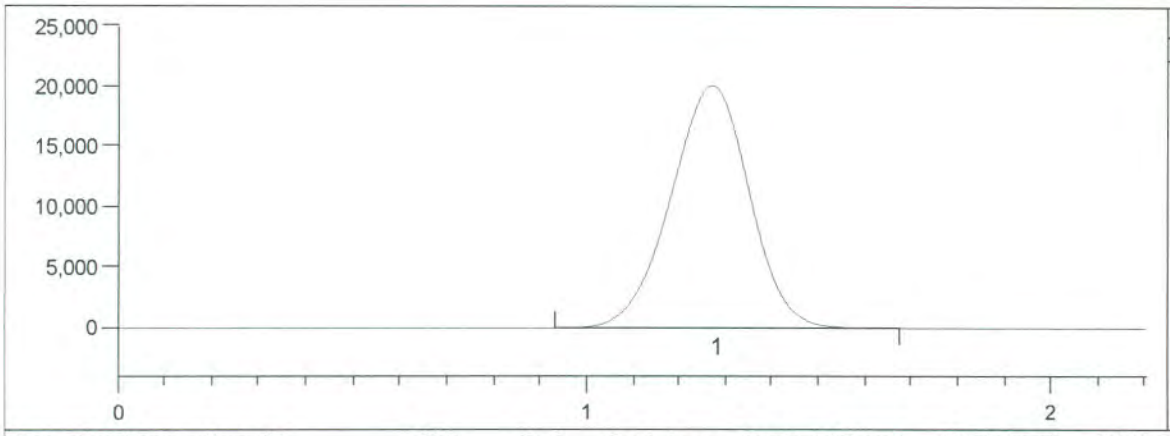


Date: 12/27/06
Time: 9:17 AM

Peak	rt	Area
1	1.28	169,828

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
4	MBA	MB-2		1	169,828	11.1	0.223	0.223	< 1	accept

Notes:

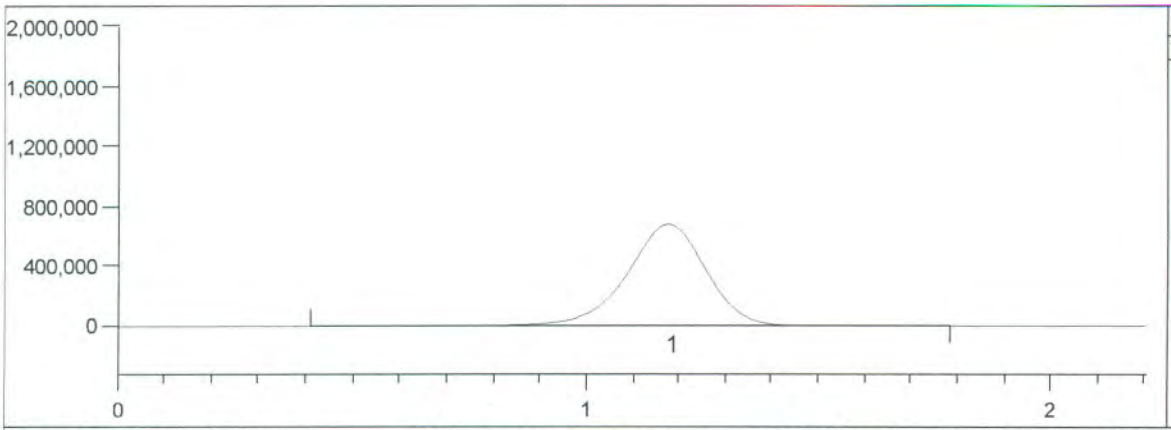


Date: 12/27/06
Time: 9:19 AM

Peak	rt	Area
1	1.29	2,444,761

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
5	OPR	OPR-1		1	2,444,761	233	4.65	93.0	70-130	accept

Notes:



Date: 12/27/06
Time: 9:22 AM

Peak	rt	Area
1	1.20	83,827,551

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
6	IPR	DOLT-3		1	83,827,551	8,150	3,140	93.0	77-123	accept

Notes:

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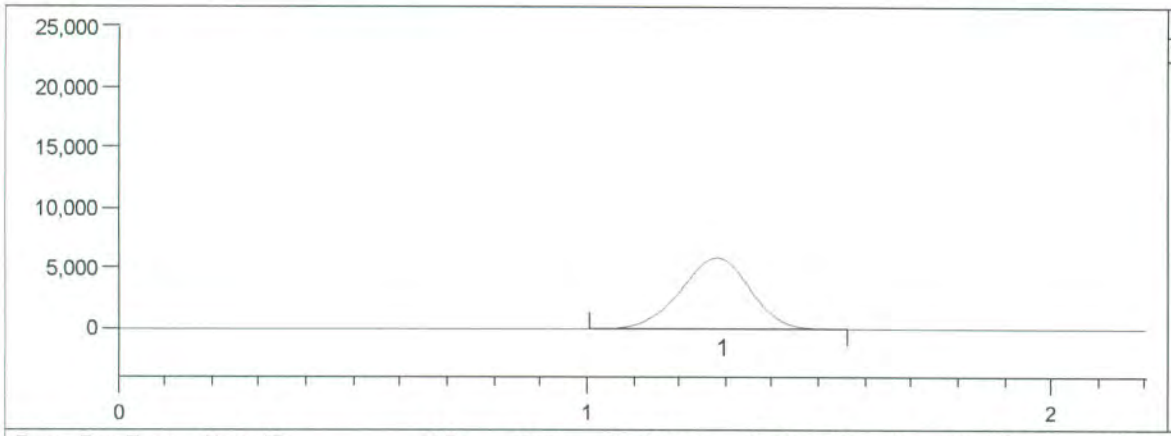
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

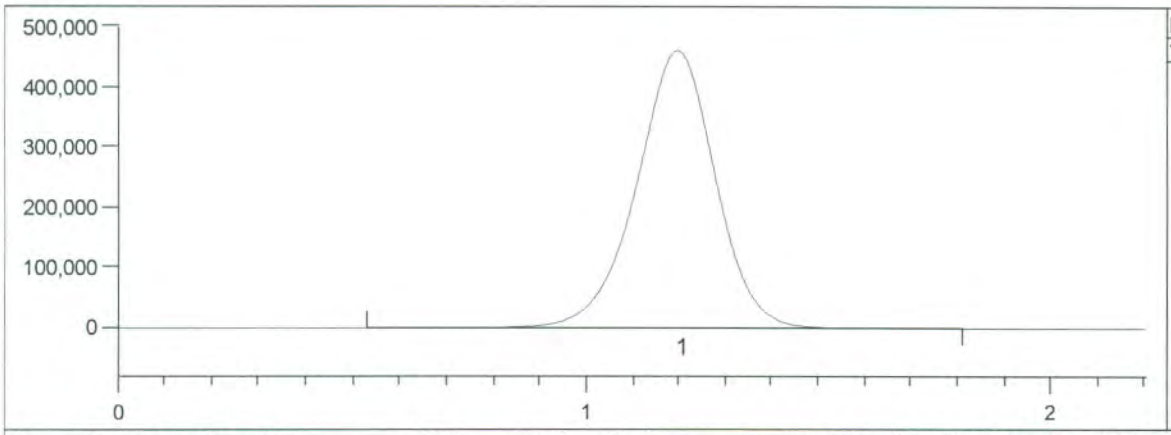


Date: 12/27/06
Time: 9:25 AM

Peak	rt	Area
1	1.30	635,875

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
7	S	K9519-01		1	635,875	56.5	3.41		< HS	accept

Notes:

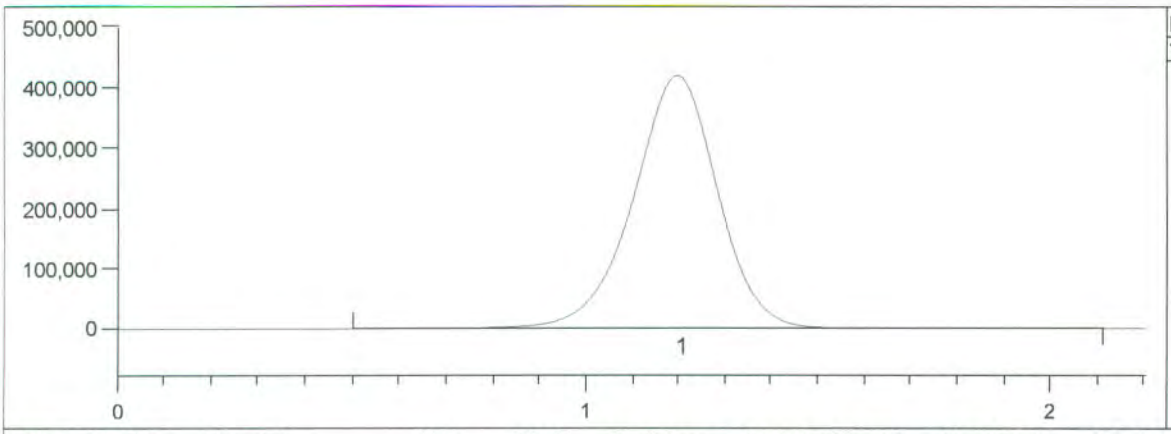


Date: 12/27/06
Time: 9:31 AM

Peak	rt	Area
1	1.22	56,388,167

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
8	MS	K9519-01		1	56,388,167	5,480	308	86.7	70-130	accept

Notes:



Date: 12/27/06
Time: 9:34 AM

Peak	rt	Area
1	1.22	55,223,089

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
9	MSD	K9519-01		1	55,223,089	5,370	334	85.0	70-130	accept

Notes:

00033

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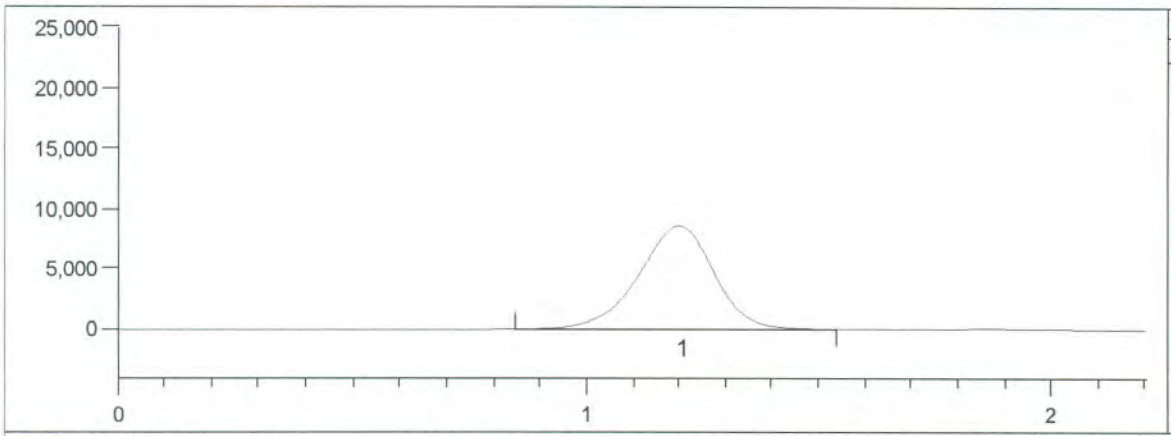
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

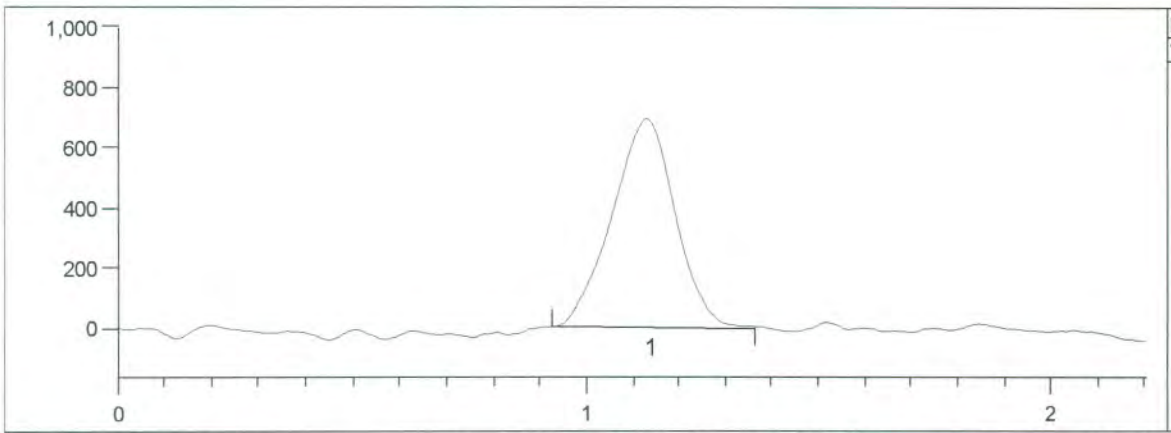


Date: 12/27/06
Time: 9:37 AM

Peak	rt	Area
1	1.22	995,527

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
10	S	K9519-02		1	995,527	91.5	5.36		< HS	accept

Notes:

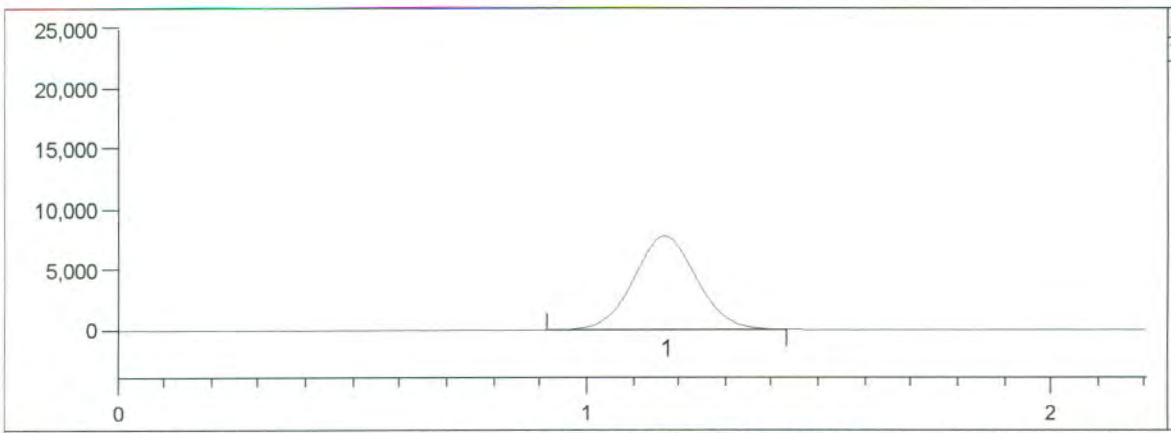


Date: 12/27/06
Time: 9:51 AM

Peak	rt	Area
1	1.15	66,544

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
11	CB	BB (VER)		1	66,544	6.48		6.48	< 50	accept

Notes:



Date: 12/27/06
Time: 9:54 AM

Peak	rt	Area
1	1.19	758,063

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
12	S	K9519-03		1	758,063	68.4	3.96		< HS	accept

Notes:

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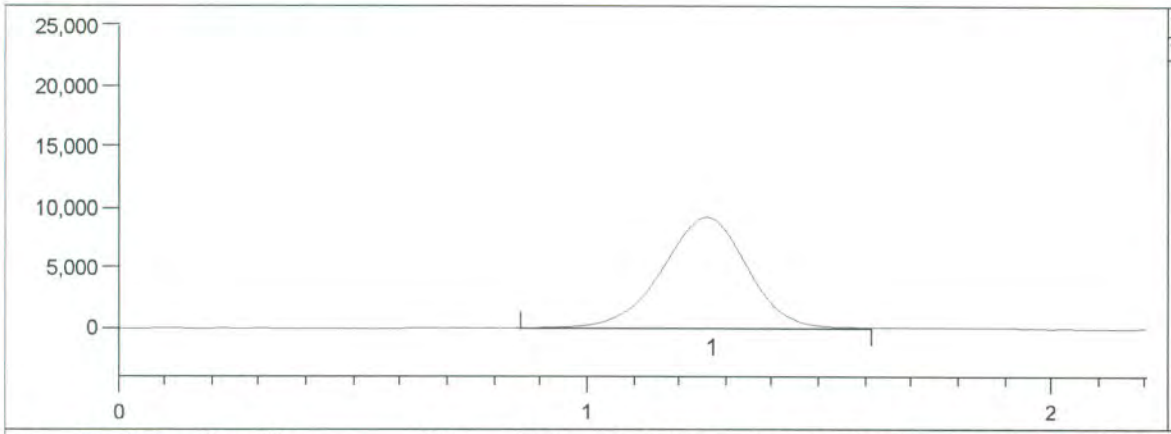
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

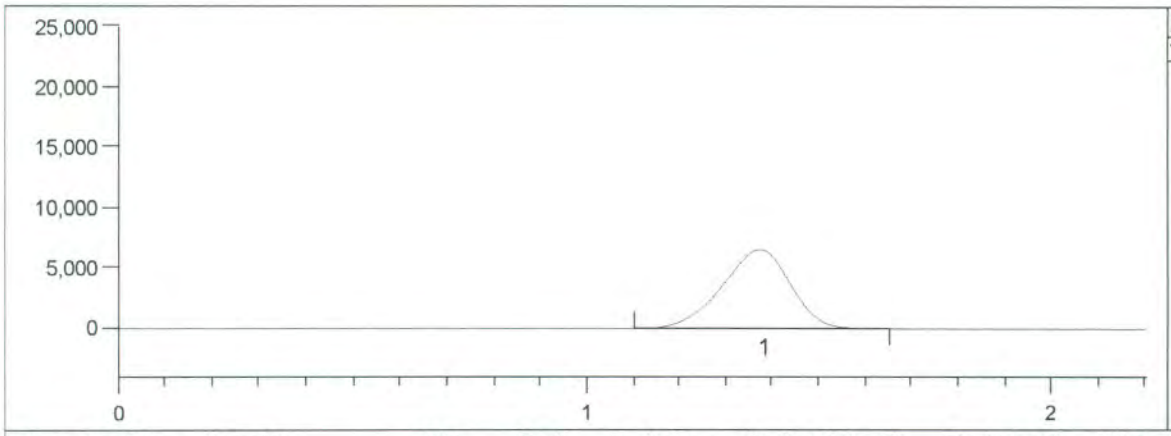


Date: 12/27/06
Time: 10:14 AM

Peak	rt	Area
1	1.28	1,199,910

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
13	S	K9519-04		1	1,199,910	111	6.12		< HS	accept

Notes:

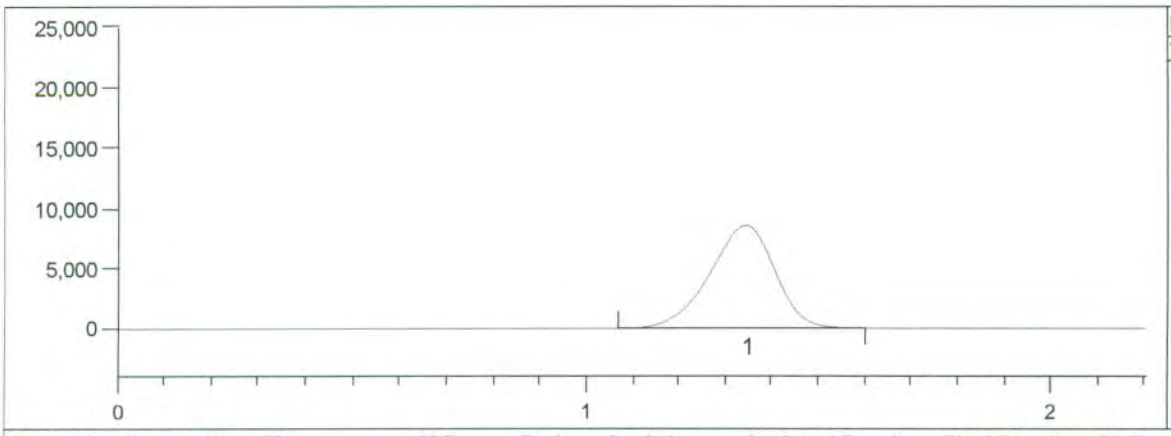


Date: 12/27/06
Time: 10:17 AM

Peak	rt	Area
1	1.40	697,785

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
14	S	K9519-05		1	697,785	62.5	3.39		< HS	accept

Notes:



Date: 12/27/06
Time: 10:19 AM

Peak	rt	Area
1	1.37	864,333

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
15	S	K9519-06		1	864,333	78.7	4.39		< HS	accept

Notes:

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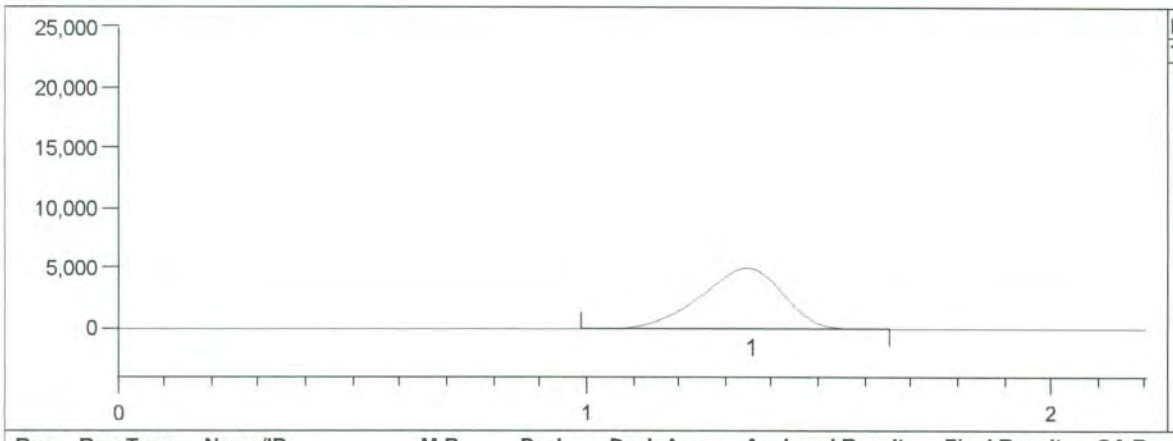
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

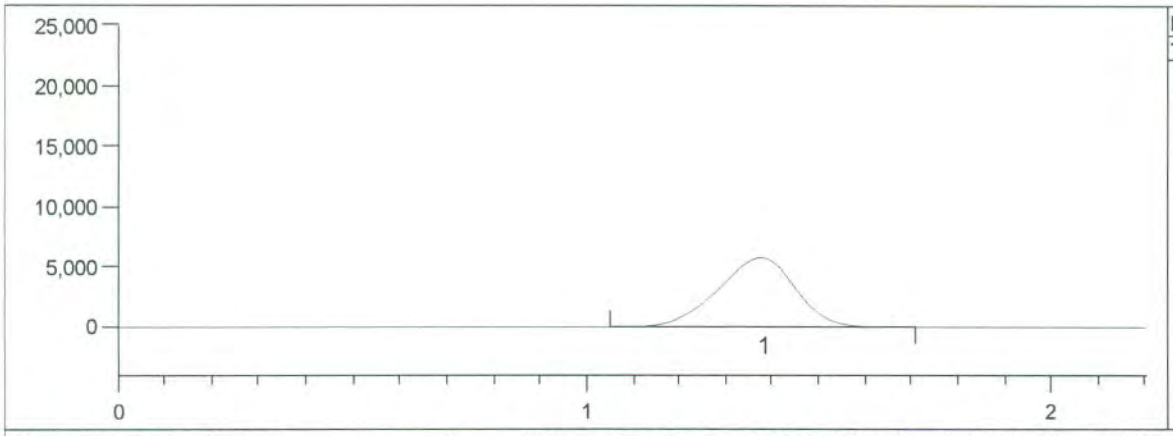


Date: 12/27/06
Time: 10:23 AM

Peak	rt	Area
1	1.37	649,368

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
16	S	K9519-07		1	649,368	57.8	3.60		< HS	accept

Notes:

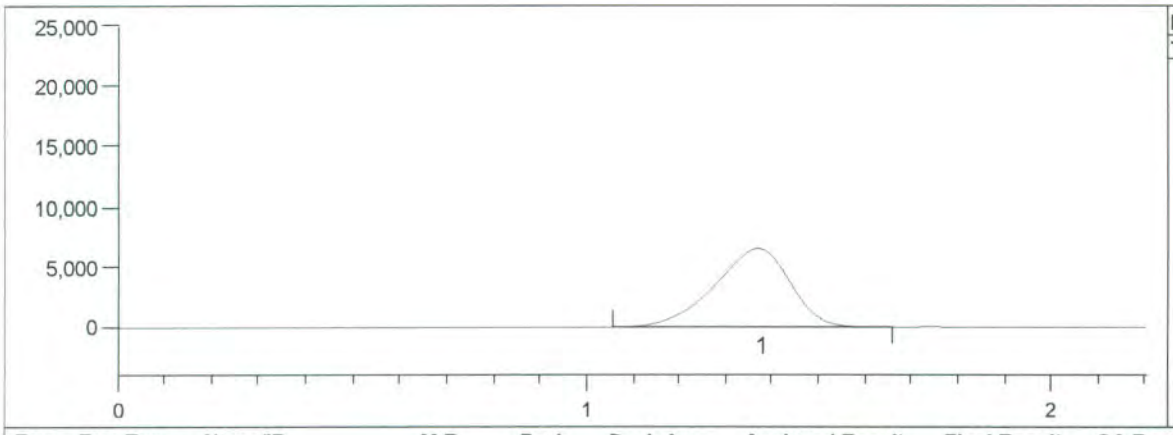


Date: 12/27/06
Time: 10:27 AM

Peak	rt	Area
1	1.40	710,006

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
17	S	K9519-08		1	710,006	63.7	4.03		< HS	accept

Notes:



Date: 12/27/06
Time: 10:34 AM

Peak	rt	Area
1	1.39	764,739

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
18	S	K9519-09		1	764,739	69.0	3.82		< HS	accept

Notes:

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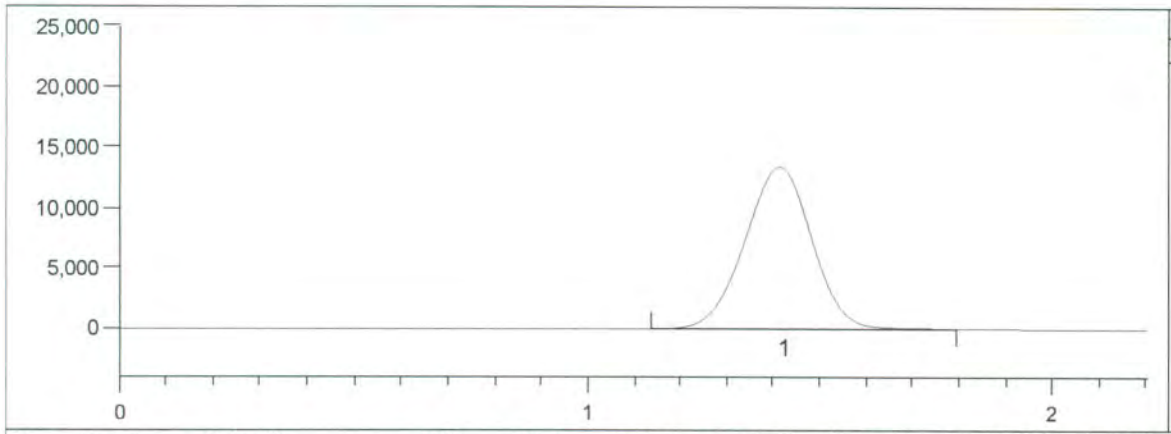
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

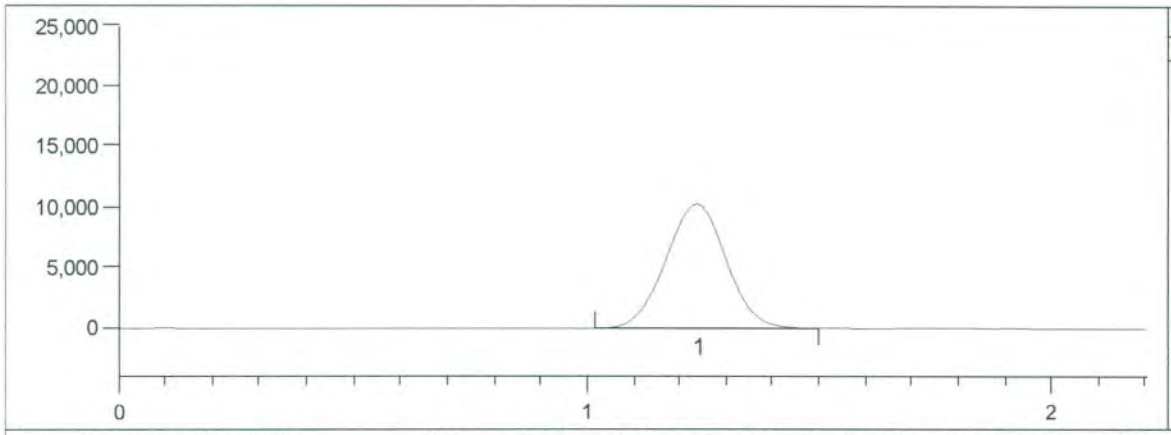


Date: 12/27/06
Time: 10:38 AM

Peak	rt	Area
1	1.44	1,390,406

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
19	S	K9519-10		1	1,390,406	130	7.67		< HS	accept

Notes:

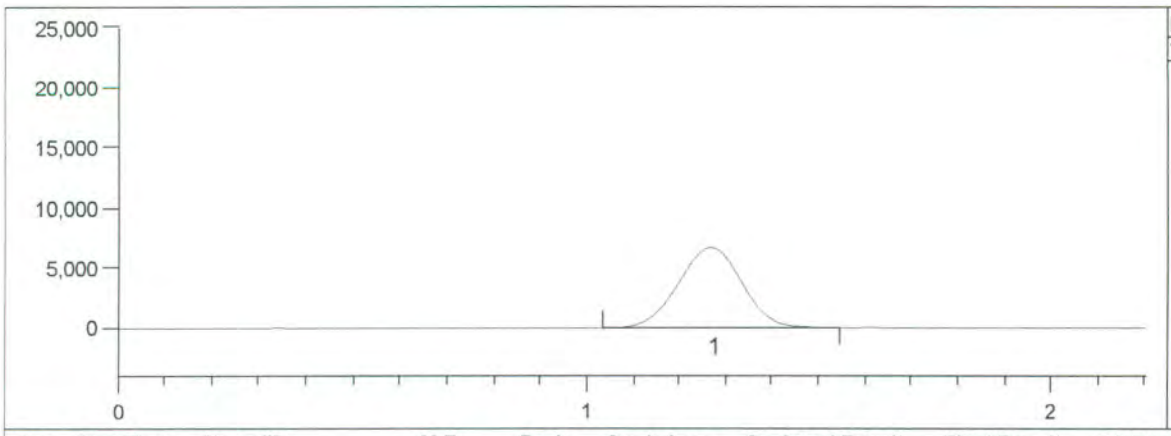


Date: 12/27/06
Time: 10:54 AM

Peak	rt	Area
1	1.26	952,892

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
20	S	K9519-11		1	952,892	87.3	5.08		< HS	accept

Notes:



Date: 12/27/06
Time: 11:03 AM

Peak	rt	Area
1	1.29	658,903

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
21	S	K9519-12		1	658,903	58.7	3.32		< HS	accept

Notes:

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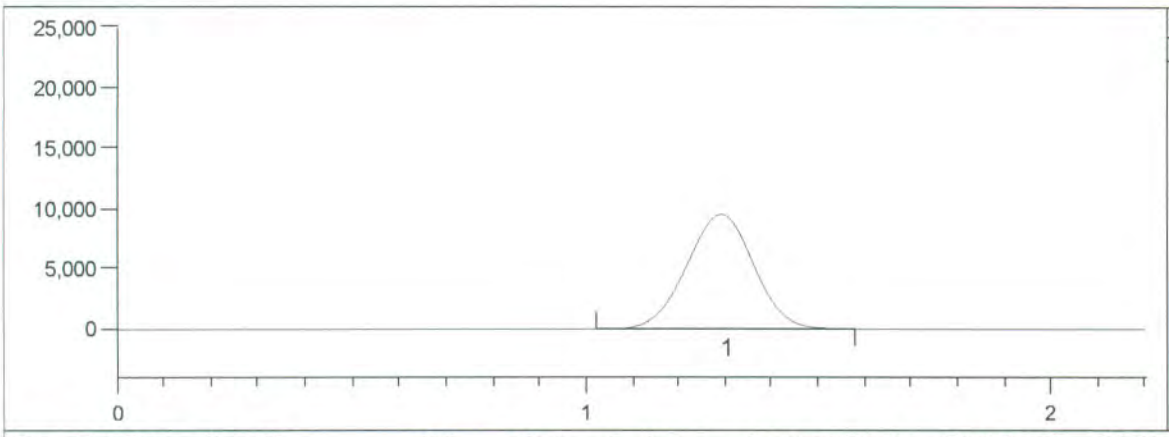
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

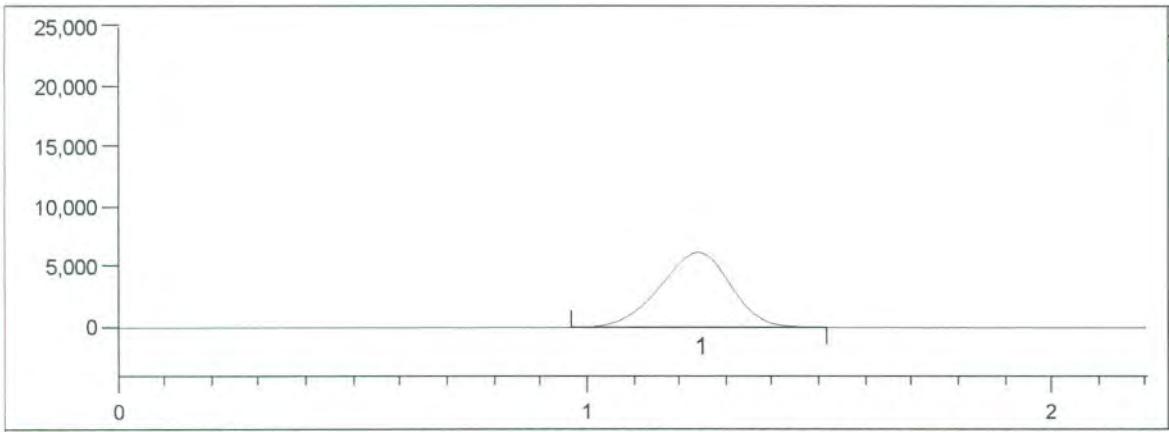


Date: 12/27/06
Time: 11:06 AM

Peak	rt	Area
1	1.32	985,992

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
22	S	K9519-13		1	985,992	90.6	5.51		< HS	accept

Notes:

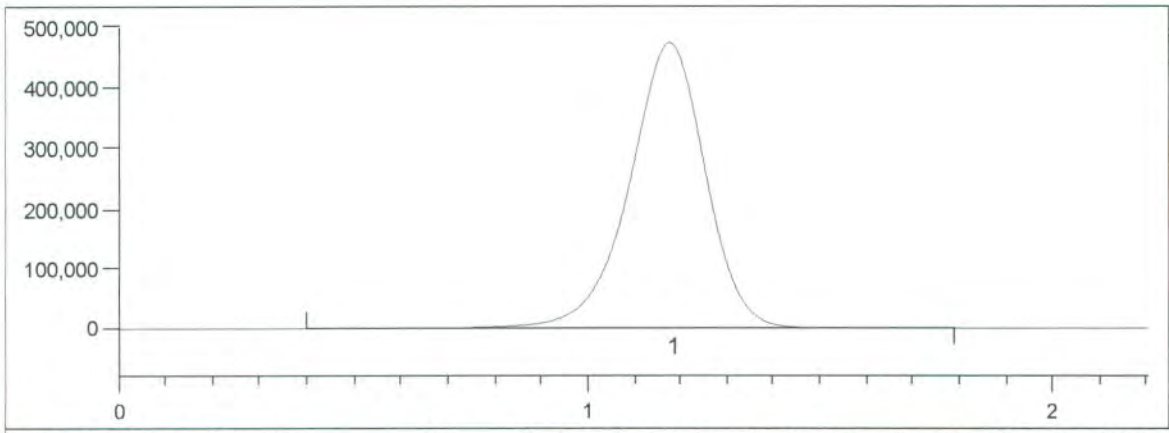


Date: 12/27/06
Time: 11:09 AM

Peak	rt	Area
1	1.26	682,552

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
23	S	K9519-14		1	682,552	61.0	3.54		< HS	accept

Notes:



Date: 12/27/06
Time: 11:15 AM

Peak	rt	Area
1	1.20	55,987,973

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
24	MS	K9519-14		1	55,987,973	5,440	309	86.0	70-130	accept

Notes:

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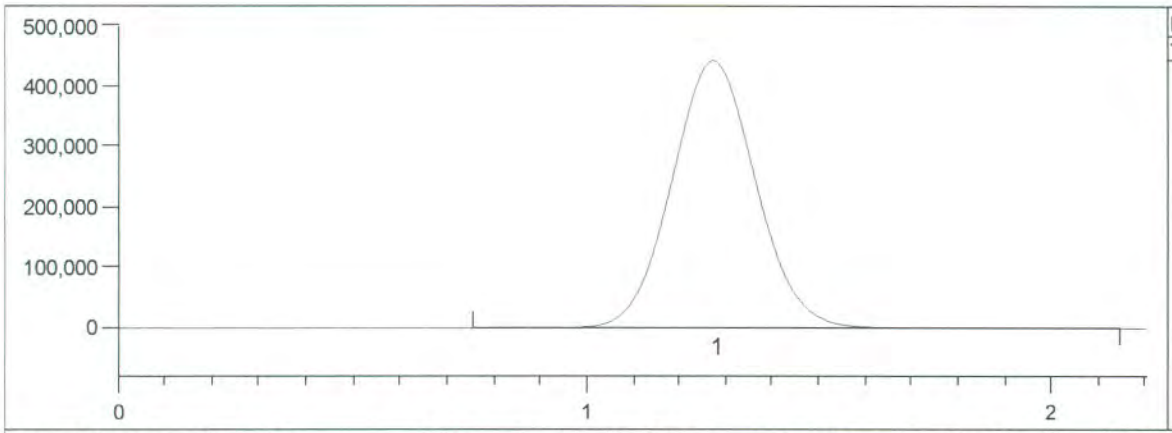
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

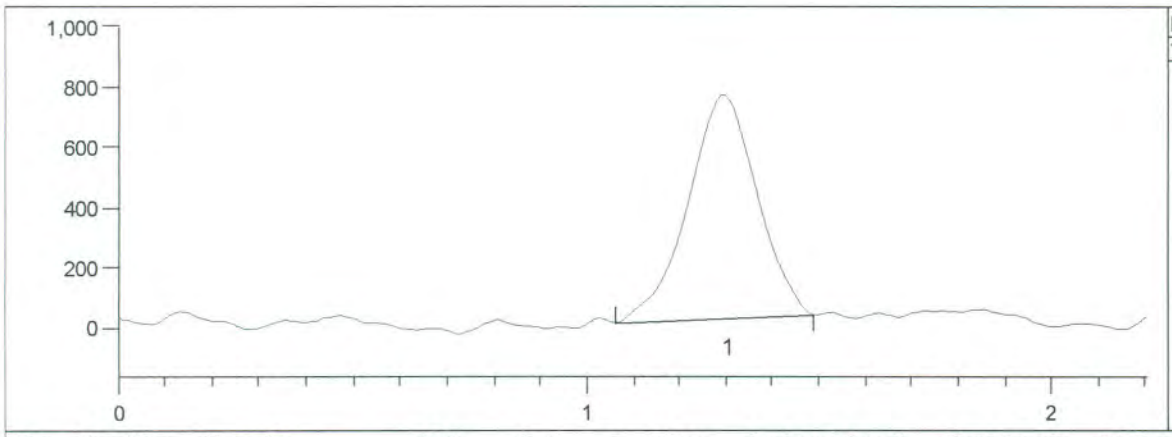


Date: 12/27/06
Time: 11:19 AM

Peak	rt	Area
1	1.30	57,436,569

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
25	MSD	K9519-14		1	57,436,569	5,580	348	88.5	70-130	accept

Notes:

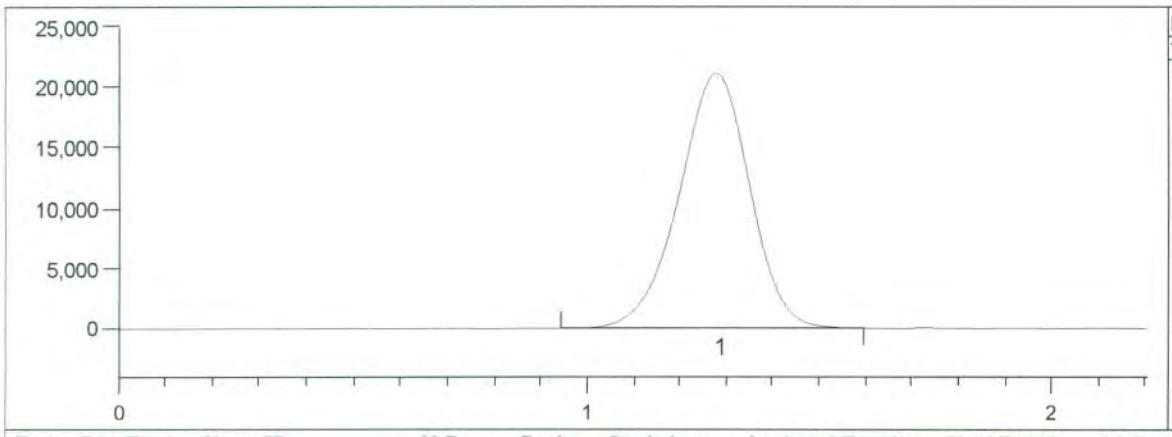


Date: 12/27/06
Time: 11:45 AM

Peak	rt	Area
1	1.32	78,748

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
26	MBA	MB-3		1	78,748	2.26	0.0453	0.0453	< 1	accept

Notes:



Date: 12/27/06
Time: 12:33 PM

Peak	rt	Area
1	1.30	2,307,451

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
27	OPR	OPR-2		1	2,307,451	219	4.38	87.7	70-130	accept

Notes:

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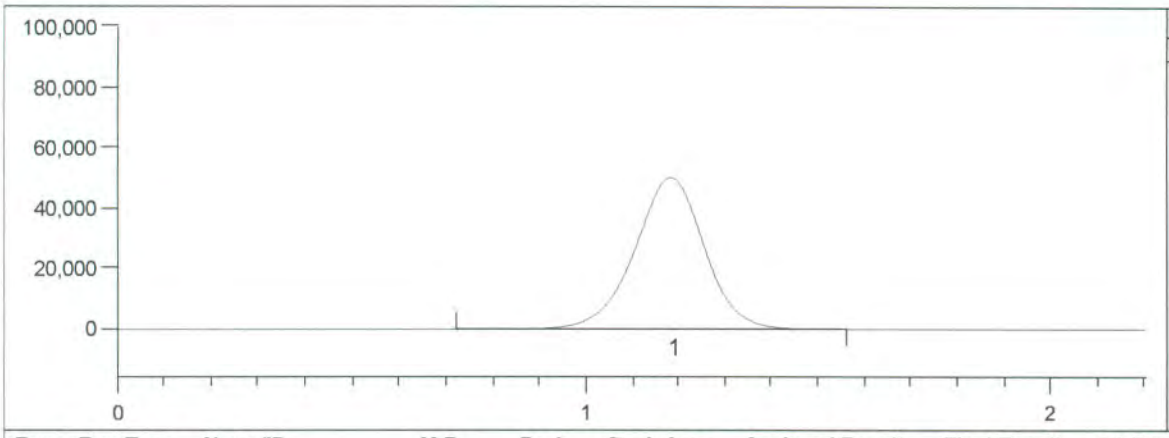
Batch Number: KA0626570
Method Number: EPA 1631 Appdx

Project Number(s): Tissues
Instrument ID: K-AFS-01

Date Analyzed: 12/27/06
Analyst Name: Dena

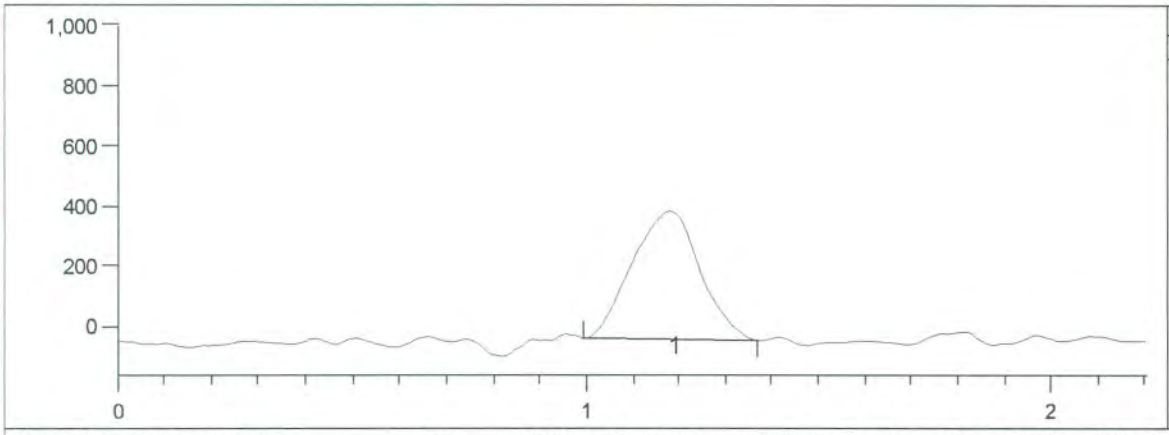


Date: 12/27/06
Time: 12:36 PM

Peak	rt	Area
1	1.20	5,410,263

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
28	QCS	VER-3		1	5,410,263	526	5.26	105	77-123	accept

Notes:



Date: 12/27/06
Time: 12:58 PM

Peak	rt	Area
1	1.20	44,407

Run	Run Type	Name/ID	M B	Peak	Peak Area	Analyzed Result	Final Result	QA Results	Criteria	Notes
29	CB	BB (VER)		1	44,407	4.32		4.32	< 50	accept

Notes:

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