MULTI-CITY STUDY

FIELD REPORT FOR FINFISH, MICRO-LAYER AND BULK WATER SAMPLE COLLECTION IN MOBILE ALABAMA, PENSACOLA FLORIDA, AND PORT ST. LUCIE FLORIDA

for

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1. INTRODUCTION

The objective of this sampling task was to collect representative finfish, microlayer, and bulk water samples for trace-level analysis of specific FOSE-based flurochemical (FC) residuals. This sampling task is in support of a larger effort to assemble baseline information about the distribution of FC in selected media that represent environmental dispersion from a source and bioaccumulation in the human food chain. The cities selected for sample collection were designated 'study' or 'control' cites prior to the involvement of Battelle Marine Sciences Laboratory staff on this project. 'Study' cities are in areas with FC production facilities or large industrial FC-consumers. 'Control' cites do not contain FC production or consumption facilities and are matched to study cities based on general location, population size, and drinking water source. This survey report covers field sampling in Mobile Alabama, Pensacola Florida, and Port St. Lucie Florida.

Finfish, microlayer, and bulk water samples were collected in accordance with Revision 2 of the QAPP (7/23/99) during the period from 7/26/99 through 7/31/99. All samples were collected in the vicinity of the same sites where Battelle Duxbury had previously sampled surface water and sediment in Mobile Alabama, and Pensacola Florida. Samples in Port St. Lucie, Florida were collected in the North Fork St. Lucie River, rather than the South Fork St. Lucie river where Duxbury staff collected surface water and sediment.

1.1 Survey Specific Permits

Scientific collecting permits for the collection of freshwater fish species were obtained for Alabama and Florida prior to departing on this sampling trip. In addition, Florida sport fishing licenses were purchased for collections made in Pensacola and Port St. Lucie, as stipulated under the conditions of our scientific collecting permit. Sample collections at all sites were made at public access points (e.g., boat ramps, county or city parks) in an effort to avoid conflicts with private property owners. Methods of collection were limited to electroshocking, seine nets, and hook-and-line, as specified in the conditions of our permits.

1.2 Field Personnel

Field personnel for this sampling effort were Rhett Zufelt from Battelle Pacific Northwest National Laboratory (PNNL) in Richland, Washington and Dave Shreffler from Battelle Marine Sciences Laboratory in Sequim, Washington. Mr. Shreffler was the Sampling Task Leader for this effort. Rosanna Buhl, Sampling Task QA Officer, performed a QA audit of the finfish, microlayer, and bulk water sampling procedures on 7/28/99.

2. METHODS

The collection of environmental samples was conducted according to Standard Operation Procedures (SOPs). The SOPs used in the Multi-City Study were written by Battelle Duxbury and Battelle Marine Sciences Laboratory (MSL) and were used to train field personnel prior to conducting field activities. Signed training documentation forms are on file at MSL for all of the SOPs used for this study. These SOPs, along with the QAPP, served as the guidance documents for the collection of field samples. Any deviations from these SOPs were documented in the field. In addition, all field personnel were trained in GLP requirements, as specified in 40CFR Part 792. The specific methods used for sample collection are summarized below.

GPS Data

The collection of position data (latitude and longitude) was completed at each sampling location using a Trimble GeoExplorer unit according to Battelle SOP 3-164-01. Because this SOP is specific to the Garmin 12XL Personal Navigator system, all deviations to the SOP were carefully noted. Instrument accuracy was validated by comparing an acquired position versus a position of known location.

Finfish Samples

Finfish samples were collected using one of three methods: backpack electroshocker, seine net, or hook-and-line. The backpack electroshocker was operated according to SOP MSL-T-023-00. There are no SOPs for finfish collection using the seine net or hook-and-line.

Microlayer Samples

Surface microlayer samples were collected using a glass plate sampler. Collection and handling of microlayer samples were performed according to SOP MSL-T-022-00.

Bulk water Samples

Bulk water samples were collected via direct submersion according to SOP M3-F-2.0. Spiking of bulk water samples was performed in accordance with SOP M3-F-4.0.

Temperature Data

Air and water temperatures were measured using a calibrated digital thermometer according to SOP MSL-M-047-00.

Sample Packaging and Shipping

All samples were packaged and shipped according to SOP No. 5-210-01.

Recording Data

Raw data for the finfish, microlayer, and bulk water samples were recorded on field data sheets, which also served as chain of custody forms. Site observations, deviations from SOPs, communications, and all other forms of documentation were recorded on Daily Log sheets according to SOP MSL-D-001-00.

3. CHRONOLOGY

Tables 1 through 4 provide a detailed chronology of the events that occurred each day of the survey. Travel days on 7/26/99 and 7/31/99 are not included in this chronology because no sampling was performed on those days. All times listed in these tables have been transcribed from the daily logs, unless preceded by the letters "Est.", indicating that the time was estimated based on my best recollection of the events of the day. The times are recorded in the local time of the sampling city. For Mobile, Alabama and Pensacola, Florida the recorded times are Central Time Zone. For Port St. Lucie, the recorded times are Eastern Time Zone.

Table 1. Chronology of Events on July 27, 1999

Est. 0830	Purchased miscellaneous field supplies that were not shipped ahead in advance
0930	Picked up all shipments sent in advance to Fed-Ex in Mobile, Al
1030	Located a USACE benchmark (TAW-9) at the Mobile USCG station; recorded GPS coordinates for this known location
1217	Arrived at Africatown-Cochrane Bridge, the location of Duxbury's surface water site #3; surveyed the area for potential sites to collect fish, microlayer and bulk water samples.
1234	Called Marcia Nishioka to determine whether brackish water fish species are acceptable for this study. No answer. Left message.
1307	Set up microlayer sampler, labeled bottles in preparation for taking microlayer and bulkwater samples
1354-1447	Collected 6 microlayer samples according to MSL-T-022-00
1500-1511	Collected 6 bulk water samples according to M3-F-2.0
1515-1525	Spiked 3 bulk water samples according to SOP No. M3-F-4.0
1547	Spoke with Marcia Nishioka. She confirmed that brackish fish species are OK.
1609-1651	Electroshocked approximately 50m of shoreline; No fish shocked; electroshocker ineffective in brackish water
Est. 1700-1800	Driving reconnaissance trip to look for a potential site to collect fish using seine net
1809-1828	Used seine net to collect fish at a site north of the Africatown-Cochrane bridge on the east bank of the Mobile River. Collected two short-nosed gar, *Lepisosteus platostomus,* and saved them as specimens according to MSL-T-023-00
2001	Recorded GPS PM reading at same benchmark (TAW-9)
2006	Sample day complete

Table 2. Chronology of Events on July 28, 1999

Est. 0830	Spoke with Terrell Smith at USACE, Irvington AL office; he gave me the State Plane coordinates for TAW-9.
Est. 0840-0930	Purchased additional field gear and fish identification field guide for Atlantic coast fishes
Est. 1000-1100	Prepared Mobile samples for shipping and dropped them off at Fed-ex
1100-1330	Drove Mobile, AL to Pensacola, FL and checked into hotel
1449	Recorded GPS coordinates at Port of Pensacola; Benchmark=USACE station designation 41, Pensacola Harbor, 1967.

1551	Decided to sample microlayer and bulk water at Duxbury's surface water site #2, near junction of Bayou Blvd and Avery Street
1558	Labeled sample bottles in preparation for microlayer and bulk water sampling
1644	Completed decon of microlayer sampler according to SOP No. MSL-T-022-00
1650-1741	Collected microlayer samples according to MSL-T-022-00
1746-1759	Collected bulk water samples according to M3-F-2.0
1802-1809	Spiked bulk water samples according to M3-F-4.0
1822-1930	Seined ~50m of shoreline at site #2 in 3 independent sets; many juvenile fish collected but none kept; total sample volume (all species combined) was less than the minimum 200g required.
Est. 1957-2018	Seined at Texar Bayou boat ramp (Duxbury surface water site #1); no sample
2035	Returned to Port of Pensacola benchmark and took PM GPS readings
2042	Field day finished

Table 3. Chronology of Events on July 29, 1999

0806-1100	Attempted to catch fish by hook and line at Bayou Texar boat ramp and Miraflores Park near the intersection of 17th and Belmont. Only juvenile fish were caught. No fish were kept. Also attempted to catch fish with the seine net at Miraflores Park. No fish were kept.
Est. 1110-1215	Drove from Pensacola, FL to Mobile, AL. During the drive, Rosanna Buhl verbally reviewed the findings of her QA audit of field procedures and documentation.
Est. 1230	Packaged and shipped Pensacola microlayer and bulkwater samples from Fed-ex in Mobile, AL
1625-2206	Flights from Mobile, AL to Atlanta, GA to West Palm Beach, FL
Est. 2315-0030	Drove from West Palm Beach, FL to Port St. Lucie, FL

Table 4. Chronology of Events on July 30, 1999

0930	Picked up methanol at fed-ex in Port St. Lucie that had been shipped in advance. Also picked up map of Duxbury's surface water sites left behind for us by Chris Gagnon and Kelly Irizarry.
1017	Talked with Rosanna Buhl, after trying unsuccessfully to reach Marcia Nishioka and Kim Andrews. After conferring with Don Gunster, Rosanna and I made the decision to collect finfish, microlayer, and bulk water samples in the North Fork St. Lucie River, instead of at the same sites where Duxbury sampled surface water (South Fork St. Lucie River)
1100-1216	Stood on the bank at White City Park and observed 3 local fishermen who were fishing for mullet. After explaining the purpose of our study, one of the fishermen was willing to give us 3 striped mullet in exchange for a small donation.
1225-1316	Processed fish samples and completed finfish data sheet according to MSL-T-023-00
1341	Completed decon of microlayer sampler according to MSL-T-022-00
1412-1444	Collected microlayer samples according to MSL-T-022-00
1447-1458	Collected bulk water samples according to M3-F-2.0
1501-1507	Spiked bulk water samples according to M3-F-4.0
1725	Shipped all samples to Kim Andrews at Battelle Columbus for Saturday pickup; shipped all field equipment back to MSL
1730	Sampling effort completed

4. RESULTS

The field survey to Mobile, Pensacola, and Port St. Lucie resulted in the successful collection of all required finfish, microlayer, and bulk water samples listed in the QAPP, with the exception that no finfish samples were collected in Pensacola, Florida. Tables 5-7 provide a list of the samples collected including sampling locations and sample ID's.

4.1 Onsite Observations

Mobile, AL: Microlayer and bulk water samples were collected from the west bank of the Mobile River approximately 1/4 mile upstream of the Africatown-Cochrane Bridge. This is a public access area reached via a dirt road from Bay Bridge Road. This location is also near Duxbury's surface water site #3. This stretch of the Mobile River is an industrial waterway and is tidally influenced. The water was reddish-brown in color with a noticeable surface film filled with leaf and floating wood debris, as well as prevalent foam. The banks of the river were littered with garbage.

Fishermen in the area were catching croakers and blue crabs, both brackish water species. The backpack electroshocker was ineffective for collecting fish samples in the brackish water. There was also too much large wood debris and rip rap on the bottom to effectively seine at this site. Using a seine net, we collected finfish samples from the east bank of the Mobile River approximately 1/2 mile upstream of the Africatown-Cochrane Bridge. This site was near a wood trestle bridge that appeared to be the loading area for a car ferry. This was a shallow, marshy area with muddy substrate and lots of fish feeding up on the surface.

Pensacola, FL: Microlayer and bulk water samples were collected from Bayou Texar near the intersection of Bayou Blvd and Avery Street, approximately 1 mile up the bay from the Bayou Texar Boat Ramp at Cervantes Street and Bayou Blvd. This was Duxbury's surface water site #2. The shoreline development in this area is predominantly residential. No large industrial uses of the bay were observed in the vicinity of our sampling site. The water was brown in color with no noticeable surface film. Fishermen observed in the area were fishing for croaker, flounder, and speckled trout. No one had fish in their buckets for us to observe.

We were unable to collect the 200g minimum sample size of fish in Bayou Texar. Based on our seine net samples, which were filled with juveniles of multiple species, this water body serves as a brackish nursery area. Twice we had speckled trout leap over the top of the seine net.

Port St. Lucie, FL: Finfish, microlayer, and bulk water samples were collected from a tidally influenced portion of the North Fork St. Lucie River at White City Park. The park is located on the east bank of the river off of Midway Road between S. 25th Street and Sunrise Blvd. The water was reddish-brown in coloration with a detectable surface film. This park is a very popular location for recreational fishermen. I counted 8 fishermen along a 100m stretch of the

river. The fishermen were catching mullet at an estimated rate of one every 5-10 minutes. One alligator and one manatee were also observed near the sampling site.

Table 5. Samples Collected from Mobile River, Mobile, AL

Matrix	Sample ID	Approximate Total Volume (L) or Weight (g) Collected	Location Collected
Microlayer water	MC-4101B	1	Africatown-Cochrane Bridge
Microlayer water	MC-4102K	0.5	Africatown-Cochrane Bridge
Microlayer water	MC-4103H	0.5	Africatown-Cochrane Bridge
Microlayer water	MC-4104B	0 (FIELD BLANK)	Africatown-Cochrane Bridge
Microlayer water	MC-4105K	0 (FIELD BLANK)	Africatown-Cochrane Bridge
Microlayer water	MC-4106H	0 (FIELD BLANK)	Africatown-Cochrane Bridge
Bulk water	MC-4107B	1	Africatown-Cochrane Bridge
Bulk water	MC-4108K	1	Africatown-Cochrane Bridge
Bulk water	MC-4109H	1	Africatown-Cochrane Bridge
Bulk water	MC-4110B	1	Africatown-Cochrane Bridge
Bulk water	MC-4111K	1	Africatown-Cochrane Bridge
Bulk water	MC-4112H	1	Africatown-Cochrane Bridge
Finfish-gar (n=2)	MC-4113	725 g	Africatown-Cochrane Bridge

Table 6. Samples Collected from Bayou Texar, Pensacola, FL

Matrix	Sample ID	Approximate Total Volume (L) or Weight (g) Collected	Location Collected
Microlayer water	MC-3101B	1	Bayou Blvd & Avery Street
Microlayer water	MC-3102K	0.5	Bayou Blvd & Avery Street
Microlayer water	MC-3103H	0.5	Bayou Blvd & Avery Street
Microlayer water	MC-3104B	0 (FIELD BLANK)	Bayou Blvd & Avery Street
Microlayer water	MC-3105K	0 (FIELD BLANK)	Bayou Blvd & Avery Street
Microlayer water	MC-3106H	0 (FIELD BLANK)	Bayou Blvd & Avery Street
Bulk water	MC-3107B	1	Bayou Blvd & Avery Street
Bulk water	MC-3108K	1	Bayou Blvd & Avery Street
Bulk water	MC-3109H	1	Bayou Blvd & Avery Street
Bulk water	MC-3110B	1	Bayou Blvd & Avery Street
Bulk water	MC-3111K	1	Bayou Blvd & Avery Street
Bulk water	MC-3112H	1	Bayou Blvd & Avery Street

Table 7. Samples Collected from North Fork St. Lucie River, Port St. Lucie, FL

Matrix	Sample ID	Approximate Total Volume (L) or Weight (g) Collected	Location Collected
Microlayer water	MC-6101B	1	White City Park Boat Ramp
Microlayer water	MC-6102K	0.5	White City Park Boat Ramp
Microlayer water	MC-6103H	0.5	White City Park Boat Ramp
Microlayer water	MC-6104B	0 (FIELD BLANK)	White City Park Boat Ramp
Microlayer water	MC-6105K	0 (FIELD BLANK)	White City Park Boat Ramp

Matrix	Sample ID	Approximate Total Volume (L) or Weight (g) Collected	Location Collected
Microlayer water	MC-6106H	0 (FIELD BLANK)	White City Park Boat Ramp
Bulk water	MC-6107B	1	White City Park Boat Ramp
Bulk water	MC-6108K	1	White City Park Boat Ramp
Bulk water	MC-6109H	1	White City Park Boat Ramp
Bulk water	MC-6110B	1	White City Park Boat Ramp
Bulk water	MC-6111K	1	White City Park Boat Ramp
Bulk water	MC-6112H	1	White City Park Boat Ramp
Finfish-striped mullet (n=4)	MC-6113	1475 g	White City Park Boat Ramp

4.2 Instrumentation Results

The location of each sampling site was determined using a Trimble GeoExplorer GPS unit. The positions for each site are reported in Tables 8-10. Following the field survey, all GPS site positions were differentially-corrected to NAD 1927 (Cornus) using post-processing methods. The results of the differential corrections are also presented in Tables 8-10. Following shipment to Mobile, Alabama the instrument was reinitialized at the Africatown-Cochrane Bridge. Within several minutes of reinitializing, the unit was displaying locations of the local area, which indicated that it was working properly. At each new sampling location, the GPS was calibrated by recording the accepted position of a benchmark, monument, or known physical location and comparing this to the GPS derived position, which was recorded in both the am and pm. The results of the calibrations for each sampling day are presented in Table 11. No calibration was done in Port St. Lucie, Florida because a landmark with known latitude and longitude could not be located.

Table 8. Sampling Site Positions in Mobile, AL

Sampling Location	Latitude	Longitude	Address
Africatown-Cochrane Bridge (West Bank of Mobile River): microlayer, bulk water	N 30°44'10.60"	W 88°02'40.95"	Bay Bridge Road
Differential correction	N 30°44'07.6798"	W 88°02'41.1503"	Bay Bridge Road
Africatown-Cochrane Bridge (East Bank of Mobile River: finfish	N 30°44'17.14"	W 88°02'22.38"	Bay Bridge Road
Differential correction	N 30°44'18.1020"	W 88°02'21.2489"	Bay Bridge Road

Table 9. Sampling Site Positions in Pensacola, FL

Sampling Location	Latitude	Longitude	Address
Bayou Texar: microlayer, bulk water	N 30°26'01.34"	W 87°10'55.79"	Bayou Blvd & Avery Street
Differential correction	N 30°26'02.6742"	W 87°10'57.2881"	Bay Bridge Road

Table 10. Sampling Site Positions in Port St. Lucie, FL

Sampling Location	Latitude	Longitude	Address
White City Park: finfish	N 27 22' 20.07"	W 80 20' 44.22"	Midway Rd

Differential correction	N 27°22'20.6260"	W 80°20'45.8520"	Bay Bridge Road
White City Park Boat Ramp: microlayer, bulk water	N 27°22'16.31"	W 80°20' 38.95"	Midway Rd
Differential correction	N 27°22'17.0382"	W 80°20'40.0435"	Bay Bridge Road

Table 11. GPS Position Verification Results

Calibration Locations	Latitude	Longitude
Accepted Position at USACE benchmark TAW-9 (Mobile, AL)	N 237010.55 (Alabama State Plane coordinates)	E 324010.71 (Alabama State Plane coordinates)
GPS Measured Position (AM)	N 30°39'02.4679"	W 88°03'33.8680"
GPS Measured Position (PM)	N 30°39'01.7855"	W 88°03'34.6657"
Accepted Position at Port of Pensacola USACE benchmark "41" (Pensacola, FL)	N 519748.52 (Florida State Plane coordinates)	E 1113921.30 (Florida State Plane coordinates)
GPS Measured Position (AM)	N 30°24'03.5823"	W 87°12'39.4217"
GPS Measured Position (PM)	N 30°24'04.8766"	W 87°12'40.1838"

4.3 Communications

During the completion of the field survey, several conversations regarding the sampling effort were noted. These communications were conducted between Battelle MSL staff and staff from other Battelle offices (e.g., Columbus, Duxbury, PNNL), as well as various municipal employees or the public.

•In Mobile, Alabama we met with N.F. Raybon, the base engineer at the U.S. Coast Guard (USCG) station in Mobile on 7/27/99. He showed us the location of a U.S. Army Corps of Engineers (USACE) benchmark where we did our GPS calibration. The station designation was TAW-9. On 7/28/99, I spoke with Terrell Smith (205-957-6019) from the USACE office in Irvington, Alabama. Mr. Smith gave me the state plane coordinates for benchmark TAW-9.

•We spoke with several fishermen in the vicinity of the Africatown-Cochrane bridge in Mobile. Two fishermen allowed us to look at their catches. This exercise confirmed that the species being caught in this area are all brackish water species.

•I talked with Marcia Nishioka at 1547 on 7/27/99 to confirm that brackish fish species were acceptable for the objectives of this study.

•In Pensacola, Florida we were guided to a benchmark on the Port of Pensacola's property in Pensacola Harbor by an administrative assistant (her name was not recorded) on 7/28/99. We recorded GPS coordinates at USACE benchmark #41, Pensacola Harbor, 1967.

•At the location of our finfish, microlayer, bulk water sampling site in Pensacola, we spoke with 3 officers from the Florida Marine Patrol, who stopped to inquire what we were doing. I explained the study in general terms and showed them our scientific collecting permit. Their concern was that fishermen will sometimes stash coolers on the banks of Bayou Texar and

offload fish in excess of their allowed daily limits into these hidden coolers before pulling a boat out of the water at a marina.

•We spoke with a local fishermen at Miraflores Park in Pensacola on 7/29/99 who said that he often fishes in this area for flounder, croaker, and speckled trout.

•7/30/99 We spoke with a fed-ex agent in Port St. Lucie who is an avid recreational fishermen (name not recorded). He showed us on a Port St. Lucie map several public access locations on the North Fork St. Lucie River. We ultimately ended up sampling at one of these locations—White City Park.

•At 1017 on 7/30/99 I spoke with Rosanna Buhl after she conferred with Don Gunster about sampling finfish, microlayer, and bulk water in Port St. Lucie. Rosanna relayed to me that Don Gunster made the decision that we should sample in the North Fork instead of the South Fork where Battelle Duxbury staff collected surface water and sediment samples.

•We spoke with four fishermen at White City Park in Port St. Lucie, who allowed us to look in their buckets at their catch for the day. One fisherman agreed to let us have three fish for the multi-city study in exchange for a small monetary donation.

•In all three cities, members of the general public inquired about our sampling efforts. In each case, we provided a general answer without divulging the client or specifics of what the samples were being tested for.

•On 9/16/99 Roger Bush (850-763-2881) from USACE in Panama City, Florida called with the GPS coordinates for the benchmark station designation "41" Pensacola Harbor, 1967.

5. DEVIATIONS FROM SOPS

During the collection of samples from Mobile, Pensacola, and Port St. Lucie all deviations from SOPs were carefully noted on the Daily Log sheets by the Sampling Team Leader, Dave Shreffler. None of these deviations were deemed significant enough to compromise sample integrity or data quality. Other minor deviations were noted during an audit conducted by Rosanna Buhl, the Sampling Task Quality Assurance Officer, and were addressed in the response to the audit report. All known deviations are documented below.

The following deviations were documented by Rosanna Buhl during a field inspection on 7/28/99 and have been cut and pasted from her QA Audit Report into this Survey Report:

- Section 10.1 and M3-F-7: Trip blanks were not prepared for this survey. The project manager made this decision.

- Section 11.1: The pens used for data collected were not ball-point with ink but were fluid ink in solvent. These inks can be obscured if wet and must not be used for GLP studies.

- Section 11.1.1: Separate Site Logs were not completed for each sampling location. Instead, all required information was recorded on the sampling form.

- Section 11.1.4: The project manager did not create the matrix and sample-specific forms for this portion of the study. They were created by the Sampling Team leader.

- Section 11.8 and SOP M3-F-7: The QAPP states that fish samples will be collected from reaches adjacent to or in the vicinity of the surface-water source of drinking water. In fact, it was discovered during the inspection that samples in Mobile, Pensacola, and Port St. Lucie were collected in estuarine waters for both the sediment/surface water survey and the microlayer/finfish survey. The project manager defined the collection location. The project manager must address this deviation and the corrective action. It is unclear whether these stations will have to be re-collected.

- Section 12.1: It was noted that some custody forms were incomplete (no relinquished signatures).

- Amendment 2 to Revision No. 1 and Section 7.3.5: According to Table 3, 1L microlayer samples would be collected. In fact, a 1L sample was collected for Rep 1 and 500 mL were collected for Reps 2 and 3. The project manager confirmed the volumes.

- Amendment 2 to Revision No. 1 Section 7.3.10, 11.8.1, and Table 9: The fish species collected during this survey were not the freshwater species specified in the QAPP.

- Amendment 2 to Revision No. 1 Section 11.1.4 and SOP M3-F-4: One label, not two labels, was prepared. No label was affixed to the custody forms. Labels were not preprinted.

- Amendment 2 to Revision No. 1 Section 11.9.1:

  Step 5 and SOP MSL-T-022-00 : The microlayer sampler glass plate was not dipped into the water gently or withdrawn slowly. The Field Team Leader should document the effect that this procedure had on the "capture" of microlayer vs. underlying water.

  Step 8 and MSL-T-022-00: The method specifies that a minimal headspace should be left in the containers. In all cases, but particularly in the 500 mL sample instances, head space was present in the sampling bottles.

- Amendment 2 to Revision No. 1 Section 11.9.2 and SOP M3-F-7: Sample bottles were not wiped with MEOH prior to affixing the labels. The purpose of this procedure was to ensure that the labels adhered to the bottle. However, bottles air-dried quickly and additional drying was unnecessary. The amendment should allow for alternative procedures.

- The inability to collect fish in Pensacola should be documented as a deviation.

- SOP M3-F-4: The spiking solutions received from BCL were not labeled with a Lot No or preparation date.

- 40 CFR Part 792: The methanol, deionized water, and BCL matrix spike containers were not labeled according to GLP standards.

  Methanol and deionized water should be labeled with Identity, Date opened or prepared, Concentration, Lot No, Analyst who opened or prepared, Storage Conditions, and Expiration Date. The last 5 items were not documented on the labels, although other information was.

  Spiking solutions are considered a reference substance and should be labeled with the name, Chemical Abstract Service (CAS) or code number, batch number, expiration date (if any is given), and the storage conditions necessary to maintain the strength, identity, purity, and composition of the material. The project manager is responsible for ensuring that spike solutions from BCL are properly labeled.

- SOP 5-210 states that coolers should be washed prior to use. The coolers used for sample shipment were not washed.

The following deviations were documented by Dave Shreffler, the Sampling Team Leader:

<u>•Collection and Handling of Fish Samples Using a Backpack Electroshocker (MSL-T-023-00)</u>
-Block nets were not set up at the downstream and upstream ends of the sampling reach as specified in Section 5.2.4. It was impractical with only two people to install block nets and also conduct electroshocking. Such an effort would require a minimum of three people.

-No sample label was placed on the outside of the aluminum foil as specified in Section 5.2.14. One label between the double Ziploc bags was deemed adequate.

-Finfish Datasheets were used instead of chain of custody forms as specified in Section 5.2.16. The finfish datasheets contained more information than what could reasonably fit on the coc forms.

•Collection and Handling of Aquatic Surface Microlayer Samples (MSL-T-022-00)
-As requested by Marcia Nishioka, no soap was used in the decontamination phase of the microlayer sampling. This is a deviation from Section 5.1.

-Air space was left in some 1L bottles containing 500mL microlayer samples, as authorized by Marcia Nishioka. This is a deviation from Section 5.2.9.

-Sample bottles were not wrapped in bubble wrap as specified in Section 5.2.11. Crushed ice was tightly packed between the sample bottles, so that there was no space between the bottles.

-Aquatic Microlayer Sample Data Sheets were used instead of chain of custody forms as specified in Section 5.2.12. The data sheets allowed more room for additional information than the coc forms.

•Collection and Handling of Water Samples for the Multi-Cities Project (M3-F-2.0)
-For the bulk water samples, GPS readings were transcribed from the Microlayer Data Sheets, because the microlayer and bulk water samples were taken from the same location. This is a deviation from 3.1.2.

-Surface Bulk Water Sampling Data Sheets were used instead of chain of custody forms as specified in Section 3.1.9. The data sheets allowed more room for additional information than the chain of custody forms.

• Calibration and Use of Thermometers (MSL-M-047-00)
No deviations were documented

• Use of Garmin GPS 12XL Personal Navigator (3-164-01)
-The Garmin GPS 12XL unit was unavailable at the time of this field effort. Instead a comparable GPS unit, a Trimble GeoExplorer, was used. A separate attachment documents the way in which we used the Trimble unit (Attachment A). Attachment A is a draft revision of SOP 3-164-01, which is specifically for the use of the Trimble GeoExplorer.

•Spiking Field Samples for the Muli-Cities Project (M3-F-4.0)
-Spiking solutions were sent to us in glass ampoules, rather than screw-topped vials. Thus, to open the ampoules we used a triangular file to score the top of the ampoule. This was a necessary deviation from Section 3.2.3.

•Assigning Sample Identification Numbers to Samples Collected for the Multi-Cities Project (M3-F-6.0)
-In order to have enough unique sample identification numbers for each city, we used a sample ID format of MC-nnnn. This was a deviation from Section 2.1, which specifies an ID format of MC-nnn.

•Packaging and Shipping of Samples (5-210-01)
-One inch of bubble wrap was not used on the bottom of each cooler. This is a deviation from Section 4.

6. PHOTODOCUMENTATION

Photographs were taken with a digital Canon camera at each sampling location. These photos document the site conditions where the fish, microlayer, and bulkwater samples were collected, and will also potentially serve as a visual reference if it becomes necessary for field staff to return to these locations.

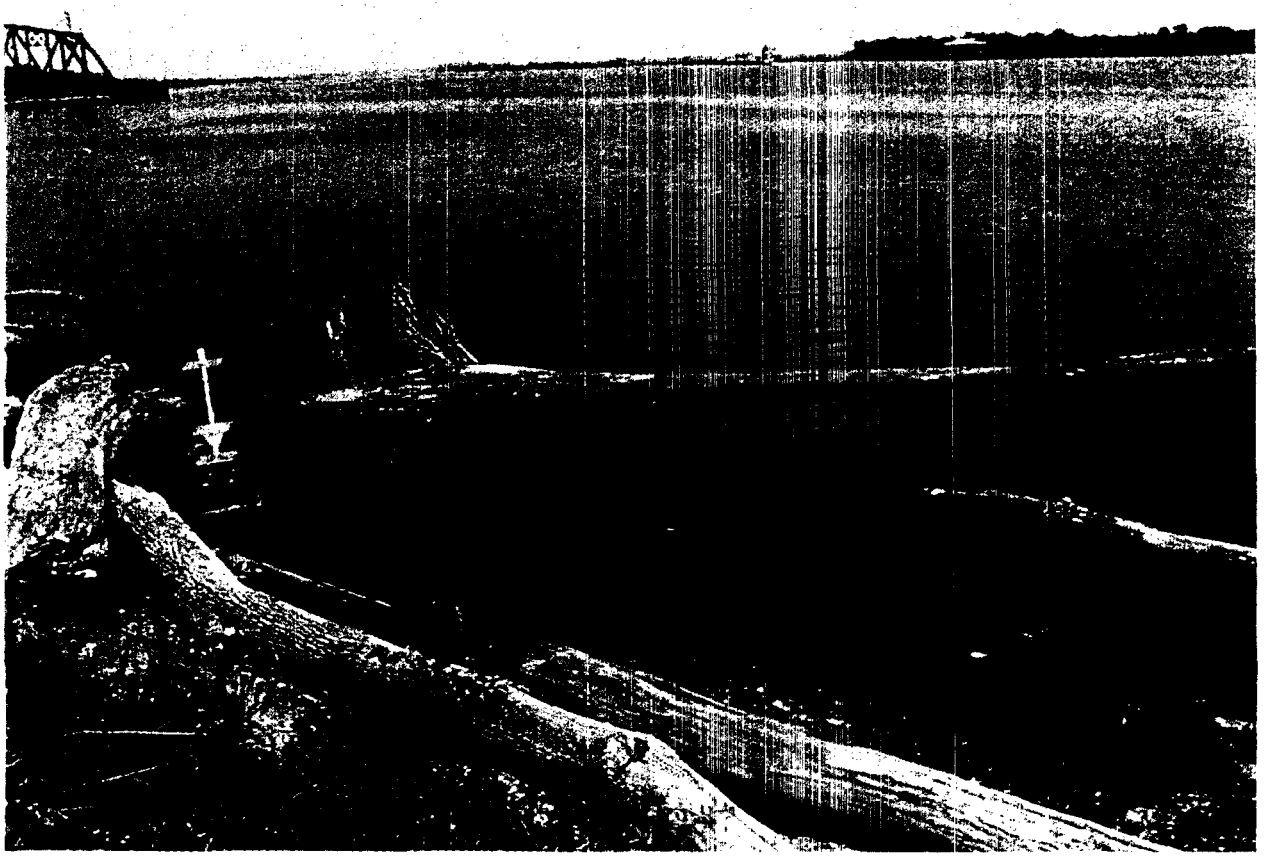

Photo 1. Mobile River, Mobile, Alabama. View upstream from the sampling location where microlayer and bulk water samples were collected, on the west bank of the Mobile River near the Africatown-Cochrane bridge off of Bay Bridge Road.

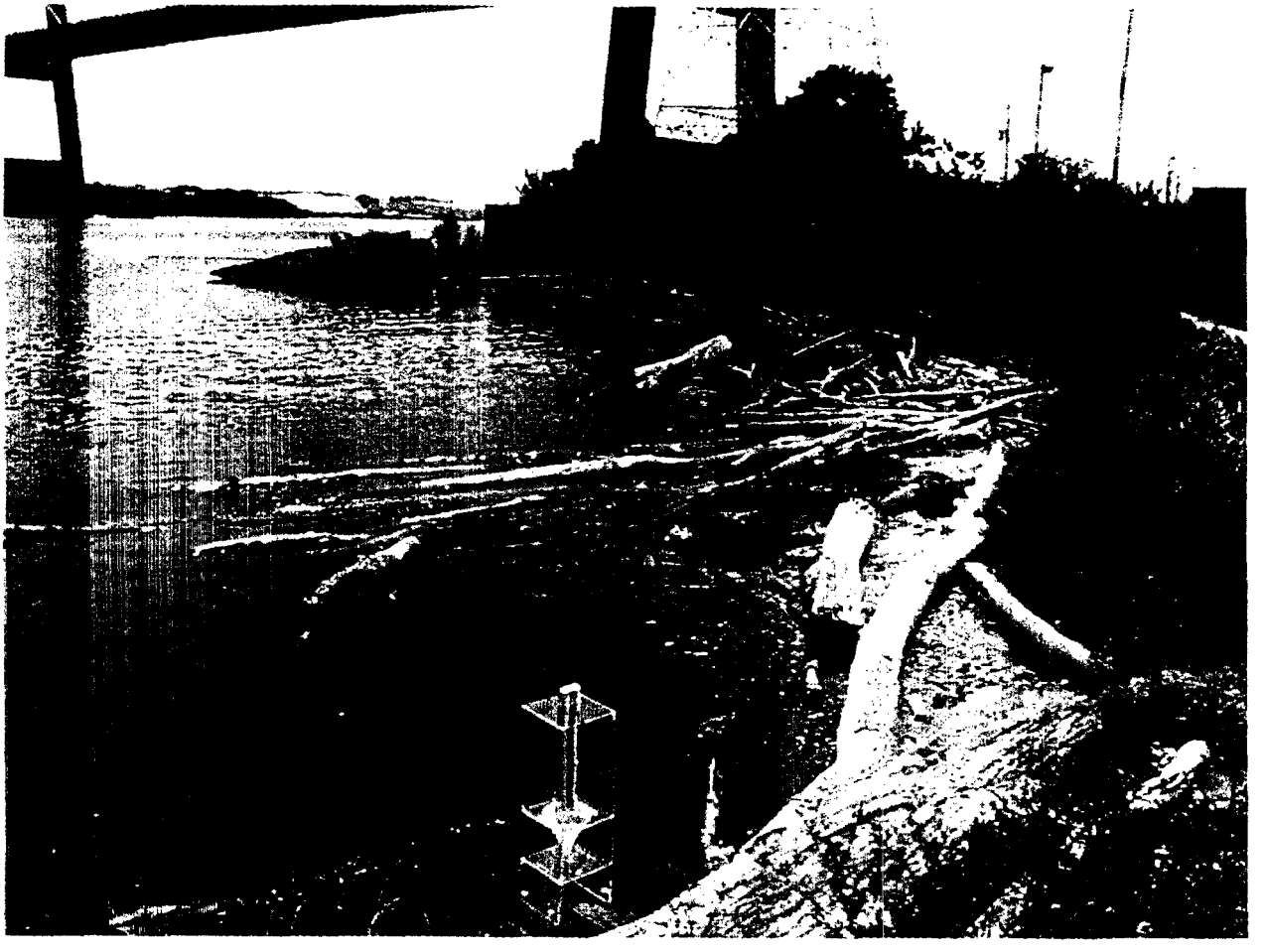

Photo 2. Mobile River, Mobile, Alabama. View downstream from the location where microlayer and bulk water samples were collected, on the west bank of the Mobile River near the Africatown-Cochrane bridge off of Bay Bridge Road. The bridge in the background is the Africatown-Cochrane Bridge.

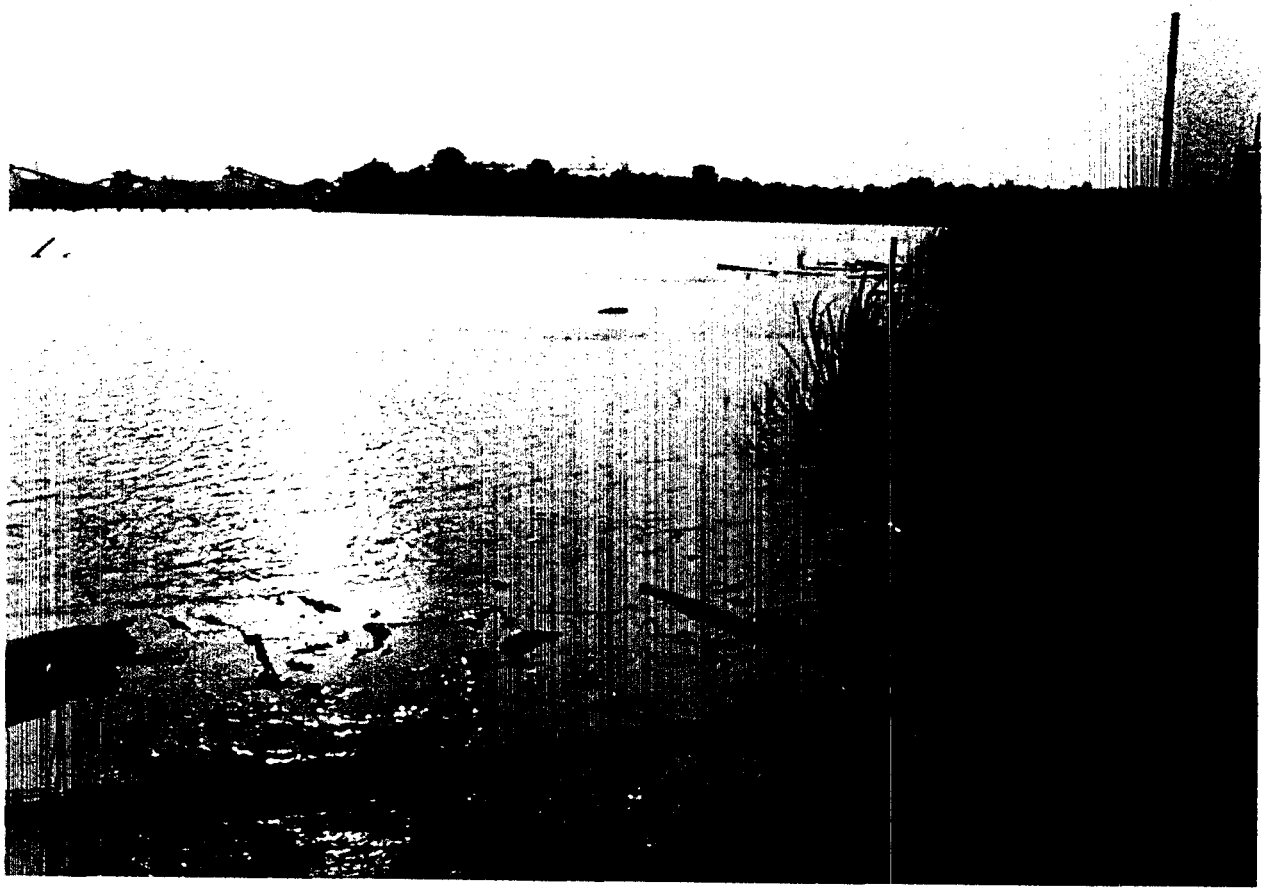

Photo 3. Mobile River, Mobile, Alabama. View upstream from where finfish samples were collected on the east bank of the Mobile River, near the Africatown-Cochrane bridge off of Bay Bridge Road.

Photo 4. Bayou Texar, Pensacola, Florida. View downstream from where microlayer and bulk water samples were collected, near the intersection of Bayou Blvd and Avery Street.

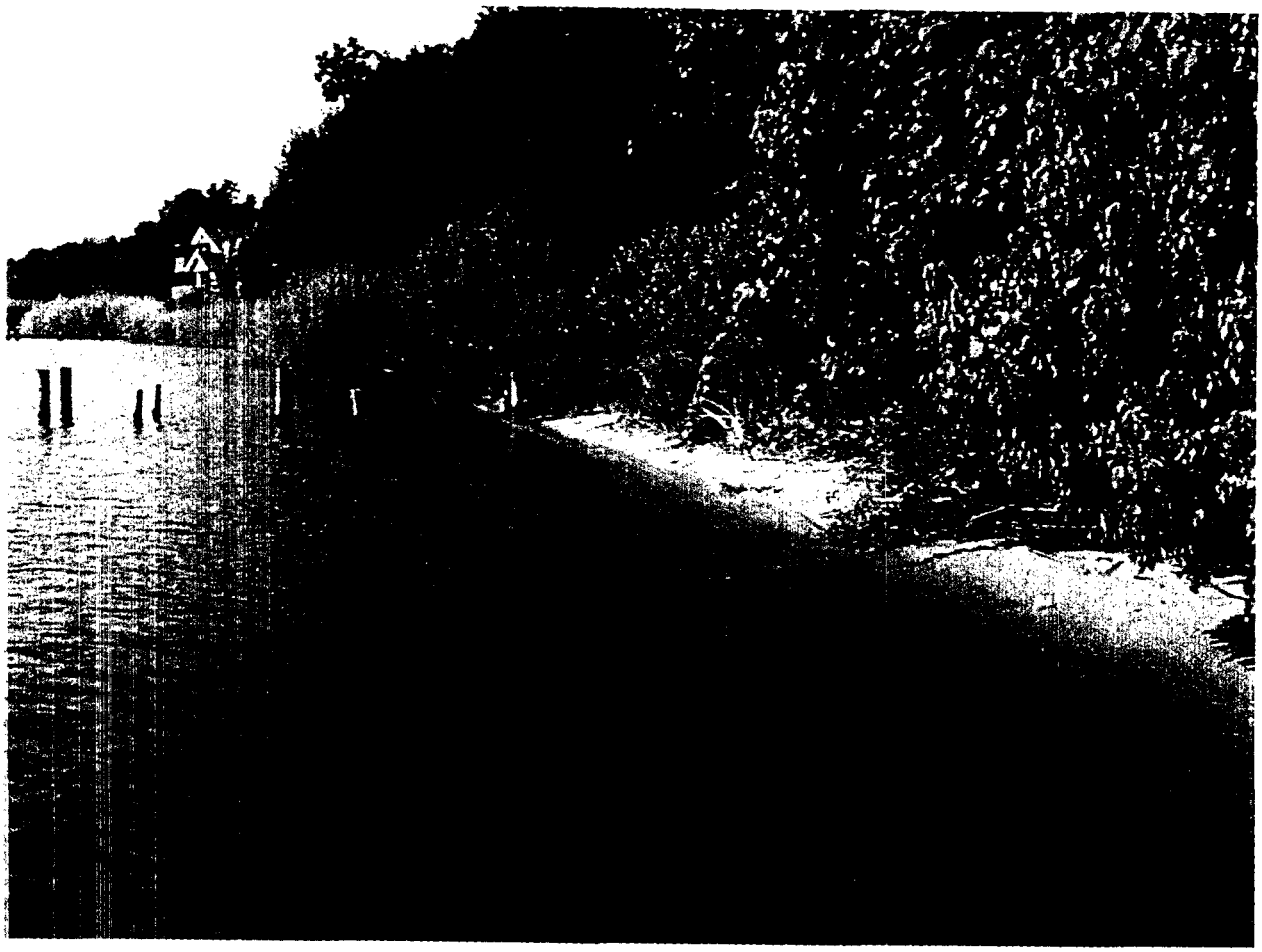

Photo 5. Bayou Texar, Pensacola, Florida. View upstream from where microlayer and bulk water samples were collected, near the intersection of Bayou Blvd and Avery Street.

Photo 6. Bayou Texar, Pensacola, Florida. Rhett Zufelt (left) and Dave Shreffler (right) collecting microlayer samples.

Photo 7. North Fork St. Lucie River, Port St. Lucie, Florida. Fishermen at White City Park fishing for mullet on an incoming tide. The fisherman in the red hat donated 3 mullet to our study.

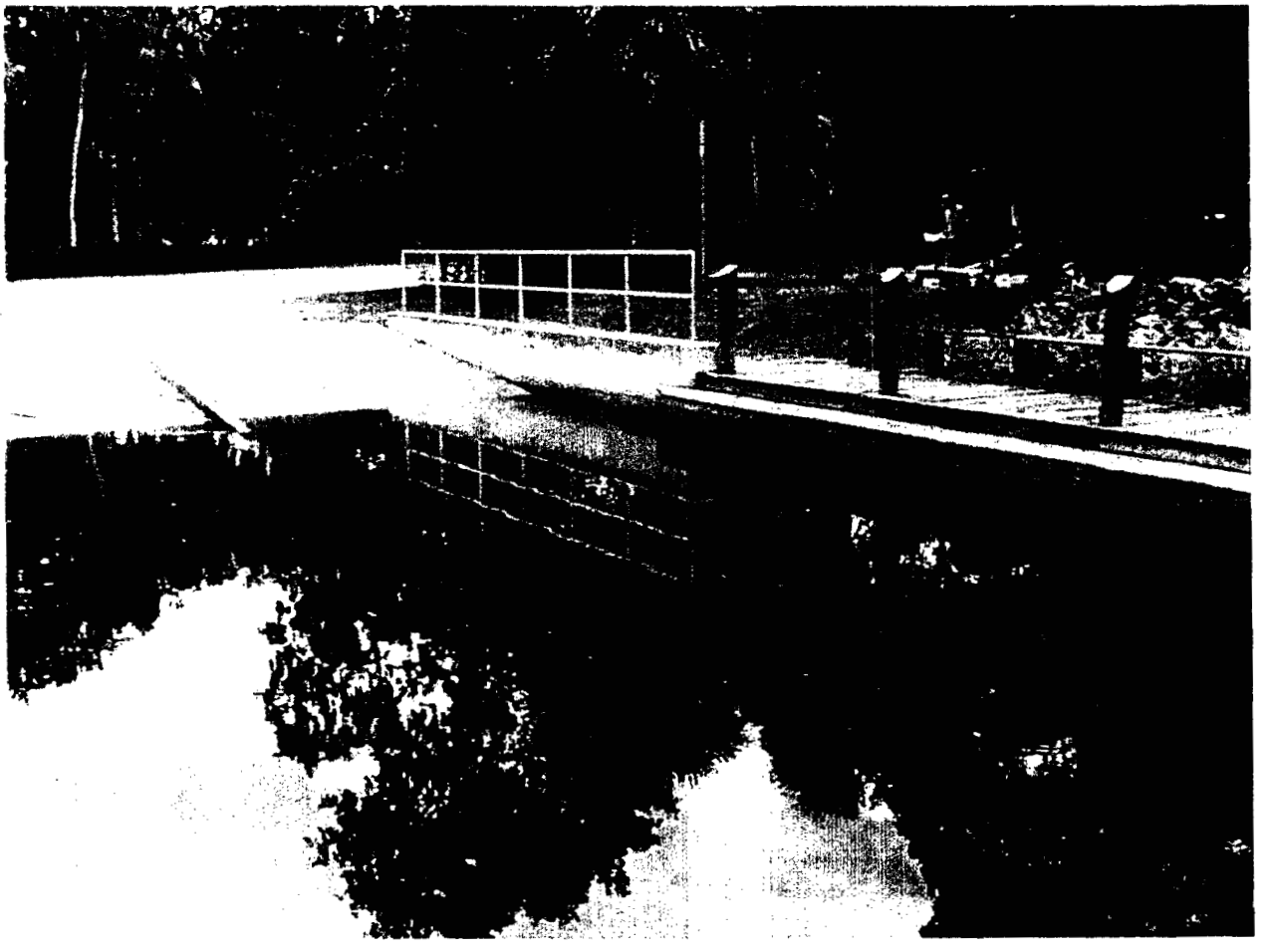

Photo 8. North Fork St. Lucie River, Port St. Lucie, Florida. Microlayer and bulkwater samples were collected at the White City Park public boat ramp. The park is located on the east bank of the river off of Midway Road between S. 25th Street and Sunrise Blvd.

ATTACHMENT A

USE OF TRIMBLE GEOEXPORER GPS

Battelle PNNL Operations
Standard Operating Procedure

for

USE OF TRIMBLE GEOEXPORER GPS

1.0 APPLICATION

The objective of this document is to define the standard operating procedures (SOP) for the operation of the Trimble GeoExplorer Global Positioning System (GPS). The Trimble GPS unit collects and displays GPS data to obtain positional information with an accuracy between 15 – 100 meters (depending on the military's use of selective availability). To obtain higher accuracy positional data, Differential GPS (DGPS) information can be used to automatically correct the Latitude/Longitude position. The Latitude/Longitude position data can also be stored and corrected at a later date.

1.1 Accuracy

All GPS units have a design positional accuracy of 15 meters. The GPS satellites are owned and controlled by the U.S. Department of Defense (DOD) and this agency has the ability to degrade the accuracy of the GPS signal available to non-military users for purposes of national defense. This is done by what is called "Selective Availability" (commonly known as SA). SA is normally turned "on." SA allows the U.S. DOD to degrade the accuracy of non-military GPS system by as much as +/- 100 meters.

At the present time the accuracy of all commercial GPS receivers can vary between 15 to 100 meters depending on the level of degradation being imposed by the U.S. DOD. SA introduces a positional error, which changes over a period of time. It is not unusual for the GPS unit to show fluctuations in both position and speed.

Another factor that will effect the accuracy of the GPS receiver is the geometry of the satellites in view to the GPS receiver. A poor geometry situation can provide less accurate position readings, this especially applies to the GPS altitude measurements. The altitude reading on the GPS unit can vary by +/- 450 ft. depending on the level of degradation being imposed under SA. It is not uncommon to see the altitude continuously drift up and down when SA is being imposed.

1.2 Waypoints

Waypoints are locations or landmarks worth recording and storing in your GPS. These are locations you may later want to return to. They may be check points on a route or significant ground features. Waypoints may be defined and stored in the unit manually, by taking coordinates for the waypoint from a map or other reference. Or, waypoints may be entered directly by taking a reading with the unit at the location itself, giving it a name, and then saving the point. Waypoints may also be put into the unit by referencing another waypoint already stored, giving the reference waypoint, and entering the distance and

compass bearing to the new waypoint (see the Trimble GeoExplorer reference manual for more information on working with waypoints).

NOTE: When this SOP is being used, the Trimble reference manual for the GeoExplorer unit must be referenced.

2. CALIBRATION

The GeoExplorer GPS unit is self calibrating. The integrity of the unit is assured instead by conducting a comparison measurement of a known position at a specific location versus the position location that is acquired by the GPS unit. Ensuring the accuracy of the data collected by the instrument will be considered sufficient for maintaining the integrity of the measurement. The following steps are used to validate the accuracy of the instrument and should be conducted at the beginning and end of each day when positions are taken.

2.1 Calibration of the GeoExplorer Unit Only

1. Prior to collecting position data, select a specific location that has a predetermined latitude and longitude (benchmark) or define a landmark where a position can be determined through a chart or map.
2. Once a location has been determined and a reference position determined, turn on the GPS unit and follow the instructions in Section 5.2 to scroll to the **Position Page** and determine the location.
3. Once the location has been determined with the unit, record the position on the Calibration Form (Attachment 1).
4. The difference between the actual position and that of the GPS unit should be determined to verify the accuracy of the position.
5. If the GPS unit fails to attain a reading that is within 100 meters of the actual position then the manual should be consulted for possible sources of error and the reference position verified.

Once the accuracy of the instrument has been verified, the collection of position data may commence.

2.2 Calibration of the GeoExplorer Unit used in Conjunction with a Differential Beacon Receiver

Differential GPS (DGPS) is a technique used to reduce the effects of SA. DGPS utilizes a GPS unit used in conjunction with a beacon receiver. The beacon receiver is an independent unit that receives a separate signal from a Beacon Transmitter Station that is located on a verified land based location. Using the information transmitted through the transmitter station the receiver is used to apply 'pseudorange' corrections for each satellite measured by the GPS receiver. The use of these corrections allows for increased accuracy in the position readings taken by the combined unit. The combined system of a differential beacon receiver and a GeoExplorer unit can improve position accuracy to better then 10 meters. The following steps are used to validate the accuracy of the GeoExplorer with DGPS.

1. Prior to collecting position data, select a specific location that has a predetermined latitude and longitude (benchmark) or define a landmark where a position can be determined through a chart or map.

2. Once a location has been determined and a reference position determined, turn on the GPS unit and follow the instructions in Section 5.2 to scroll to the **Position Page** and determine the location.
3. Once the location has been determined with the unit, record the position on the Calibration Form (Attachment 1).
4. The difference between the actual position and that of the GPS unit should be determined to verify the accuracy of the position.
5. If the GPS unit fails to attain a reading that is within 25 meters of the actual position then the manual should be consulted for possible sources of error and the reference position verified.

Once the accuracy of the instrument has been verified, the collection of position data may commence.

3. OPERATION

3.1 Turning the Trimble GPS unit ON and Acquiring Position Information

1. Make certain the unit has 4 AA batteries loaded. Bring extra batteries. To install batteries, remove the battery holder on the rear of the instrument and insert the batteries into position. Replace the battery holder within 15 minutes to avoid loss of stored data.

2. Turn the unit on by pressing the ⏻ (on/off) button. Table 1 shows a quick reference to the GPS keypad.

Table 1. Trimble GPS Keypad Reference

⏻	On/Off
⊘	Used to edit subsequent lines with the waypoint editor
◉	Confirms data entry and activates highlighted fields
Esc	Returns display to a previous page
▲ ▼	Selects alphanumerical characters and menu choices
◀ ▶	Moves the selected character field

3. There are six information pages: the **GPS Status Page, Position Page, Navigation Page, Data Capture Page, Date & Time Page,** and **Configuration Page**. See Table 2 for a brief description of each page. To scroll through the different pages use the ▲ ▼ keys.

   When the unit is first turned on, a welcome screen will be displayed for a few seconds while the unit performs a self test. The active page when the GPS was last turned off will appear while the GPS unit is acquiring information from the satellites. Until sufficient satellite signal is received, the **Position Page** will display "Old Position"

   When there is sufficient satellite signal to acquire a position the **Position Page** will display "GPS Position". The **Position Page** shows your current position in three dimensions: latitude, longitude, and altitude.

Table 2. Definition of the Primary Pages

GPS Status Page	Shows satellite positions and signal strength
Position Page	Shows current location
Navigation Page	Provides steering guidance when going to a waypoint. Also allows the user to manage the stored waypoints
Data Capture Page	Allows user to save positional data to a file for later Differential Correction.
Date & Time Page	Allows user to select current date and time formats and view the current date and time
Configuration Page	Allows user to set current GPS configurations including: Coordinate system, datum, & log rates

3.2 Monitoring Signal Strength and Satellite Position using the GPS Status Page

The **GPS STATUS PAGE** displays several different types of information, including: the status of various receiver functions, the **sat tracking** display, and the signal strength indicators.

The **sat tracking** display and the **sat posn** provide an indication of which satellites are visible to the receiver, whether or not they are being used to calculate a position fix, and the signal quality. Individual satellites and their general location are represented by numbers displayed on the screen.

Once the receiver has found the satellite, an arrow will appear, indicating that the unit is receiving data from the satellite.

To determine if you have a current position fix, look at the status field in the lower left corner.

If a position has been obtained it will display: **2D** or **3D: 2D** means that at least 3 satellites with good geometry have been locked onto and a 2 dimensional position fix (latitude and longitude) has been determined. **3D** means that at least 4 satellites with good geometry have been locked onto and position fix is determined in latitude, longitude, and altitude.

If you are in an area that is blocked from satellite reception, such as indoors or in a "shaded" area with many trees, mountains, or tall buildings, you can use the **Satellite Page** to monitor the signal strength and the satellite positions to move to an area with improved reception. If the GPS unit is not able to track enough satellites for a 2D or 3D fix, the status field in the upper left corner of the screen will display **Old Posn**. Try moving the GPS unit to a less "shaded" area.

3.3 Reinitializing the GPS Unit

If you travel more than 500 miles with the receiver turned off – you must reinitialize the unit to your new position. Record the reinitialization on the calibration form (Attachment 1).

- To reinitialize the unit, turn the GPS unit on and allow GPS unit to initialize itself and calculate a position fix. (Total time to reinitialize is 3-5 minutes)

The Trimble GPS unit can be used to store up to 99 different waypoints. *To mark your present location*:

1. Select the **Navigation Page**, select **Waypoint Setup**. Then scroll to the **Add Here** menu and press **ENTER.**
2. When the **Save** waypoint page appears, scroll to the Yes menu to confirm press **ENTER.**
3. Within the **Waypoint Setup** page, scroll to the **Edit Waypoint** menu, and select **ENTER**
4. Enter a new waypoint name by using the up and down arrow keys to scroll through the alphabet or numbers.
5. Press **ENTER** twice when finished..

Once a position is stored in memory as a waypoint, you can return to it:

1. In the **Navigation Page**, select **To Waypoint** and highlight the desired waypoint. Press **ENTER**
2. The Trimble will return to the **Navigation Page**, select **Start Navigate.**
3. Several navigation methods may be selected from the **Display Format** page.

3.4 Collecting point data for later differential correction

1. **Esc** to the **Main Menu Page**, and select the **Data Capture Page.**
2. Select **Open Rover File** and press **ENTER.**
3. Scroll to **Select Feature**, press **ENTER** then select **Point** and press **ENTER.**
4. While the Trimble collects points, scroll to the feature name (Blank line) and press **ENTER.**
5. Enter a new feature name by using the up and down arrow keys to scroll through the alphabet or numbers. Press **ENTER** when finished.
6. Once the Trimble has collected a minimum of 120 positions (indicated in the upper right corner), select **Close Feature** and press **ENTER.**
7. After the last point feature has been collected, select **Close File** and press **ENTER.**
8. The point data will then be ready for later download and differential correction with the Pfinder Office software package.

3.5 Turning the GPS unit OFF

Press and hold the LIGHT button for 5 seconds.

4. MAINTENANCE

There is no routine maintenance required for this unit.

5. QUALITY CONTROL

To ensure the accurate collection of data the GPS unit will be calibrated according to Section 2.0.

6. TRAINING

Training for general use requires a 15 minute standup session with a field staff member familiar with the operation of the system. Once training is complete a Certificate of Training will be completed and forwarded to the Quality Assurance Unit.

7. SAFETY

There are no specific safety concerns associated with this instrument.

ATTACHMENTS

Attachment 1: Example of Trimble GeoExplorer Calibration and Reinitialization Form
Attachment 2: Example of Certificate of Training

APPROVALS

Author	_____	_____
Field Operations Manager	_____	_____
Quality Systems Manager	_____	_____
Ecology Section Manager	_____	_____
	Name	Date

Attachment 1
Battelle Duxbury Operations
Calibration Form for the Trimble GeoExplorer GPS Unit

Date: _____ **Name:** _____

Location of Calibration: _____

Accepted Position

Latitude: _____

Longitude: _____

Measured Position

Latitude: _____

Longitude: _____

Source of actual position: _____

Determining Acceptance:
To determine the difference between the '*Accepted Position*' and the '*Measured Position*' use the Trimble GEOEXPLORER (unless the positions are the same – then the following procedure is unnecessary.)

1. Enter the *Accepted Position* as a waypoint (see Section 3.4 on how to mark a position).
2. Enter the current *Measured Position* as a waypoint.
3. Go to the Main Menu Page. Highlight the submenu option and press **ENTER**.
4. Select the Distance and Sun calculation page.
5. Highlight the 'FROM' field, press ENTER. Enter the Accepted Position waypoint. Press ENTER again.
6. Highlight the 'TO' field, press ENTER. Enter the Measured Position waypoint. Press ENTER again.
7. The distance between these two points will be displayed on the Distance and Sun page. If this distance is less than 100 meters then the instrument accuracy is acceptable.

* Note. Positional offset can also be calculated by hand using the procedures described in SOP#3-118-02 *Northstar 800 GPS/Loran-C Navigation System* (Section 2.1.4)

Recorded Position (AM)

Latitude: _____

Longitude: _____

Recorded Position (PM)

Latitude: _____

Longitude: _____

Comments:

Reinitializing of Trimble GeoExplorer GPS

Date	Initials	Method	Location	Comments

Attachment 2

Battelle Duxbury Operations
Certificate of Training for the Trimble GeoExplorer GPS Unit

Name of Trainee: _____

Date SOP Read: _____

Date of Successful Operation: _____

Signature of Approved Trainer: _____