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A handwritten signature in black ink, reading "Bradley G. Jacobson", with a long horizontal line extending to the right.

Port St. Lucie Florida Water and Sediment Resample for the Empirical Human Exposure Assessment Multi- City Study

**Port St. Lucie, Florida
July 18-19, 2000**

Prepared under contract with:

**3M ET&SS Field
Analytical Services and
Technologies**

Client Coordinator: Jess Eldridge
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Introduction

Pace Analytical Services, Inc. was contracted by the 3M Company to recollect samples for the Port St. Lucie Multi-City Study. The sampling was originally conducted in July 1999 by Battelle. The resampling was conducted to confirm baseline information obtained during the July 1999 event. Target analytes for this event are PFOS, PFOSA, POAA, PFHS, and TFA (fluorochemicals). Surface water samples were also analyzed for metals. The area of greatest interest was the quiet surface water located near Martin County Marina (Mapp Rd and SW Chapman Way).

Emphasis was placed on quality control measures such as extensive field matrix spiking at multiple concentration levels, duplicate samples, and procedures to reduce possible contamination during field collection. The sampling was conducted according to the specifications set forth in the 3M General Project Outline (GPO), except as noted in the report section "Deviations to the GPO". A summary of the field observations can be found in Table 1. Sampling locations were located for future reference with GPS longitude and latitude coordinates and are listed in Table 2.

Sampling Protocols

Equipment Preparation: The 1 liter Nalgene™ sample containers used for sampling were rinsed with "Optima" grade methanol and DI (Type I water) prior to use. Transfer devices, such as the stainless steel bucket, were field decontaminated between samples by mechanical removal of visible contaminants followed by a thorough rinsing with methanol and Type I DI water. New nitrile gloves were worn at all times during the equipment preparation, sample collection and handling procedures. New gloves were donned with every change of sample location and/or sample matrix.

Surface Water Samples: Samples were collected approximately 15 cm below the surface of the water by first submersing the sample container into the water. Then the container was uncapped, filled and recapped while continually submerged (Figure 1). This procedure was used to avoid capturing a possible concentrated surface film layer.

Sediment Samples: Samples were collected using a stainless steel scoop. The sediment samples were collected at the corresponding subsurface water sample location. Approximately the top 2 centimeters of sediment were collected into the scoop. The scoop was then raised slowly to the surface to avoid loss of top sediment layer (Figure 2).

Tap Water Samples: Samples were collected directly into the sample container via the cold water tap.

Wastewater Treatment Sludge: This sample was collected using a stainless steel bucket and a nylon rope. The first two feet of nylon rope above the point of attachment to the bucket was rinsed with methanol and Type I water in the field prior to use.

Field Observations

- **A summary of the field observations can be found in Table 1.**
- **Municipal Drinking Water Plant:** The drinking water plant has added a deep aquifer (approximately 1350 feet) to the plant intake source. This water is treated via reverse osmosis and is referred to as the RO water. This site was not available for collection during the 1999 Battelle sampling event, per site contact Brad Macek. The RO site was collected in addition to the original shallow aquifer (approximately 100 feet). The shallow aquifer undergoes lime-softening treatment. The outflow from the plant is a blend of the RO and lime softened waters. The plant refers to the plant outflow as the "point of entry" because this water *enters* the city water system.
- **North Port Wastewater Treatment Plant (WWTP):** The final effluent for the WWTP is at the Injection Well (Figure 3). This is the point where the effluent is injected into the ground. Samples were collected at this point, but after further discussions with site contact Carl Norton, it was determined this water would not be representative of the effluent collected by Battelle in 1999. This sampling point is now a blend of the WWTP effluent and waste reverse osmosis (RO) water from the drinking water plant. The samples were submitted to the laboratory, but effluent samples were also collected at the chlorine contact chamber (Figure 4). Per Carl Norton, the chlorine contact chamber effluent would be representative of the discharge collected in 1999. Chlorination was not occurring in the chlorine contact chamber at the time of sampling. Note Figure 5, which shows the algae-like film on the surface of the pond leading to the injection well.
- **Port St. Lucie Landfill:** There were two leachate ponds in use. The operators were currently pumping into Pond #3 and pumping out of Pond #4.

Samples were collected from Pond #4 using a pond sampler. The sample container was inverted as it was submerged into the leachate pond to minimize the entry of surface leachate into the container.

- **Fire Department – Station #5:** The cold water tap to the kitchen sink was purged for approximately 5 minutes and the sample was collected. No abnormalities noted.
- **Stuart Harbor:** This site is located just off the NW corner of Jefferson Bridge. The sediment appeared to be relatively clean sand. There appeared to be some landscaping activities occurring approximately 100 yards to the west.
- **Pendarvis Park:** The cold water tap samples were collected from the women's restroom. The surface water samples were collected by walking out on the concrete boat landing to avoid stirring up sediment. Sediment samples were collected approximately 20 yards to the right of the landing. A light rain started during the surface sampling and the 3M project coordinator Jess Eldridge was contacted. Per that first phone conversation, as long as the rain remained light, finish Pendarvis Park sampling. A second phone call was made to Jess Eldridge after collecting Pendarvis Park. The rain had become heavier and outside sampling activities were halted for the day to allow the surface water systems to settle. Total rainfall for the event was 0.23 inches and lasted approximately one hour.
- **Holiday Inn:** Samples were collected in room 413 after purging the cold water line for ten minutes. The water remained near ambient temperature. Nothing abnormal noted.
- **Martin County Marina:** GPS coordinates from the 1999 sampling event indicated the sampling location to be within the boat docking area. This area of the marina was littered and had several boats in dock, so a sampling point was selected just outside the boat docks.
- **Quite Surface Water:** The pond was relatively small (approximately 200 feet X 200 feet) see Figure 6. The water was fairly clear with some minnows

present. Styrofoam, plastic bags, a can and a bottle were some of the litter noted in the water (Figures 7 and 8). Sampling was conducted approximately 45 feet away from visible litter. The technician waited approximately five minutes after stepping into the water to allow bottom sediment to settle prior to collecting the water sample.

Deviations from the GPO

- Addition of the deep aquifer - reverse osmosis sampling point at the drinking water plant.
- Addition of the chlorine contact chamber sampling point due to changes at the wastewater treatment plant.
- Pendarvis Park samples were collected during light to moderate rainfall. Sampling at Martin County Marina and the Quiet Surface water occurred with 24 hours of a rain event. GPO requested dry conditions for a 24 hour period prior to sampling.
- Per the July 11, 2000 phone conversation with Jess Eldridge, use of the subsurface water sampler would be needed only if a sampling configuration required its use. The surface water samples were collected manually by hand.
- Benchmark locations for GPS accuracy confirmation were not located due to construction activities.
- As mentioned in the "Special Precautions, QA/QC" section of the GPO, Zip Lock bags and aluminum foil were to be tested for background levels of fluorochemicals. The Zip Lock bag was clean but the aluminum foil had some positive results. As a precaution, after this information was made known, the sediment scoops which had been cleaned and wrapped in foil, were rinsed with "Optima" grade methanol and Type I water in the field prior to use. The data regarding the aluminum foil will be evaluated and re-analyzed if necessary.

Contacts for Municipal Sites

- **Permissions Granted by Municipal Officials:** Full cooperation was received from the respective officials of the municipal drinking water plant, municipal wastewater treatment plant, municipal landfill and Station #5 fire department. Following are the names and phone numbers of the site contacts:

Municipal Drinking Water Plant 1. Wes Upham – 561/873-6400
2. Brad Macek – 561/343-2373

Wes Upham made the arrangements for Brad Macek to show the Pace technicians the monitoring points.

Wastewater Treatment Plant 1. Wes Upham – 561/873-6400
2. Carl Norton (onsite)
3. Mark Rowen (onsite)

Wes Upham made the arrangements for Carl Norton to show the Pace technicians the monitoring points.

Municipal Landfill 1. Ron Roberts – 561/462-1768
2. Chuck Lamb (onsite)

Fire Station #5 1. Chief Vaughn – 561/462-2312

Port St. Lucie Resampling
 Lab Request: E00-2003
 July 2000 Event
 Field Summary Table

Table 1
Field Summary

<u>Location Name</u>	<u>Comments</u>
Municipal DW Plant Intake RO	Came on-line July 1999. Deep aquifer - reverse osmosis treatment. Not collected by Battelle.
Municipal DW Plant Intake LIME	This is the original site collected by Battelle in 1999.
Municipal DW Plant Outflow	Blend of the Reversed Osmosis and lime softened water intakes.
Tap Water site #1 Holiday Inn	Hotel Room 413.
Tap Water Site #2 Fire dept	Fire Station #5 - Kitchen sink.
Tap Water Site #3 Pendarvis Park	Collected from Womens rest room.
Surf. Water Site #1 Pendarvis Park	Raining quite hard by end of sampling. Sampling halted for the day after Pendarvis Park.
Sediment Site #1 Pendarvis Park	Raining quite hard by end of sampling. Sampling halted for the day after Pendarvis Park.
Surf. Water Site #2 Martin Cty Marina	Moved out of the boat docking area to reduce possible contamination from boat motors etc.
Sediment Site #2 Martin Cty Marina	Moved out of the boat docking area to reduce possible contamination from boat motors etc.
Surf. Water Site #3 Stuart Harbor	Sandy shoreline - very little silt like material
Sediment Site #3 Stuart Harbor	Relatively clean sand, not much silt.
North Port WWTP Effluent	Collected from valve as it enters the injection well. Blend of WWTP effluent and waste DW RO water
North Port WWTP Chlorine Contact Chamber	Representative of what Battelle collected in 1999 per site contact. Chlorine not being added here at this time.
WWTP Sludge (pretreated)	Strong ammonia odor, thick and black.
Port St. Lucie LF Leachate	Dark brown - very little odor.
Quiet Surface Water Palm City	Small pond - Some styrofoam, bags, bottles, cans etc. in water. Minnows present.
Field Blank Control Sample Filled	Labeled and filled at Pace and transported with the sample bottles for the duration of the project.
Field Blank Control Sample Empty	Labeled at Pace and transported with the sample bottles for the duration of the project.
Field Spike Control Sample (FSCS)	Bottles filled with Type I water at Pace and spiked in the field along with the other samples.

Port St. Lucie Resampling
 Lab Request: E00-2003
 July 2000 Event
 Garmin GPS12 Coordinates

Table 2

Sampling Location	Position	July 2000 event Instrument reading † (deg. and min.)	July 2000 event Conversion † (deg., min. and sec.)	July 1999 event Battelle Measurements (deg., min. and sec.)
Municipal DW Plant 1001S.Prinville Road	Latitude Longitude	N27° 18 . 521' W080° 20 . 484'	N27° 18' 31.3" W080° 20' 29.0"	N27° 18' 32.1" W080° 20' 37.8"
North Port WWTP 281 St. James Ave.	Latitude Longitude	N27° 20 . 175' W080° 21 . 070'	N27° 20' 10.5" W080° 21' 04.2"	N27° 20' 10.7" W080° 21' 08.7"
Port St. Lucie Landfill 6120 Glades Cutoff Rd	Latitude Longitude	N27° 23 . 362' W080° 23 . 912'	N27° 23' 21.7" W080° 23' 54.7"	N27° 23' 21.4" W080° 23' 53.1"
Fire Station 5 1616 Port St. Lucie Blvd	Latitude Longitude	N27° 16 . 246' W080° 18 . 195'	N27° 16' 14.8" W080° 18' 11.7"	N27° 16' 21.8" W080° 18' 14.6"
Stuart Harbor N. side of Roosevelt Bridge	Latitude Longitude	N27° 12 . 197' W080° 15 . 693'	N27° 12' 11.8" W080° 15' 41.6"	N27° 12' 13.6" W080° 15' 43.0"
Pendarvis Park Pendarvis Cove Park	Latitude Longitude	N27° 11 . 251' W080° 16 . 213'	N27° 11' 15.1" W080° 16' 12.8"	N27° 11' 15.2" W080° 16' 12.9"
Holiday Inn 10120 S Highway 1	Latitude Longitude	N27° 16 . 748' W080° 17 . 494'	N27° 16' 44.9" W080° 17' 29.6"	N27° 16' 46.2" W080° 17' 30.1"
Martin County Marina Mapp Rd/SW Chapman Wa	Latitude Longitude	N27° 10 . 997' W080° 16 . 118'	N27° 10' 59.8" W080° 16' 07.1"	N27° 11' 00.1" W080° 16' 08.7"
Quiet Surface Water Mapp Rd/SW Chapman Wa	Latitude Longitude	N27° 10 . 991' W080° 16 . 344'	N27° 10' 59.5" W080° 16' 20.6"	N27° 11' 00.1" W080° 16' 20.4"

† The Garmin GPS12 used for this project displays the position in degrees and minutes. Previous data was reported in degrees, minutes and seconds. For comparison to previous data, the fractional increment of the minute was multiplied by 60 to convert to seconds.

Port St. Lucie Resampling
Lab Request: E00-2003
July 2000 Event
Abbreviations

Table 3

<u>Abbreviation</u>	<u>Full Description</u>
C	Sample for Centre Laboratory
dup	Duplicate sample collected same as original sample
FB-Empty	Field Blank Control Sample Empty
FB-Filled	Field Blank Control Sample Filled
FMS	Field Matrix Spike (either 200 ppt, 1 ppb, or 25 ppb)
FSCS (D1 and D2)	Field Spike Control Sample (Day 1 and Day 2)
K	Sample for Kris Hansen
MDWPIN-LIME	Municipal Drinking Water Plant Intake - LIME
MDWPIN-RO	Municipal Drinking Water Plant Intake - Reverse Osmosis
MDWP-OUT	Municipal Drinking Water Plant Outflow
NPWWTP-CC	North Port Wastewater Treatment Plant Chlorine Contact Chamber
NPWWTP-EFF	North Port Wastewater Treatment Plant Effluent
NPWWTP-SLUDGE	Wastewater Treatment Plant Sludge (pretreated)
PSLLF-LEACH	Port St. Lucie LF Leachate
QSWPALM CITY	Quiet Surface Water Palm City
SED #1 PEN PK	Sediment Site #1 Pendarvis Park
SED #2 MCM	Sediment Site #2 Martin County Marina
SED #3 - SH	Sediment Site #3 Stuart Harbor
SW#1 PEN PK	Surface Water Site #1 Pendarvis Park
SW#2-MCM	Surface Water Site #2 Martin Cty Marina
SW#3-SH	Surface Water Site #3 Stuart Harbor
TW#1 HOLIDAY INN	Tap Water site #1 Holiday Inn
TW#2 FIRE DEPT	Tap Water Site #2 Fire Department
TW#3 PEN PK	Tap Water Site #3 Pendarvis Park

Port St. Lucie Resampling
 Lab Request: E00-2003
 Listing of Samples Collected July 2000

Table 4

Sample Date/Time	Location	dup K	dup C	Blind dup K	Blind dup C	K-FMS-200 ppt	K-FMS-1ppb	C-FMS-200 ppt	C-FMS-1ppb	Metals Scan
7/18/00 09:00	Municipal DW Plant Intake RO	1	1	1	1	1	1	1	1	
7/18/00 09:25	Municipal DW Plant Intake Lime	1	1			1	1	1	1	
7/18/00 09:40	Municipal DW Plant Outflow	1	1			1	1	1	1	
7/18/00 17:45	Tap Water site #1 Holiday Inn	1	1			1	1	1	1	
7/18/00 13:40	Tap Water Site #2 Fire dept	1	1							
7/18/00 15:00	Tap Water Site #3 Pendarvis Park	1	1							
7/18/00 15:10	Surf. Water Site #1 Pendarvis Park	1	1			1	1	1	1	1
7/18/00 15:20	Sediment Site #1 Pendarvis Park	1	1							
7/19/00 07:10	Surf. Water Site #2 Martin Cty Marina	1	1	1	1					1
7/19/00 07:20	Sediment Site #2 Martin Cty Marina	1	1							
7/18/00 14:15	Surf. Water Site #3 Stuart Harbor	1	1							1
7/18/00 14:25	Sediment Site #3 Stuart Harbor	1	1							
7/18/00 10:20	N. Port WWTP Eff Injection Well	1	1			1	1	1	1	
7/18/00 10:45	N. Port WWTP Eff Chlorine Chamber	1	1			1	1	1	1	
7/18/00 11:05	WWTP Sludge (pretreated)	1	1							

Sample Date/Time	Location	dup K	dup C	K-FMS-200 ppt-A	K-FMS-1ppb-A	K-FMS-25ppb-A	K-FMS-200 ppt-B	K-FMS-1ppb-B	K-FMS-25ppb-B	Metals Scan
7/18/00 12:15	Port St. Lucie LF Leachate	1	1	1	1	1	1	1	1	1
				C-FMS-200 ppt-A	C-FMS-1ppb-A	C-FMS-25ppb-A	C-FMS-200 ppt-B	C-FMS-1ppb-B	C-FMS-25ppb-B	
				1	1	1	1	1	1	

Sample Date/Time	Location	dup K	dup C	K-FMS-200 ppt-A	K-FMS-1ppb-A	K-FMS-25ppb-A	K-FMS-200 ppt-B	K-FMS-1ppb-B	K-FMS-25ppb-B
7/19/00 07:55	Quiet Surface Water Palm City	1	1	1	1	1	1	1	1
				C-FMS-200 ppt-A	C-FMS-1ppb-A	C-FMS-25ppb-A	C-FMS-200 ppt-B	C-FMS-1ppb-B	C-FMS-25ppb-B
				1	1	1	1	1	1

Sample Date/Time	Location	FB-Filled	FB-Empty
7/14/00 11:00	Field Blank Control Sample (FB)	1	1

Sample Date/Time	Location	FSCS-200 ppt D1	FSCS-1ppb D1	FSCS-200 ppt D2	FSCS-1ppb D2
7/18/00 18:42	Field Spike Control Sample (FSCS)	1	1	1	1
7/19/00 08:25					

Sample Date/Time	Location	
7/19/00 08:20	Rinse methanol/bottle blank	1