CAPE CANAVERAL ODMDS TRIBUTYLTIN REPORT

EPA Project #: 11-0010

MAY 2011

Ecological Assessment Branch
Science and Ecosystem Support Division
980 College Station Rd.
Athens, GA 30605

Title and Approval Sheet

Title: Cape Canaveral Tributyltin Study

This quality assurance project plan (QAPP) has been prepared according to:
EPA Requirements for Quality Assurance Project Plans (EPA QA/R5 EPA/240/B-01/003, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC, March 2001 (USEPA, 2001).

This document will be used to ensure that environmental and related data collected, compiled, and/or generated for this project are of the type, quantity, and quality required for their intended purposes within the limitations of available resources.

Reviewed and approved by:

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John Deatrick, Section Chief, Ecological Evaluation Section

6/20/11
Date

Prepared by:

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6/17/11
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1.0 Introduction/Background

At the request of Christopher McArthur of the US-EPA R4 Water Management Division (WMD), 61 Forsyth St. SW, Atlanta, GA 30303, the US-EPA R4 Science and Ecosystem Support Division, 980 College Station Rd., Athens, GA 30605 conducted a sediment pore water study at the Cape Canaveral Ocean Dredged Material Disposal Site (ODMDS) offshore of Cape Canaveral Florida the week of September 27, 2010.

In March 2007, SESD conducted a trend assessment of the Canaveral ODMDS pursuant to 40 CFR 228.13. Results indicated an elevated organic tin concentration of 57 ug/kg tri-n-butyltin (tributyltin or TBT) in sediments within the northern disposal zone based on a single sample. Material from the berthing areas of Canaveral Harbor was recently disposed in this area. Based on this elevated level, a follow-up study was needed to assess the extent of the contamination and to assess its ecological significance.

TBT is utilized as an antifoulant in bottom paints on the hulls of ships in order to prevent marine growth. TBT is very toxic to marine organisms and information documenting TBT's adverse impact on the aquatic environment is extensive. In addition to direct mortality, adverse impacts on a wide variety of aquatic organisms include reduced larval growth, sexual abnormalities, reproductive failure, gross morphological abnormalities, immune system dysfunction, nervous system disorders, and skin and eye disorders. The available literature indicates that the toxicity and bioaccumulation of TBT are affected by a variety of factors, including total organic carbon (TOC) in sediment and water, pH, salinity, clay fraction, and the presence of inorganic constituents such as iron oxides. Determining the relationship of the TBT concentration to the concentration of other contributing factor concentrations such as TOC, called partitioning, is highly complex and the relationship between concentrations and observed effects is much stronger for interstitial water and tissue concentrations. Chronic effects to aquatic organisms have been reported at concentrations ranging from 0.002 -74 ug TBT/L, with the majority of species responding below 0.5 ug TBT/L. Acute effects have been reported at concentrations ranging from 0.3 -200 ug TBT/L. The consensus of a Washington State TBT workgroup was that an interstitial water concentration of 0.05 ug TBT/L corresponds to a no adverse effects level that would protect most, (approximately 95%), species. (USEPA, 1998)

2.0 Objective

The objective of the study was to determine the sediment and interstitial water (pore water) concentrations of TBT within the northern disposal zone of the Canaveral ODMDS and determine if further study or remediation actions should be undertaken depending upon the results.

3.0 Study Area

Three stations, CTBT 1, 4 and 6 within the disposal area (Figure 1), as well as a background station CTBTB (Figure 2), located south of the ODMDS were targeted for both sediment and pore water sampling. In addition, pore water only was collected at station CTBT3. Stations CTBT2 and CTBT5 were not sampled due to time constraints and adverse weather conditions. All sampling location coordinates were recorded using a global positioning system (GPS) in accordance with SESDPROC-110-R3 (USEPA 2011a).

Table 1 GPS Coordinates for Cape Canaveral TBT Sampling			
Station	**Description**	**Latitude (Degrees, Minutes)**	**Longitude (Degrees, Minutes)**
CTBT1	Sample Location 1	28 19.5306’	-80 31.3032’
CTBT2	Not Sampled	-	-
CTBT3	Sample Location 3	28 19.6068’	-80 31.2546’
CTBT4	Sample Location 4	28 19.6248’	-80 31.1994’
CTBT5	Not Sampled	-	-
CTBT6	Sample Location 6	28 19.6638’	-80 31.0755’
CTBTB	Background Location	28 16.6368’	-80 30.8103’

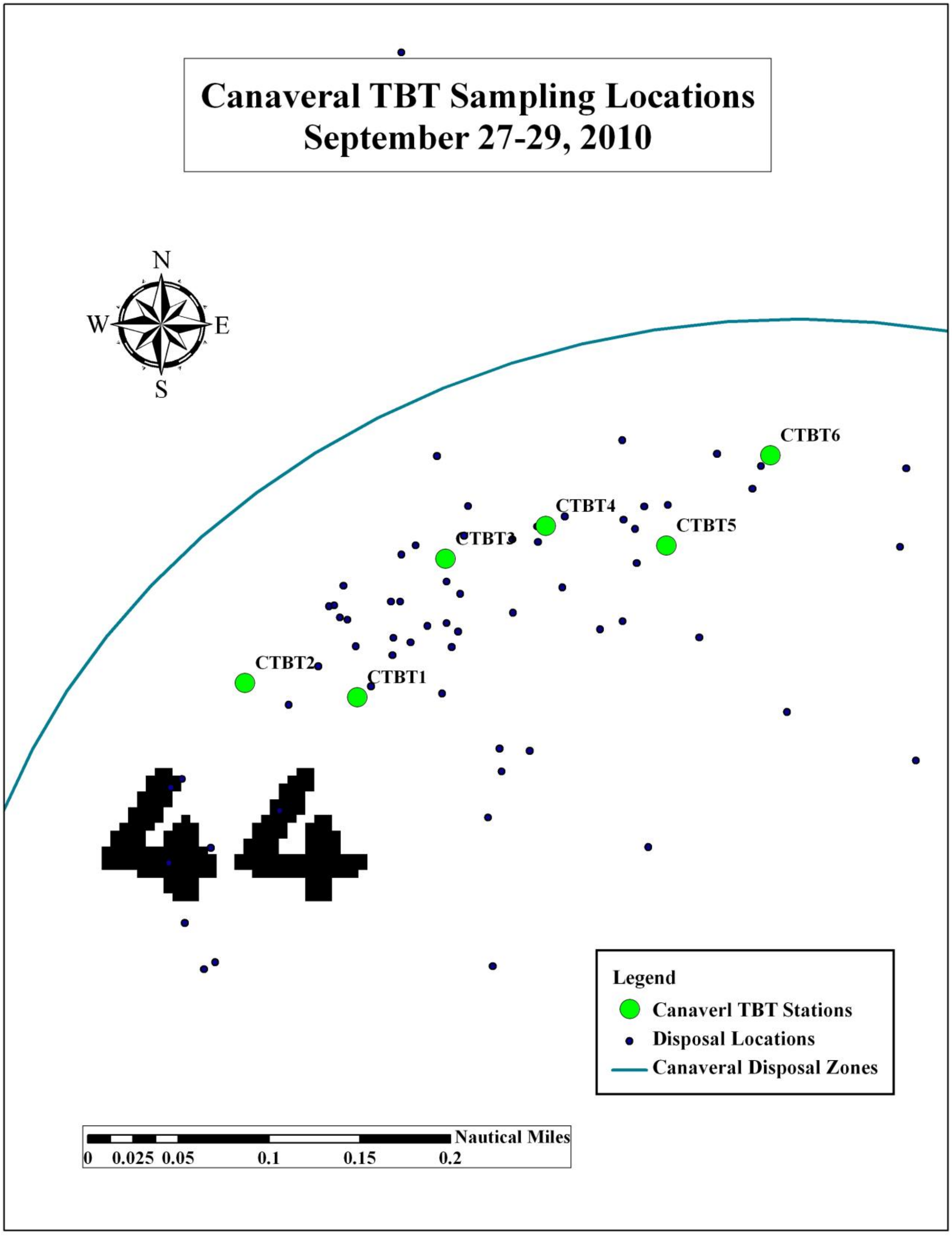
Canaveral TBT Sampling Locations
September 27-29, 2010
N
S
E
W
CTBT1
CTBT2
CTBT3
CTBT4
CTBT5
CTBT6
44
Legend
Canaverl TBT Stations
Disposal Locations
Canaveral Disposal Zones
Nautical Miles
0 0.025 0.05 0.1 0.15 0.2

FIGURE 1

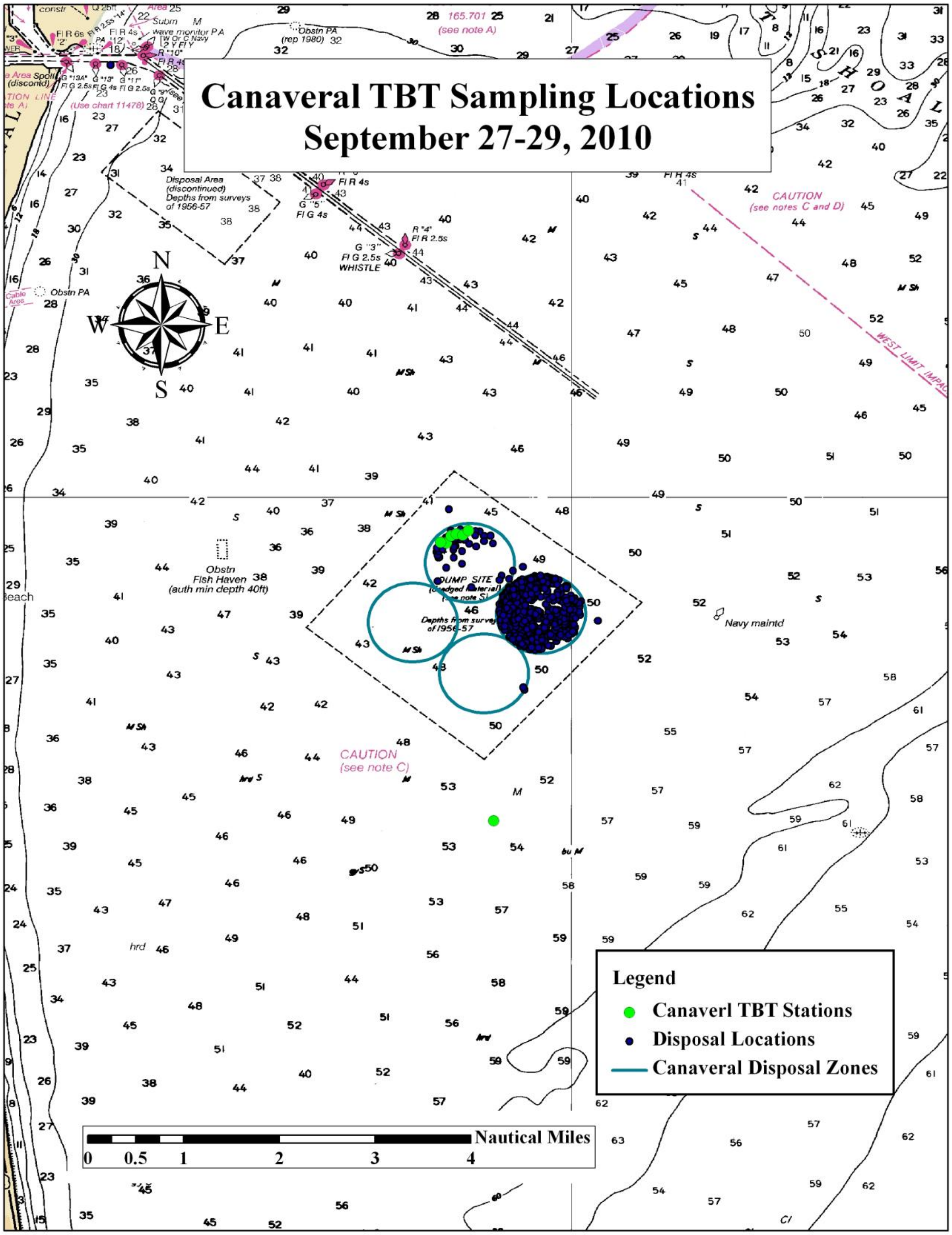
Canaveral TBT Sampling Locations
September 27-29, 2010
Legend
Canaverl TBT Stations
Disposal Locations
Canaveral Disposal Zones
Nautical Miles
0
0.5
1
2
3
4
N
S
E
W

FIGURE 2

4.0 Methods

In-situ physico-chemical water quality profile measurements were not conducted during this project due to inclement weather and time constraints.

4.1 Pore Water Sampling

Pore water sampling for TBT analysis was conducted at four ODMDS locations plus a background location by utilizing standard off-the-shelf Push Point Henry Samplers as described in the SESD Operating Procedure (USEPA 2007b) (Figure 3). A 30 cm diameter stainless steel flange with a 2 cm vertical lip was utilized to isolate sediment pore water from the overlying ambient surface water during sampling (Figure 4). Divers installed the flange on the sediment surface and inserted the Push Point Sampler into a hole in the center of the flange by means of a Teflon screw-in adapter. The sampling slits on the sampler are 5 cm in depth, therefore, the sampler was inserted into the sediment approximately 7 cm. Since the sampler draws pore water from above and below the intake as well as directly to the side, pore water was collected from a range of approximately 0-10 cm. The sample was collected by means of a 140 ml syringe connected to a three way valve with one side going to a 60 ml purge syringe and the other side going to the Push Point Sampler (Figure 5). If the 60 ml purge side of the valve is open, then the 140 ml sample side is closed and vice versa. The sampler is taken down with the 140 ml side closed. The push point sampler and tubing have a volume of approximately 30 ml, therefore, the first step was to purge the sampler and tubing of ambient surface water by extracting this water into the 60 ml syringe which pulls pore water into the sampler and tubing. The valve was then turned to close off the 60 ml purge syringe which allowed the pore water sample to be pulled into the 140 ml syringe. Once the 140 ml syringe was full, it was capped and two more syringes filled in the same manner in order to get enough volume for analysis. The samples were then brought to the surface and composited into a .5 liter glass container and put on ice for shipping. The samples were analyzed for TBT by Columbia Analytical Service (CAS) in Kelso, WA.

In addition to the pore water samples collected by divers, approximately 1 gallon of sediment was collected at Station CTBT1 by means of a Young Grab for centrifugal extraction of the pore water by the Columbia Analytical Services Laboratory. The purpose of this sample was to provide a comparison of the data between the two collection methods.

Figure 3: Push Point Pore Water Sampling Apparatus

Figure 4: Pore Water Flange

Figure 5: Pore Water Sampling Syringe and Valve

4.2 Sediment Sampling

Sediment samples were collected at station CTBT 1, 4, 6, and CTBTB for Total Organic Carbon (TOC) analysis by the Athens SESD Laboratory and TBT analysis by CAS. These samples were diver collected by gently scooping sediment directly into the container from the upper ten cm of sediment.

All sediment sampling, whether by grab or diver collected, was conducted according to SESD Operating Procedure (USEPA, 2007d).

Table 2: Analysis and sample Containers

Media	Analysis	Method	Container	Preservative	Holding Time
Pore Water	TBT	Krone	.5 Liter Glass	Ice	7 Days
Sediment	TBT	Krone	250 ml Glass	Ice	7 Days
	TOC	ASB107C	8 oz. Glass	Ice	None Specified

5.0 Discussion and Results

5.1 Tributyltin (TBT) Analysis

Analysis for tri-n-butyltin (TBT), include other cations of butyltin such as n-butyltin, di-n-butyltin and tetra-n-butyltin. Results of analysis for TBT and TOC are included in Tables 3, 4 and 5 and Appendix A.

Table 3: TBT Results in Sediment

CAPE CANAVERAL ODMDS TBT CONCENTRATIONS IN SEDIMENT (ug/kg dry wt.)				
Station	n-Butyltin	Di-n-butyltin	Tri-n-butyltin	Tetra-n-butyltin
CTBT1	ND	ND	0.70 J	ND
CTBT4	ND	ND	ND	ND
CTBT6	ND	ND	ND	ND
CTBTB	ND	ND	ND	ND

Table 4: TBT Results in Pore Water

CAPE CANAVERAL ODMDS TBT CONCENTRATIONS IN POREWATER (ug/l)				
Station	n-Butyltin	Di-n-butyltin	Tri-n-butyltin	Tetra-n-butyltin
CTBT1*	ND	ND	ND	ND
CTBT1	ND	ND	ND	ND
CTBT3	ND	ND	0.013 J	ND
CTBT4	ND	ND	0.034 J	ND
CTBT6	ND	ND	ND	ND
CTBTB	ND	ND	ND	ND

*Centrifuged from whole sediment sample

All detectable concentrations of TBT were estimated values falling below the quantitation range or method reporting limit (MRL), but above the method detection limit (MDL). The MDL for TBT in sediment at station CTBT1 was 0.60 ug/kg and the MDL for TBT in pore water at stations CTBT3 and CTBT4 were 0.012 and 0.015 ug/l respectively. Differences in the MDL are due to the differences between the recovery of known concentration of spiked samples.

TBT isn't soluble in water. Therefore, detecting concentrations in pore water without a corresponding detectable concentration in the sediment, especially at such low concentrations is likely due to analytical "noise" and not actual concentrations in the pore water (2011, CAS Personal Communication). With this in mind, the estimated concentrations at stations CTBT3 and CTBT4 may be considered analytical anomalies, but are below the TBL workgroup adverse effects level of 0.05 ug/l in any case.

The same is true for the 0.70 ug/kg concentration of TBT in the sediment at station CTBT1, although it is possible that this does indicate the actual presence of TBT in the sediment at this location due to the fact that a concentration of 57 ug/kg was detected at this location on a previous study.

The fact that no TBT was detected at other locations sampled, indicate that TBT at the Cape Canaveral ODMDS is very localized at station CTBT1 and is not a widespread issue within the disposal area. However, in future monitoring efforts, it would be worthwhile to sample for TBT at this location in order to corroborate these results.

5.2 Total Organic Carbon (TOC) Analysis

All results for TOC analysis in sediment were below analytical method detection limits (MDL).

Table 5: TOC Results

TOC ANALYSIS @ CAPE CANAVERAL ODMDS (mg/kg dry wt.)				
Station	Sample ID	Date	Time	Results
CTBT1	CTBT1-SD-0910	09/27/10	12:30	< 7600 U*
CTBT4	CTBT4-SD-0910	09/28/10	10:00	< 6900 U
CTBT6	CTBT6-SD-0910	09/28/10	13:10	< 7100 U
CTBTB	CTBTB-SD-0910	09/28/10	11:15	< 7000 U

*U-Analyte not detected

6.0 Quality Control

Due to the limited nature of the sampling in this study, and cost constraints for analysis, no additional samples were collected during this survey for QA purposes.

6.1 Field Instrumentation and Equipment

All instruments or equipment used by SESD personnel to conduct field sampling and measurement activities during SESD field investigations are tracked, inspected, maintained and calibrated according to SESD's operating procedures (USEPA, 2007c, f).

6.2 Supplies and Consumables

All critical supplies and consumables for this field investigation were inspected and maintained in accordance with the following procedures:

SESD Operating Procedures for Purchasing of Services and Supplies (USEPA, 2007k)
SESD Operating Procedures for Field Sampling Quality Control (USEPA, 2007e)

7.0 Data Management

7.1 Documentation and Records

All data generated for this field investigation, whether hand-recorded or recorded and stored in an electronic data logger were recorded, stored and managed according to the following procedures:

SESD Operating Procedure for Control of Records (USEPA, 2007g)
SESD Operating Procedure for Logbooks (USEPA, 2007h)

Since no *in-situ* data was collected during this survey a formal log book was not maintained. As samples were collected, dates and times were recorded directly on sample containers and the chain of custody.

The field project leader will be responsible for ensuring that all requirements for data management are met.

8.0 References

CAS 2011, Personal Correspondance

USEPA 1998. Dredge Material Evaluation Framework, Lower Columbia River Management Area, Appendix 8A. Testing, Reporting and Evaluation of Tributyltin Data.

USEPA 2011a. Operating Procedure for Global Positioning System, SESDPROC-110-R2, Region 4, SESD, Athens, Georgia.

USEPA 2007b Operating Procedure for Pore Water Sampling, SESDPROC-513-R1, Region 4, SESD, Athens, Georgia.

USEPA 2007c Operating Procedure for Insitu Water Quality Monitoring, SESDPROC-111-R1, Region 4, SESD, Athens, Georgia.

USEPA 2007d Operating Procedure for Sediment Sampling, SESDPROC-200-R1, Region 4, SESD, Athens, Georgia.

USEPA 2007e Operating Procedure for Field Sampling Quality Control, SESDPROC-011-R2, Region 4, SESD, Athens, Georgia.

USEPA 2007f Operating Procedure for Equipment Inventory and Management, SESDPROC-108-R2, Region 4, SESD, Athens, Georgia.

USEPA 2007g Operating Procedure for Control of Records, SESDPROC-002-R4, Region 4, SESD, Athens, Georgia.

USEPA 2007h. Operating Procedure for Logbooks, SESDPROC-010-R3, Region 4, SESD, Athens, Georgia.

USEPA 2007i. Operating Procedure for Sample and Evidence Management, SESDPROC-005-R1, Region 4, SESD, Athens, Georgia.

USEPA 2007j, Quality Management Plan, SESDPLAN-001-R1, Region 4, SESD, Athens, Georgia.

USEPA 2007k. Operating Procedure for Purchasing Services and Supplies, SESDPROC-015-R2, Region 4, SESD, Athens, Georgia.

APPENDIX A

DATA

Sample	Sample Type	Matrix	Date	Time	Component	Reporting Limit	Detection Limit	Result	Result Notes	Units	Basis	Extraction Method	Method	Spike Concentration	Percent Recovery	Acceptance Limits	Avg	RPD
CTBT1-SD-0910	SMPL	Sediment	09/27/10	12:30	Total Solids			72.5	=	PERCENT	Wet	NONE	160.3M					
CTBT4-SD-0910	SMPL	Sediment	09/28/10	10:00	Total Solids			73.8	=	PERCENT	Wet	NONE	160.3M					
CTBT6-SD-0910	SMPL	Sediment	09/28/10	13:10	Total Solids			65.8	=	PERCENT	Wet	NONE	160.3M					
CTBTB-SD-0910	SMPL	Sediment	09/28/10	11:15	Total Solids			71.9	=	PERCENT	Wet	NONE	160.3M					
CTBT1-SD-0910	DUP1	Sediment	09/27/10	12:30	Total Solids			73.6	=	PERCENT	Wet	NONE	160.3M				73.1	2
CTBT1-PW-0910	SMPL	Pore Water	09/27/10	12:30	Tetra-n-butyltin	0.059	0.045	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT1-PW-0910	SMPL	Pore Water	09/27/10	12:30	Tri-n-butyltin Cation	0.059	0.014	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT1-PW-0910	SMPL	Pore Water	09/27/10	12:30	Di-n-butyltin Cation	0.059	0.0085	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT1-PW-0910	SMPL	Pore Water	09/27/10	12:30	n-Butyltin Cation	0.059	0.034	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT1-PW-0910	SMPL	Pore Water	09/27/10	12:30	Tri-n-propyltin			98	SUR	PERCENT	NA	EPA 3520C	Krone	250	98	24-142		
CTBT1-SD-0910	SMPL	Pore Water	09/27/10	12:30	Tetra-n-butyltin	0.13	0.093	ND	ND	ug/L	NA	PSEP	Krone					
CTBT1-SD-0910	SMPL	Pore Water	09/27/10	12:30	Tri-n-butyltin Cation	0.13	0.030	ND	ND	ug/L	NA	PSEP	Krone					
CTBT1-SD-0910	SMPL	Pore Water	09/27/10	12:30	Di-n-butyltin Cation	0.13	0.018	ND	ND	ug/L	NA	PSEP	Krone					
CTBT1-SD-0910	SMPL	Pore Water	09/27/10	12:30	n-Butyltin Cation	0.13	0.071	ND	ND	ug/L	NA	PSEP	Krone					
CTBT1-SD-0910	SMPL	Pore Water	09/27/10	12:30	Tri-n-propyltin			89	SUR	PERCENT	NA	PSEP	Krone	250	89	24-142		
CTBT1-SD-0910	SMPL	Sediment	09/27/10	12:30	Tetra-n-butyltin	1.4	0.61	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT1-SD-0910	SMPL	Sediment	09/27/10	12:30	Tri-n-butyltin Cation	1.4	0.60	0.70	=, J	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT1-SD-0910	SMPL	Sediment	09/27/10	12:30	Di-n-butyltin Cation	1.4	0.27	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT1-SD-0910	SMPL	Sediment	09/27/10	12:30	n-Butyltin Cation	1.4	0.36	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT1-SD-0910	SMPL	Sediment	09/27/10	12:30	Tri-n-propyltin			62	SUR	PERCENT	Dry	SOC-OSWT	Krone	125	62	18-95		
CTBT3-PW-0910	SMPL	Pore Water	09/28/10	16:15	Tetra-n-butyltin	0.043	0.038	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT3-PW-0910	SMPL	Pore Water	09/28/10	16:15	Tri-n-butyltin Cation	0.043	0.012	0.013	=, J	ug/L	NA	EPA 3520C	Krone					
CTBT3-PW-0910	SMPL	Pore Water	09/28/10	16:15	Di-n-butyltin Cation	0.043	0.0073	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT3-PW-0910	SMPL	Pore Water	09/28/10	16:15	n-Butyltin Cation	0.043	0.029	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT3-PW-0910	SMPL	Pore Water	09/28/10	16:15	Tri-n-propyltin			94	SUR	PERCENT	NA	EPA 3520C	Krone	250	94	24-142		
CTBT4-PW-0910	SMPL	Pore Water	09/28/10	10:00	Tetra-n-butyltin	0.060	0.046	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT4-PW-0910	SMPL	Pore Water	09/28/10	10:00	Tri-n-butyltin Cation	0.060	0.015	0.034	=, J	ug/L	NA	EPA 3520C	Krone					
CTBT4-PW-0910	SMPL	Pore Water	09/28/10	10:00	Di-n-butyltin Cation	0.060	0.0087	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT4-PW-0910	SMPL	Pore Water	09/28/10	10:00	n-Butyltin Cation	0.060	0.035	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT4-PW-0910	SMPL	Pore Water	09/28/10	10:00	Tri-n-propyltin			76	SUR	PERCENT	NA	EPA 3520C	Krone	250	76	24-142		
CTBT4-SD-0910	SMPL	Sediment	09/28/10	10:00	Tetra-n-butyltin	1.4	0.60	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT4-SD-0910	SMPL	Sediment	09/28/10	10:00	Tri-n-butyltin Cation	1.4	0.58	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT4-SD-0910	SMPL	Sediment	09/28/10	10:00	Di-n-butyltin Cation	1.4	0.26	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT4-SD-0910	SMPL	Sediment	09/28/10	10:00	n-Butyltin Cation	1.4	0.36	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT4-SD-0910	SMPL	Sediment	09/28/10	10:00	Tri-n-propyltin			67	SUR	PERCENT	Dry	SOC-OSWT	Krone	125	67	18-95		
CTBT6-PW-0910	SMPL	Pore Water	09/28/10	13:10	Tetra-n-butyltin	0.044	0.038	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT6-PW-0910	SMPL	Pore Water	09/28/10	13:10	Tri-n-butyltin Cation	0.044	0.012	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT6-PW-0910	SMPL	Pore Water	09/28/10	13:10	Di-n-butyltin Cation	0.044	0.0073	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT6-PW-0910	SMPL	Pore Water	09/28/10	13:10	n-Butyltin Cation	0.044	0.029	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBT6-PW-0910	SMPL	Pore Water	09/28/10	13:10	Tri-n-propyltin			72	SUR	PERCENT	NA	EPA 3520C	Krone	250	72	24-142		
CTBT6-SD-0910	SMPL	Sediment	09/28/10	13:10	Tetra-n-butyltin	1.6	0.67	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT6-SD-0910	SMPL	Sediment	09/28/10	13:10	Tri-n-butyltin Cation	1.6	0.66	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT6-SD-0910	SMPL	Sediment	09/28/10	13:10	Di-n-butyltin Cation	1.6	0.29	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT6-SD-0910	SMPL	Sediment	09/28/10	13:10	n-Butyltin Cation	1.6	0.40	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBT6-SD-0910	SMPL	Sediment	09/28/10	13:10	Tri-n-propyltin			75	SUR	PERCENT	Dry	SOC-OSWT	Krone	125	75	18-95		

Sample	Sample Type	Matrix	Date	Time	Component	Reporting Limit	Detection Limit	Result	Result Notes	Units	Basis	Extraction Method	Method	Spike Concentration	Percent Recovery	Acceptance Limits	Avg	RPD
CTBTB-PW-0910	SMPL	Pore Water	09/28/10	11:15	Tetra-n-butyltin	0.044	0.038	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBTB-PW-0910	SMPL	Pore Water	09/28/10	11:15	Tri-n-butyltin Cation	0.044	0.012	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBTB-PW-0910	SMPL	Pore Water	09/28/10	11:15	Di-n-butyltin Cation	0.044	0.0073	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBTB-PW-0910	SMPL	Pore Water	09/28/10	11:15	n-Butyltin Cation	0.044	0.029	ND	ND	ug/L	NA	EPA 3520C	Krone					
CTBTB-PW-0910	SMPL	Pore Water	09/28/10	11:15	Tri-n-propyltin			70	SUR	PERCENT	NA	EPA 3520C	Krone	250	70	24-142		
CTBTB-SD-0910	SMPL	Sediment	09/28/10	11:15	Tetra-n-butyltin	1.4	0.61	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBTB-SD-0910	SMPL	Sediment	09/28/10	11:15	Tri-n-butyltin Cation	1.4	0.60	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBTB-SD-0910	SMPL	Sediment	09/28/10	11:15	Di-n-butyltin Cation	1.4	0.27	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBTB-SD-0910	SMPL	Sediment	09/28/10	11:15	n-Butyltin Cation	1.4	0.36	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
CTBTB-SD-0910	SMPL	Sediment	09/28/10	11:15	Tri-n-propyltin			73	SUR	PERCENT	Dry	SOC-OSWT	Krone	125	73	18-95		
Method Blank	MB1	Pore Water	NA		Tetra-n-butyltin	0.043	0.038	ND	ND	ug/L	NA	EPA 3520C	Krone					
Method Blank	MB1	Pore Water	NA		Tri-n-butyltin Cation	0.043	0.012	ND	ND	ug/L	NA	EPA 3520C	Krone					
Method Blank	MB1	Pore Water	NA		Di-n-butyltin Cation	0.043	0.0073	ND	ND	ug/L	NA	EPA 3520C	Krone					
Method Blank	MB1	Pore Water	NA		n-Butyltin Cation	0.043	0.029	ND	ND	ug/L	NA	EPA 3520C	Krone					
Method Blank	MB1	Pore Water	NA		Tri-n-propyltin			86	SUR	PERCENT	NA	EPA 3520C	Krone	250	86	24-142		
Lab Control Sample	LCS1	Pore Water	NA		Tetra-n-butyltin	0.050	0.038	0.307	=	ug/L	NA	EPA 3520C	Krone	0.500	61	24-104		
Lab Control Sample	LCS1	Pore Water	NA		Tri-n-butyltin Cation	0.050	0.012	0.288	=	ug/L	NA	EPA 3520C	Krone	0.446	64	30-120		
Lab Control Sample	LCS1	Pore Water	NA		Di-n-butyltin Cation	0.050	0.0073	0.213	=	ug/L	NA	EPA 3520C	Krone	0.384	56	18-128		
Lab Control Sample	LCS1	Pore Water	NA		n-Butyltin Cation	0.050	0.029	0.172	=	ug/L	NA	EPA 3520C	Krone	0.312	55	40-165		
Lab Control Sample	LCS1	Pore Water	NA		Tri-n-propyltin			74	SUR	PERCENT	NA	EPA 3520C	Krone	250	74	24-142		
Duplicate Lab Control Sample	DLCS1	Pore Water	NA		Tetra-n-butyltin	0.050	0.038	0.371	=	ug/L	NA	EPA 3520C	Krone	0.500	74	24-104		19
Duplicate Lab Control Sample	DLCS1	Pore Water	NA		Tri-n-butyltin Cation	0.050	0.012	0.287	=	ug/L	NA	EPA 3520C	Krone	0.446	64	30-120		0
Duplicate Lab Control Sample	DLCS1	Pore Water	NA		Di-n-butyltin Cation	0.050	0.0073	0.199	=	ug/L	NA	EPA 3520C	Krone	0.384	52	18-128		7
Duplicate Lab Control Sample	DLCS1	Pore Water	NA		n-Butyltin Cation	0.050	0.029	0.171	=	ug/L	NA	EPA 3520C	Krone	0.312	55	40-165		0
Duplicate Lab Control Sample	DLCS1	Pore Water	NA		Tri-n-propyltin			76	SUR	PERCENT	NA	EPA 3520C	Krone	250	76	24-142		
Method Blank	MB1	Sediment	NA		Tetra-n-butyltin	0.99	0.44	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
Method Blank	MB1	Sediment	NA		Tri-n-butyltin Cation	0.99	0.43	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
Method Blank	MB1	Sediment	NA		Di-n-butyltin Cation	0.99	0.19	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
Method Blank	MB1	Sediment	NA		n-Butyltin Cation	0.99	0.26	ND	ND	ug/Kg	Dry	SOC-OSWT	Krone					
Method Blank	MB1	Sediment	NA		Tri-n-propyltin			64	SUR	PERCENT	Dry	SOC-OSWT	Krone	125	64	18-95		
Lab Control Sample	LCS1	Sediment	NA		Tetra-n-butyltin	1.0	0.44	18.4	=	ug/Kg	Dry	SOC-OSWT	Krone	25.0	74	30-110		
Lab Control Sample	LCS1	Sediment	NA		Tri-n-butyltin Cation	1.0	0.43	15.6	=	ug/Kg	Dry	SOC-OSWT	Krone	22.2	70	25-101		
Lab Control Sample	LCS1	Sediment	NA		Di-n-butyltin Cation	1.0	0.19	13.8	=	ug/Kg	Dry	SOC-OSWT	Krone	19.2	72	35-108		
Lab Control Sample	LCS1	Sediment	NA		n-Butyltin Cation	1.0	0.26	14.8	=	ug/Kg	Dry	SOC-OSWT	Krone	15.6	95	20-123		
Lab Control Sample	LCS1	Sediment	NA		Tri-n-propyltin			79	SUR	PERCENT	Dry	SOC-OSWT	Krone	125	79	18-95		

END OF REPORT