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FINAL REPORT  
CENTREDALE MANOR (WOONASQUATUCKET RIVER)  
NORTH PROVIDENCE, RHODE ISLAND

SEPTEMBER 1999

U.S. EPA Work Assignment No.: 0-006  
Lockheed Martin Work Order No.: R1A00006  
U.S. EPA Contract No.: 68-C99-223



OFFICE OF EMERGENCY AND REMEDIAL RESPONSE

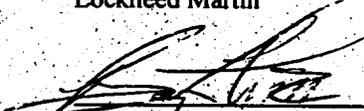
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## LIST OF ACRONYMS

ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
°C	Degrees Centigrade
cm	Centimeter
CMS	Centredale Manor Site
COC	Contaminant of Concern or Chain of Custody
COPC	Contaminant of Potential Concern
CV	Coefficient of Variation
d	day
DL	Detection Limit
d.w.	Dry Weight
e.g.	For Example (exempli gratia)
EPA	Environmental Protection Agency
ERTC	Environmental Response Team Center
et al.	And Others
etc.	And So Forth (et cetera)
FEB	February
ft	Feet, Foot
g	Gram
GC	Gas Chromatography
GW	Ground Water
ha	Hectare
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
HPLC	High Performance Liquid Chromatography
hr	Hour
Hwy	Highway
i.e.	That is (id est)
kg	Kilogram
L	Liter
LOQ	Limit of Quantitation
m	Meter
MAR	March
MDL	Method Detection Limit
µg/µL	Microgram/microliter
mg/mL	Milligram/milliliter
mL	Milliliter
mm	Millimeter
MQL	Method Quantitation Limit
MSL	Mean Sea Level
NA	Not Applicable
ND	Not Detected
PL	National Priority List
OSC	On-Scene Coordinator
ppb	Parts per Billion
ppm	Parts per Million
PRP	Potentially Responsible Party
PW	Porewater
QA/QC	Quality Assurance/Quality Control

LIST OF ACRONYMS (cont'd)

QAWP	Quality Assurance Work Plan
REAC	Response Engineering and Analytical Contract
RI	Rhode Island
ROD	Record of Decision
RPM	Remedial Project Manager
S	Soil
SE	Standard Error
SOP	Standard Operating Procedure
SSC	Site Safety Coordinator
SW	Surface Water
TAL	Target Analyte List
TCL	Target Compound List
TEQ	Toxic Equivalent
TOC	Total Organic Carbon
U.S.	United States
WA	Work Assignment
WAM	Work Assignment Manager
WP	Work Plan
w.w.	Wet Weight

## EXECUTIVE SUMMARY

The objective of this project was to provide technical support to the U.S. Environmental Protection Agency/Environmental Response Team Center (U.S. EPA/ERTC) and U.S. EPA Region I with evaluating the extent of contamination and human health risks associated with the Centredale Manor (Woonasquatucket River) site, North Providence, Rhode Island. Currently, a high-rise residential complex is on the site, but previously there was a chemical company and a drum reclamation company on the site property.

Tracing sources of dioxins that were first discovered in fish and eel taken from the Woonasquatucket River, the U.S. EPA found elevated levels of dioxin in sediments in portions of the river in a July 1998 study. Results of samples collected by U.S. EPA Region I were received in January 1999 and showed soil dioxin concentrations in some areas above 1 part per billion (ppb), the level at which a further investigation is warranted. The 1998 data, as well as screening data obtained from additional samples taken in January 1999, showed soil dioxin concentrations of up to 14 ppb in soil on the southern portion of the Centredale Manor property, including the drainage swale, and in the wooded area south of Centredale Manor. Since the public has access to some of these areas, Region I made it a priority to further determine the extent of dioxin contamination on and around Centredale Manor.

In cooperation with U.S. EPA Region I personnel, ERTC and the Response, Engineering, and Analytical Contract (REAC) collected surface soil (upper 3 inches) samples in order to evaluate the extent of dioxin contamination at the site. The site was divided into three sampling areas. Area 1 consisted of the portion of the property containing Brook Village Apartments, Centredale Manor, and associated parking areas. This area was gridded based on a 50 foot (ft.) nodal length. Area 2 was comprised of the remaining property south of Centredale Manor and was sampled based on a 100 ft. nodal length. Area 3 was represented by a line transect along the west bank of the Woonasquatucket River. Approximately 42% (61 of 146) of the samples collected from Area 1 exceeded the 1 part per billion (ppb,  $\mu\text{g}/\text{kg}$ ) action limit set by Region I. Sample locations with elevated Toxic Equivalent (TEQ) values were associated with the east bank of the Woonasquatucket River, the oxbow depression west of Centredale Manor, the drainage swale along the eastern border of the property, and the wooded area south of Centredale Manor. The maximum TEQ value for Area 1 was 117 ppb. Sixty-three percent (24 of 38) of the samples collected from Area 2 were above the 1 ppb action limit. The maximum concentration in samples collected in Area 2 was 21.8 ppb at location CMS-192. TEQ values greater than the Region I action limit of 1 ppb were found at 5 of the 25 locations of Area 3, on the west bank of the Woonasquatucket River. The maximum TEQ value for Area 3 was 2.48 ppb. Concentrations of dioxin equivalents exceeded the 1 ppb limit at the following residential locations: 550 Woonasquatucket Ave. (10.5 ppb), 494 Woonasquatucket Ave. (mean = 2.99 ppb), and 41 Stevens St. (1.99 ppb).

## 1.0 INTRODUCTION

### 1.1 Objective

The objective of this project was to provide technical support to the U.S. Environmental Protection Agency/Environmental Response Team Center (U.S. EPA/ERTC) and U.S. EPA Region I with evaluating the extent of contamination and human health risks associated with the Centredale Manor (Woonasquatucket River) site, North Providence, Rhode Island.

### 1.2 Site Background

Tracing sources of dioxins that were first discovered in fish and eel taken from the Woonasquatucket River, the U.S. EPA found elevated levels of dioxin in sediments in portions of the river in a July 1998 study. As a result of this study, U.S. EPA Region I (henceforth to be referred to as Region I) performed soil and sediment sampling on and around Centredale Manor in September 1998. Results of these samples were received in January 1999, and showed dioxin concentrations in some areas above 1 part per billion (ppb), the level at which a further investigation is warranted. As a result, Region I took an additional 25 samples around Centredale Manor, the Lee Romano ballfield, and the Boys and Girls Club (January 1999). Five surface soil samples were collected (27 January 1999) and analyzed from the Lee Romano ballfield (REAC 1999). The previous sampling, as well as screening data obtained from additional samples taken in January 1999, showed dioxin up to 14 ppb on the southern portion of the Centredale Manor property, including the drainage swale, and in the wooded area south of Centredale Manor. Since the public has access to some of these areas, Region I made it a priority to further determine the extent of dioxin contamination on and around Centredale Manor.

Centredale Manor is located in North Providence Rhode Island just south of Route 44 on the eastern bank of the Woonasquatucket River (Figure 1). Currently, a high-rise residential complex is on the site, but previously there was a chemical company and a drum reclamation company on the site property. Just north and adjacent to Centredale Manor is Brook Village, another high-rise residential area. Much of this combined property is covered by roadway, parking lots, and the two above-mentioned buildings. On the eastern portion of this property is a drainage swale that begins north of the property and extends south behind the manor building. It then curves to the west and discharges into a wooded wetland south of the property and eventually into the Woonasquatucket River.

## 2.0 METHODOLOGY

### 2.1 Technical Approach

#### 2.1.1 Data Requirements

A site visit was conducted on 22 January 1999. The purpose of the site visit was to identify depositional areas expected to retain translocated dioxin and other contaminants. Evaluation of data from previous sampling efforts was utilized in constructing a statistically sound sampling plan (U.S. EPA 1999) that would accurately estimate the extent of contamination. Maps of the site, including past and future sampling locations, property boundaries, wetlands, surface water, and streets were constructed.

## 2.1.2 Observations and Activities

A field investigation was necessary to collect the information described above for use in an extent of contamination assessment.

The REAC sampling team arrived on-site at 1300 hours (15 February 1999) and met with JoAnn Camacho (U.S. EPA/ERTC), Tim Goddeyne (U.S. EPA/ERTC), and Ted Bazenas (U.S. EPA Region I). Access to the green-way on the west side of the Woonasquatucket River was not obtained until 16 February 1999. Grid construction was started at the northern portion of the site (CMS-026). The site was divided into three sampling areas (Figure 2). Area 1 consisted of the portion of the property containing Brook Village Apartments, Centredale Manor, and a wooded area adjacent to Centredale Manor. This area was gridded based on a 50 foot (ft.) nodal length. Area 2 was comprised of the remaining property south of Centredale Manor, and was sampled based on a 100 ft. nodal length. Area 3 was represented by a line transect along the west bank of the Woonasquatucket River. Region I personnel (Beth Deabay, Dan Granz, and Rich Fisher) and Superfund Technical Assessment and Response Team (START) personnel (Shawn Kennedy, Brad Bowen, and Bill Lincourt) arrived on-site Tuesday (16 February 1999) morning. Each morning began with a briefing and a health and safety meeting led by Al Lupiano, REAC. Personnel were placed into teams with specific tasks (Table 1). Surface soils from the site were collected (Tables 2-4) on 16 (start: 0730, finish: 1700) and 17 (start: 0630, finish: 1800) February 1999 and shipped via Federal Express to Triangle Laboratories (Durham, NC) to be analyzed for dioxin/furans. An inventory of sample collection times, dates, and location alterations are presented in Tables 2-4. Michelle Chipaloski, Amanda Daly and Elsa Matos (REAC) transported samples to the FedEx station. Noel Rogers (REAC), with assistance from two START employees (Shawn Kennedy and Brad Bowen), began the geophysical survey on 16 February and finished on 18 February 1999.

## 3.0 RESULTS

### 3.1 Results of the Analyses for Dioxins in Surface Soils

Region I conducted the the QA/QC evaluation of the raw analytical data. Tabular, validated results of the analyses of surface soils for dioxins (expressed as total, dry-weight TEQs) are presented in Table 5.

Approximately 42% (61 of 146, excluding duplicates) of the samples collected from Area 1 exceeded the 1 part per billion (ppb,  $\mu\text{g}/\text{kg}$ ) action limit set by Region I. Sample locations with elevated TEQ values were associated with the east bank of the Woonasquatucket River, the oxbow depression west of Centredale Manor, the drainage swale along the eastern border of the property, and the wooded area south of Centredale Manor. Approximately 75% of the samples (mean of those exceeding limit = 15.25 ppb, SE = 8.52) on the east bank of the river exceeded the action limit, with the maximum being 116 ppb at location CMS-060. TEQ values of the samples collected from the oxbow region between Centredale Manor and the river ranged from 0.11 ppb (CMS-111) to 8.75 (CMS-075), with about 48% of the samples exceeding the 1 ppb action limit. A smaller proportion (34%) of the samples collected from the swale along the eastern border of the property exceeded the action limit. The maximum TEQ value here was 35.5 ppb at location CMS-141. The area south of Centredale Manor and still within the Area 1 boundary, had approximately 70% of it's locations with TEQ values (mean of those exceeding limit = 17.28 ppb, SE = 5.38) greater than 1ppb. Location CMS-140 was found to have a TEQ value of 117 ppb.

Sixty-three percent (24 of 38) of the samples collected from Area 2 were above the 1 ppb action limit. The maximum concentration in samples collected in Area 2 was 21.8 ppb at location CMS-192. The mean TEQ value for the samples that exceeded the action limit was 5.46 ppb (SE = 0.98).

TEQ values greater than the Region I action limit of 1 ppb were found at 5 of the 25 locations of Area 3, on the west bank of the Woonasquatucket River. The locations were on the south end of the transect line (CMS-019, 021, 022, 023, 024, and 025). The maximum TEQ value for Area 3 was 2.48 ppb.

Concentrations of dioxin equivalents exceeded the 1 ppb limit at the following residential locations: 550 Woonasquatucket Ave. (10.5 ppb), 494 Woonasquatucket Ave. (mean = 2.99 ppb, n = 4), and 41 Stevens St. (1.99 ppb).

### 3.2 Results of the Geophysical Surveys

A comprehensive geophysical survey of the site was conducted in February 1999, with a "follow-up" investigation in April 1999 (Appendix A). A total of 44 anomalies were identified from the geophysical data collected in February 1999. Of particular interest were possible pipes or targets, a possible buried tank/disposal area, and other numerous single targets, debris, pipes, and buried power-lines. The April 1999 work was conducted to further define the extent of the anomalies reported previously and to complete surveying portions of the site not covered during the February 1999 investigation. Many of the previously reported anomalies were found to be buried utilities. However, results indicate that the area of the South Parking Lot for Centredale Manor may contain buried bulk metallic materials.

## 4.0 CONCLUSIONS

Approximately 42% (61 of 146, excluding duplicates) of the samples collected from Area 1 exceeded the 1 part per billion (ppb,  $\mu\text{g}/\text{kg}$ ) action limit set by Region I. Sample locations with elevated TEQ values were associated with the east bank of the Woonasquatucket River, the oxbow depression west of Centredale Manor, the drainage swale along the eastern border of the property, and the wooded area south of Centredale Manor. Sixty-three percent (24 of 38) of the samples collected from Area 2 were above the 1 ppb action limit. The maximum concentration in samples collected in Area 2 was 21.8 ppb at location CMS-192. TEQ values greater than the Region I action limit of 1 ppb were found at 5 of the 25 locations of Area 3, on the west bank of the Woonasquatucket River. The maximum TEQ value for Area 3 was 2.48 ppb. Concentrations of dioxin equivalents exceeded the 1 ppb limit at the following residential locations: 550 Woonasquatucket Ave. (10.5 ppb), 494 Woonasquatucket Ave. (mean = 2.99 ppb), and 41 Stevens St. (1.99 ppb).

The data suggest the need for further investigation as to both the extent of subsurface contamination and source of identified contamination.