a global professional services company

creative thinking. **custom solutions.**®

220 Athens Way, Suite 410 | Nashville, Tennessee 37228 | Telephone 615-255-9300 | Facsimile 615-255-9345 | www.ensafe.com

September 19, 2008

Larry Rosenmann
NYS Department of Environmental Conservation
Division of Solid and Hazardous Materials
625 Broadway
Albany, NY 12233-7258

Re: Carrier Corporation, Thompson Road Facility, Syracuse, NY
Corrective Action Order – Index CO 7-20051118-4
CO Update 2008 – FCMS Sanders Creek Sediments

Mr. Rosenmann,

Please find attached one copy of the Focused Corrective Measures Study (FCMS) for the referenced facility. This report was prepared in response to a letter that was received from NYSDEC on May 23, 2008 requesting additional work be performed at the site. Some changes were made following a meeting between NYSDEC and UTC/Carrier personnel and were outlined in meeting minutes submitted to you on July 14, 2008.

Please call me if you have any questions at (615) 255-9300.

Sincerely,

EnSafe Inc.

May M. Heflin

May Heflin, PE

Encl. CO Update 2008 – FCMS Sanders Creek Sediments

cc: Mr. Mark Sergott — NYSDEC (1 hard copy)
Mr. Tim DiGuilio — NYSDEC (1 hard copy)
Mr. James E. Gruppe — NYSDEC (1 hard copy)
Mr. William Penn — UTC (electronic copy via e-mail)
Mr. Nelson Wong — Carrier Corporation (electronic copy via e-mail)

FOCUSED CORRECTIVE MEASURES STUDY
SEDIMENTS IN SANDERS CREEK

Revision No.: 0

United Technologies/Carrier
Thompson Road Facility
Syracuse, New York

EnSafe Project No.: 0888806464

Prepared for:

United Technologies Corporation
UTC Shared Remediation Services
United Technologies Building
Hartford, Connecticut 06010

Prepared by:

ENSAFE

EnSafe Inc.
220 Athens Way, Suite 410
Nashville, Tennessee 37228
(615) 255-9300
(800) 588-7962
www.ensafe.com

September 2008

Table of Contents

List of Figures

List of Tables

INTRODUCTION

Carrier Corporation (Carrier), a wholly-owned subsidiary of United Technologies Corporation (UTC) has prepared this abbreviated Corrective Measures Study (CMS) in response to the requests outlined in the New York State Department of Environment and Conservation (NYSDEC) letter dated May 23, 2008. In this letter, NYSDEC raised several environmental concerns related to the investigation(s) and subsequent findings related to Corrective Action Order — Index CO 7-20051118-4 (order) dated February 13, 2006. The three primary environmental concerns deal with:

- Soil vapor intrusion to buildings on the Carrier campus
- Adequacy of Carrier's groundwater monitoring program at Building TR-3 and in deep groundwater
- Polychlorinated biphenyl (PCB) contamination in sediments of Sanders Creek

On July 2, 2008, UTC and Carrier personnel met with NYSDEC representatives to discuss the requests made in the referenced letter. Meeting minutes were submitted to NYSDEC by Mr. William Penn on July 14, 2008 via e-mail. A summary of the minutes is provided below:

Soil Vapor Intrusion

- The vapor migration pathway appears to be related to the storm water lines that emanate from the Solid Waste Management Units 1 through 4 source area. In lieu of continued indoor air and sub-slab vapor investigations, Carrier proposes to perform mitigation at some of the locations.
- In addition Carrier will evaluate information on historical manufacturing operations that used chlorinated solvents and propose additional soil vapor, indoor air sampling if warranted.

The work plan addressing soil vapor intrusion was submitted to NYSDEC on August 11, 2008.

Groundwater Monitoring

The remedial approach for site-wide groundwater involves the containment of waters at the site boundary. Shallow groundwater flow is toward the storm water system and is being collected by the storm water system and the bedding material collection system. Deep groundwater, except for one event, has been demonstrated to flow to the north-northwest. Prior Hydro-punch sampling in the deep horizon did not detect contaminants to the east of the current boundary deep wells.

- Carrier will abandon MW-13D and install a replacement well, install a new shallow well at TR-3, and perform annual groundwater monitoring.

- Carrier will submit an abbreviated CMS for TR-3 area groundwater.

Carrier submitted to NYSDEC a Groundwater Monitoring Work Plan on August 25, 2008, and will submit a focused CMS for TR-3 on September 22, 2008.

Sanders Creek

PCB detections in the creek appear to be associated with the releases through the facility's storm water system. A rigorous monitoring program, being performed in compliance with the site's State Pollutant Discharge Elimination System permit, has detected PCBs in the storm water. Based on the data to date, it is expected that a treatment system will be installed sometime in 2010 to address PCBs in storm water above the permit requirements.

- A future remedial action in Sanders Creek will address PCBs in sediments.
- Additional sampling may be needed to support the remedial measure.

The study presented below discusses Carrier's approach to addressing these items.

1.0 BACKGROUND

Carrier Corporation (Carrier), a wholly-owned subsidiary of United Technologies Corporation (UTC) has prepared this focused Corrective Measure Study (CMS) in response to New York State Department of Environment and Conservation (NYSDEC) correspondence dated May 23, 2008, related to the requirements outlined in the NYSDEC Corrective Action Order — Index Consent Order CO 7-20051118-4 (order) dated February 13, 2006. The order indicated that past sampling results identified polychlorinated biphenyl (PCB) impacts in Sanders Creek and recommended additional investigation. **Figure 1-1 —Site Location Map** shows the general location of the facility.

On behalf of Carrier, EnSafe has designed this focused CMS to comply with the directives set forth in the NYSDEC letter to implement a remedial action in Sanders Creek by end of year 2008.

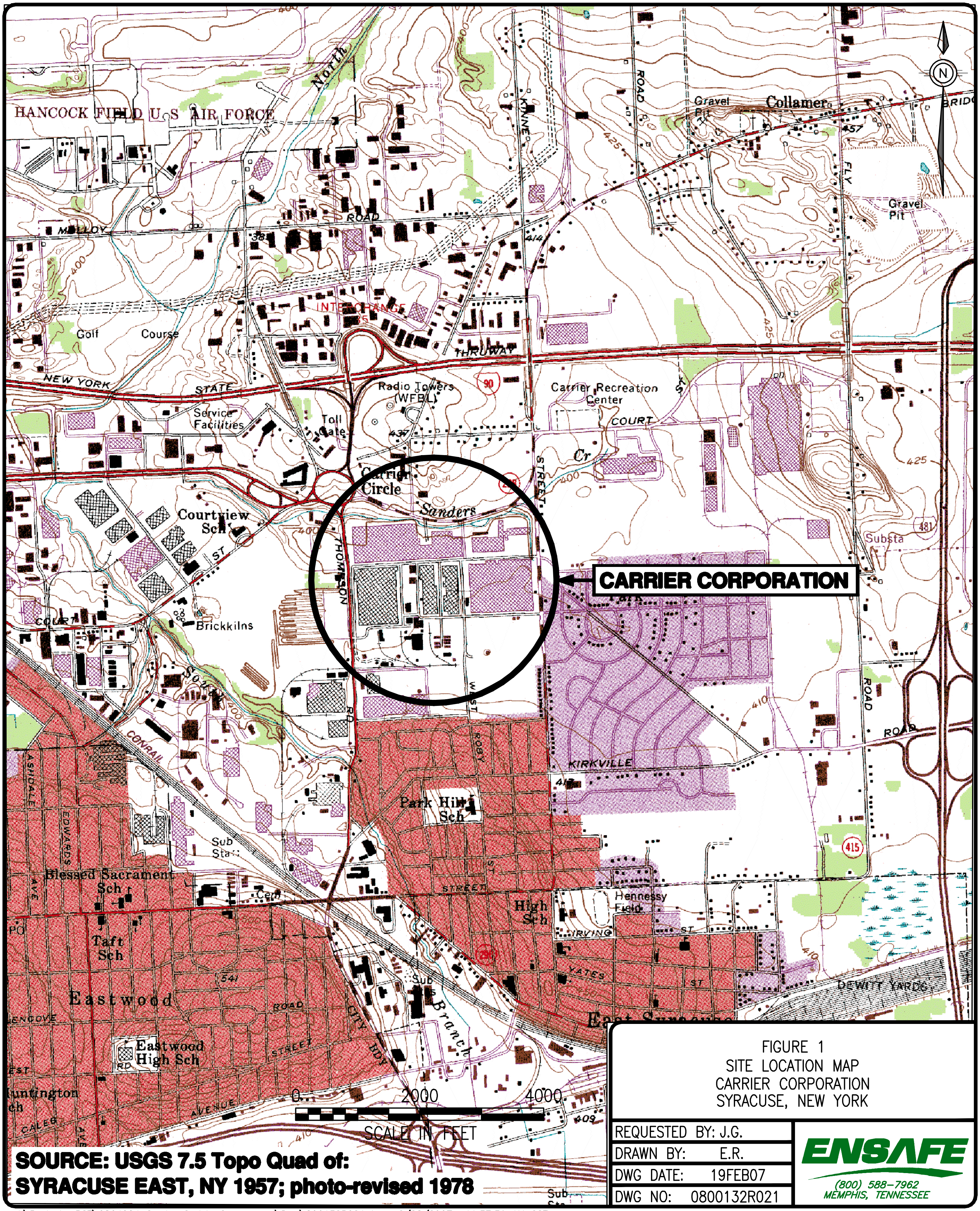


FIGURE 1
SITE LOCATION MAP
CARRIER CORPORATION
SYRACUSE, NEW YORK

REQUESTED BY:	J.G.
DRAWN BY:	E.R.
DWG DATE:	19FEB07
DWG NO:	0800132R021

ENSAFE
(800) 588-7962
MEMPHIS, TENNESSEE

SOURCE: USGS 7.5 Topo Quad of: SYRACUSE EAST, NY 1957; photo-revised 1978

I:\Projects-BST\0804084 Carrier Carlyle Compressor\Dwg\800132R021.dwg 2/28/2007 11:37:39 AM CST

2.0 PURPOSE OF THE CORRECTIVE MEASURES STUDY

This focused CMS is intended to identify, screen, develop, evaluate, and compare remedial action alternatives to reduce exposure to PCBs by various ecosystems in Sanders Creek and therefore reduce the concentration of PCBs in the tissue of wildlife, over time.

The report is organized as follows:

- Section 3, Proposed Cleanup Objectives, details the objectives of remedy evaluation.

- Section 4, SWMU Site Description, briefly describes the status at the site and identifies the area being addressed in this report.

- Section 5, Identification, Screening, Evaluation, and Ranking of Remedies, presents a detailed analysis of alternatives, where applicable.

- Section 6, Public Involvement Plan, describes the activities that will be carried out as part of a community involvement program.

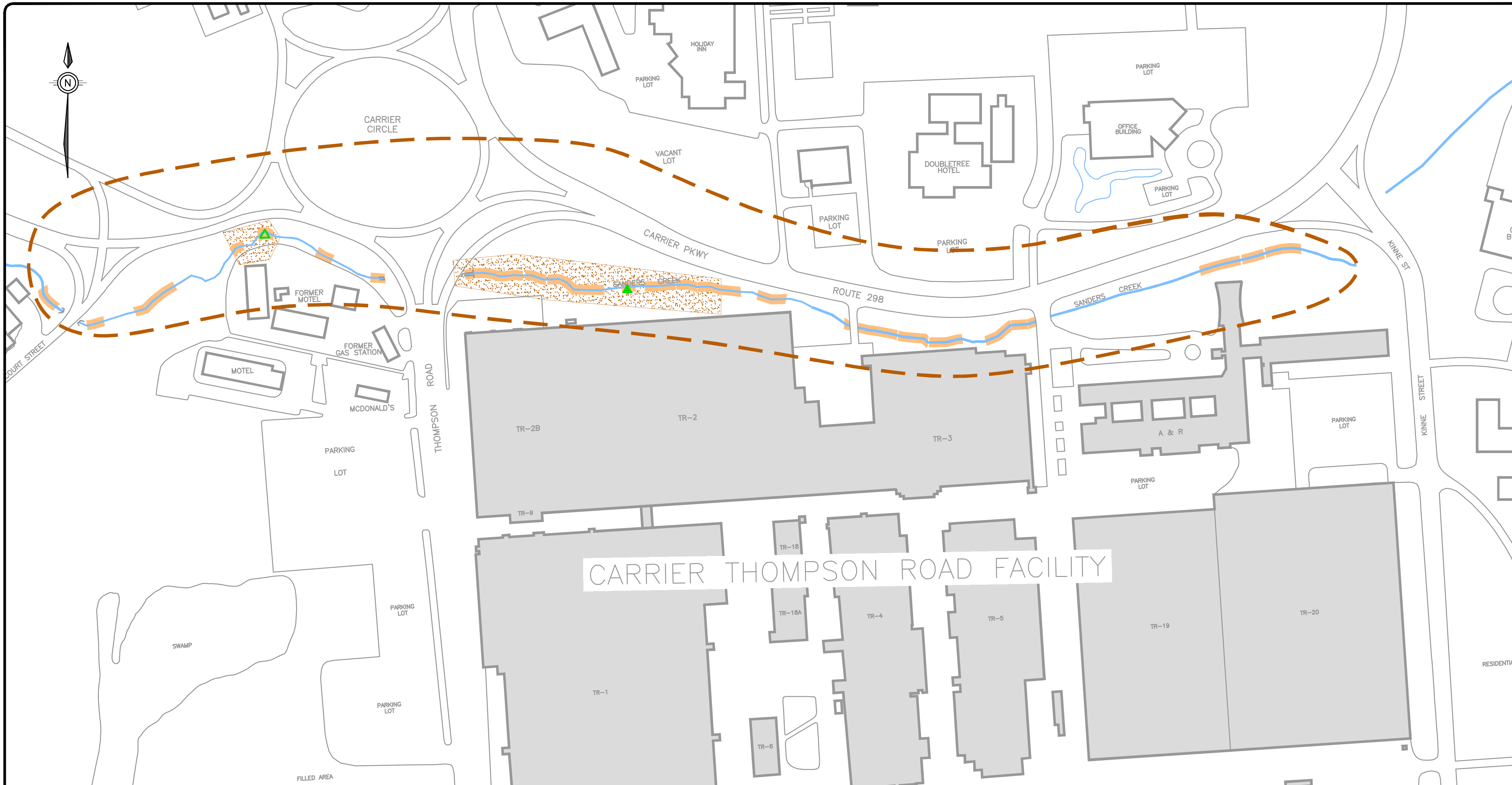
3.0 CORRECTIVE MEASURES OBJECTIVES

The contaminants of concern identified for Sanders Creek are PCBs. PCBs have been shown to cause adverse reproductive and developmental effects in animals. Ecological exposure to PCBs is primarily an issue of bioaccumulation rather than direct toxicity. PCBs bioaccumulate in the environment by both bioconcentrating (being absorbed from water and accumulated in tissue to levels greater than those found in surrounding water) and biomagnifying (increasing in tissue concentrations as they go up the food chain through two or more trophic levels). Animals and plants living in or near the creek, such as invertebrates, fish, amphibians, and water-dependent reptiles, birds, and mammals, may be directly exposed to the PCBs from contaminated sediments and creek water and/or indirectly exposed through ingestion of food (e.g., prey) containing PCBs.

The long-term or final objective of remedy evaluation at the facility is to select a remedy that will facilitate the reduction of bio-accumulated PCBs in the tissues of fish and wildlife in Sanders Creek (see **Figure 3-1 — Sanders Creek Project Area** for the portion of Sanders Creek being addressed as part of this focused CMS). The final objective is a performance-based standard that has been agreed upon with NYSDEC regulators in lieu of a traditional numeric clean-up standard. This objective will be achieved by:

- reducing direct exposure to PCBs in sediments in Sanders Creek
- minimizing future migration of PCBs offsite (downstream)

The corrective measure selected for Sanders Creek sediments will be chosen based on information from the current RFI, other files or support documents, and professional experience.



LEGEND

BUILDING
NYSDEC CRAYFISH SAMPLE LOCATION (2003)
NYSDEC SEDIMENT SAMPLE LOCATION (ONONDAGA LAKE NPL SITE)
TRIBUTARY SAMPLING, NYSDEC 1998 DATA)

CARRIER SEDIMENT SAMPLE LOCATION (DEC 2001)
CARRIER SEDIMENT SAMPLE LOCATION (JUL 2001)
PISCES SAMPLE LOCATION (2007)

0 300 600
SCALE IN FEET

FIGURE 3-1
PROJECT AREA
SANDERS CREEK
CARRIER FACILITY THOMPSON ROAD
SYRACUSE, NEW YORK

REQUESTED BY: M.H.
DRAWN BY: E.R.
DWG DATE: 11SEPT08
DWG NO: 806464R009

ENSAFE
(800) 588-7962
MEMPHIS, TENNESSEE

I:\Projects-BST\0803666 Carrier\805086R009.dwg 9/11/2008 13:56:24 PM CST

4.0 SITE DESCRIPTION AND IDENTIFICATION OF REMEDIAL AREAS

4.1 Site Description and Status

Sanders Creek is a small, freshwater stream that is immediately north of several manufacturing buildings in the northern portion of the Carrier facility. Human activities and development near the site have altered the watershed's ability to support diverse biota due to the loss of large tracts of forest and wetlands over the last 100 years and resulting fragmentation of natural communities, particularly in the greater Syracuse area surrounding Onondaga Lake and the lower watershed basin (USACE 2003). The area has been fragmented by the presence of canals, railroads, highways, streets, residential areas, and urbanized areas (USACE 2003).

Sanders Creek habitat was determined to be marginal due to disturbances by human activities and natural forces over time, resulting in fragmented communities, reduced bank protection tree cover, and riparian buffer zone, as well as increased bank erosion (USACE 2003; EnSafe 2007). The creek width and depth vary, and most of the creek is three feet deep or less. Sanders Creek is usually less than six feet across, with some larger, deeper pools observed at isolated locations (EnSafe 2007). The effects of nearby human activities lead to increased water velocity during heavy rain events, bank sloughing, bottom scouring, and ultimately limited aquatic habitats (EnSafe 2007).

Sampling conducted at the site by NYSDEC and Carrier indicated the following:

- Habitat is marginal at best and has been impacted by human activities
- Diversity and abundance of fish species are limited, especially sports fish species
- PCBs are bioavailable in the creek
- PCBs have been detected in creek sediment and downgradient fish tissue
- Sediment sampling conducted in July 2001, December 2003, and November 2006 identified PCBs in the sediment

In November 2006, EnSafe conducted sediment sampling from Sanders Creek according to the methods and procedures outlined in the NYSDEC approved work plan (*Sanders Creek Sediment and Fish Sampling Work Plan, Rev No.: 1* — EnSafe 2006) to determine if downgradient sediments contained PCBs, and if so, their possible source. **Table 4-1** summarizes the detectable sediment PCB analytical results. Sediment PCB results are similar to historic PCB concentrations for samples collected previously by both NYSDEC and Carrier. Sediment concentrations ranged from nondetect to 8.22 mg/kg, with one duplicate sample result of 36.9 mg/kg for Aroclors 1254 and 1260 (EnSafe 2007).

Fishing is catch and release only in the Onondaga watershed due to historic contamination in the watershed (USEPA 2007). Nearby sources of PCBs may have contributed the fish tissue concentrations of PCBs, and remedial actions due to PCBs have been conducted to address some nearby sources. For example, as reported in the U.S. Fish and Wildlife Service (USFWS) *Natural Resource Damages Preassessment Screen for Onondaga Lake*, the Ley Creek PCB Dredging sub-site identified PCBs as the primary contaminant of concern, which was found in the creek sediments (USFWS 2005). Groundwater near the site was also determined to be contaminated with PCBs (USFWS 2005). A Remedial Design/Remedial Action Order on Consent was executed by the NYSDEC on July 15, 1999, and a 4,000-foot reach of stream bank containing dredge spoils has been remediated (USFWS 2005).

The GM plant sub-site is another nearby source of PCBs. The site was used for plating, buffing, forming, and finishing metal auto parts, and GM site operations produced PCB-contaminated hydraulic oils, waste solvents, and PCB paint sludge (USFWS 2005). Surface water, groundwater, soils, and vegetation have been contaminated by waste spills and releases from the manufacturing operation (USFWS 2005). Several interim remedial actions have been implemented at the GM plant sub-site, including removing 26,000 tons of soil containing PCBs, capping an industrial landfill, and constructing a treatment pond and water treatment system, which could have influenced Ley Creek PCB concentrations (USFWS 2005).

Table 4
Sanders Creek Sediment Sample PCB Results
Carrier Thompson Road Facility
Syracuse, New York

ID/Location	Date	GPS Position	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Percent Solids	Total Organic Carbon	Normalized Sediment Criteria (mg PCB/gOC)	Normalized Results Aroclor 1254	Normalized Results Aroclor 1260
Station 1														
CARMSTA101 (Station 1, Sample 1) 135 ' Downstream (west) from Court Street Bridge	11/8/2006	43° 05.126' N 76° 05.416 W	<0.011	<0.035	<0.031	<0.018	<0.020	<0.027	<0.012	57.6	30,300	NR	NR	NR
CARMSTA102 (Station 1, Sample 2) 40' West of Court Street Bridge	11/8/2006	43° 05.114 N 76° 05.402 W	<0.0091	<0.029	<0.026	<0.015	<0.016	0.107	0.333	69	7,360	0.0103	0.015	0.045
Station 2														
CARMSTA201 (Station 2, Sample 1) 155' Upstream (east) from Court Street Bridge	11/9/2006	43° 05.204' N 76° 05.636 W	<0.073	<0.023	<0.021	<0.012	<0.018	0.202	0.646	86.6	2,360	0.0033	0.086	0.274
CARMSTA202 (Station 2, Sample 2) 365' East of Court Street Bridge	11/9/2006	43° 03.321 N 76° 02.327 W	<0.087	<0.027	<0.025	<0.015	<0.016	<0.022	<0.0092	72.6	7,370	NR	NR	NR
CARMSTA203 (Station 2, Sample 3) 588' East of Court Street Bridge	11/9/2006	43° 02.964 N 76° 01.761 W	<0.0077	<0.024	<0.022	<0.013	<0.014	<0.019	6.870 J	81.6	7,970	0.0112	NR	0.862
CARMSTA204 (Station 2, Sample 4) 838' East of Court Street Bridge	11/9/2006	43° 01.503 N 76° 03.296 W	<0.0079	<0.025	<0.022	<0.013	<0.014	0.0694	0.0776	80.1	1,200	0.0017	0.058	0.065
CARMSTA205 (Station 2, Sample 5) 1018' east of Court Street Bridge	11/9/2006	43° 01.489 N 76° 03.272 W	<0.0076	<0.026	<0.022	<0.013	<0.014	0.405	2.160	82.7	6,110	0.0086	0.066	0.354
Station 3														
CARMSTA301 (Station 3, Sample 1) 113' East of Thompson Road	11/8/2006	43° 05.207' N 76° 05.344 W	<0.0094	<0.030	<0.027	<0.016	<0.017	1.280 J	8.220 J	66.3	22,700	0.0318	0.056	0.362
CARMSTA302 (Station 3, Sample 2) 400' East of Thompson Road	11/8/2006	43° 05.221 N 76° 05.674 W	<0.011	<0.035	<0.032	<0.018	<0.020	0.141	0.481	57.3	40,400	0.0566	0.003	0.012
CARMSTA302 (Station 3, Duplicate of Sample 2) 400' East of Thompson Road	11/8/2006	43° 05.221 N 76° 05.674 W	<0.0083	<0.026	<0024	<0.014	<0.15	7.050 J	36.90 J	75.1	28,400	0.0398	0.248	1.299
CARE110906A (Equipment Blank) Blank collected from Hand Auger	11/9/2006	NA	<0.0001	<0.00052	<0.00043	<0.00018	<0.00017	<0.00012	<0.00013	NA	NA	NA	NR	NR
New York State Wildlife Bioaccumulation Sediment Criteria for PCBs (µg/gOC)			1.4	1.4	1.4	1.4	1.4	1.4	1.4					

Notes:
All results are reported in milligrams per kilogram (mg/kg) except percent solids which is reported in percent.
ND - Not Detected
NA - Not Analyzed
J - Data review indicates sample results potentially biased high.
NR - Data not able to be normalized as no concentrations were identified above method detection limits.

In the Onondaga Lake watershed, PCBs were detected in many receptor species analyzed by NYSDEC from 1992 and 2000, and by Honeywell in 2000 (USFWS 2005). PCB concentrations ranged as follows in mg/kg (USFWS 2005):

- Bluegill: 0.30 — 0.88
- Carp: 0.50 — 9.8
- Channel catfish: 0.78 — 6.0
- White perch: 0.37 — 3.8
- Smallmouth bass: 0.21 — 11
- Largemouth bass: 0.075 — 2.8
- Walleye: 0.66 — 7.8

Target tissue concentration ranges were identified in the March 25, 2005 letter from the USEPA Region 2 Emergency and Remedial Response Division to the National Remedy Review Board (USEPA 2005). In USEPA's letter, summary tables reference the Onondaga Lake Feasibility Study, Appendix I, Table I.28 (USEPA 2005). Target tissue PCB concentrations were developed for sports fish and prey species (mg/kg wet weight):

- Sports fish: 0.2 — 0.6
- Prey species: 0.02 — 9.6

During the November 2006 ecological survey, only seven fish species were encountered in the creek (in order of frequency): creek chub, longnose dace, white sucker, pumpkinseed, fathead minnow, largemouth bass, and bullhead catfish (EnSafe 2007). The creek chub, a prey species, was the most commonly observed species in Sanders Creek (EnSafe 2007). Few game fish species were observed, and those observed were small, so long-term, frequent sports fishing is not likely to occur in this portion of Sanders Creek based on the low abundance of game fish species and its physical characteristics (small creek, shallow water, proximity to busy roadways and industrial/commercial facilities).

Fish samples were collected from Sanders Creek, and the focus of the fish tissue sampling was creek chub (EnSafe 2007). The weight and length of fish tissue samples were measured, and weights ranged from 14.78 g to 154 g, with an arithmetic mean weight of 58.4 g (EnSafe 2007). Lengths ranged from 5 mm to 23 mm, with an arithmetic mean length of 14.6 mm (EnSafe 2007). Total PCB tissue concentrations ranged from 1.4 mg/kg to 8.8 mg/kg wet weight (EnSafe 2007).

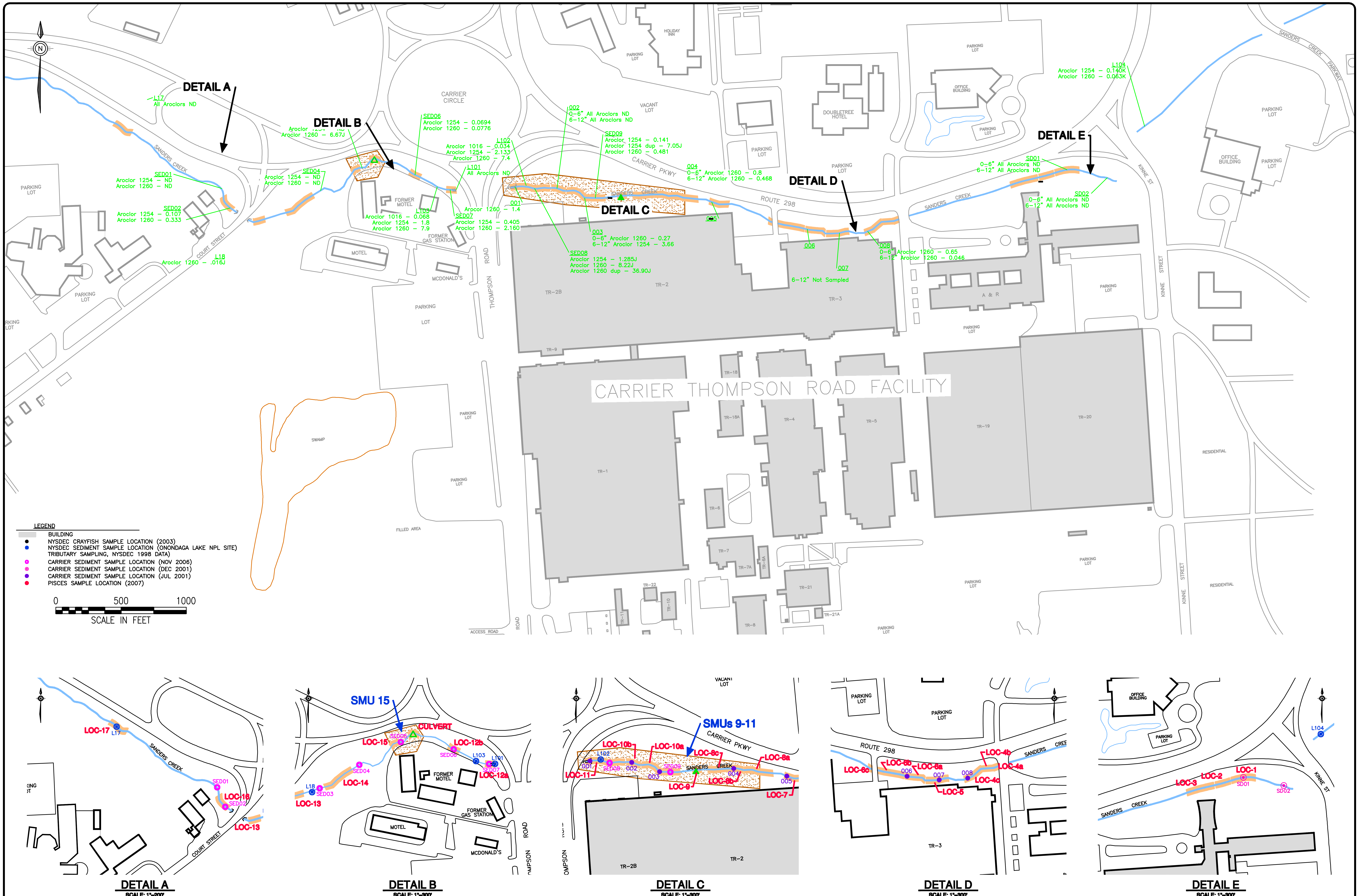
These concentrations are within the range of prey species' target tissue PCB concentrations established during the Onondaga Lake Feasibility Study, and the concentrations are greater than the target tissue concentrations established for sports fish. The creek chub is a prey species.

Sanders Creek habitat was determined to be marginal, and its quality is declining due to human activities and natural forces (EnSafe 2007). Additionally, the downgradient watershed has been contaminated with PCBs and other contaminants by other sources (USEPA 2007). To evaluate remedial alternatives and to identify sediment management units (SMUs), historical analytical data were integrated with a recent sediment study where the length, width, and depth of Sanders Creek sediment were measured, and the mass of PCBs was calculated for each SMU to identify remedial areas and to facilitate the CMS.

4.2 Sediment Management Units

The length, width, and depth of Sanders Creek sediment were measured in 17 SMUs, and the results were compiled to calculate the sediment volume in each SMU as well as the total sediment volume in the area evaluated. Sediment volume measurement activities began at the eastern end of the Carrier property along Sanders Creek. EnSafe observed some utility construction at the intersection of Hwy. 298 and Kinne St. Sediment volume measurements were collected by probing the creek bed with a hollow steel pole. When a significant (>2 inches) of sediment was encountered, length, average width, and average depth measurements were collected. SMUs in close proximity were subdivided, such as 10a and 10b. Location names and measurements were noted in a field logbook. **Figure 4-1 — Proposed Sediment Management Units**, shows the areas with significant sediment volumes and the associated historic sediment samples collected. Due to the presence of a large culvert near the abandoned motel west of Thompson Road, measurements were collected from Thompson Road to the culvert and then from Court St. east toward the culvert.

Table 4-2 shows sediment volume calculations for each area measured. Sediment volume was integrated with PCB data to estimate the mass of PCBs in sediment using bulk density. Sediment measurements were multiplied to calculate the cubic feet of sediment in each SMU. Samples were historically collected from SMUs, so data from each SMU were integrated by first averaging the PCB concentrations for each Aroclor detected in the SMU and subsequently calculating the sum total of PCBs for each SMU. Representative sediment sample locations for each SMU and calculated PCB concentrations are indicated on Table 4-2.



NOTES:
1. SMUs 9–11 INCLUDE SEDIMENTS IN THE AREA OF LOCATIONS 9, 10, AND 11
2. SMU 15 INCLUDES SEDIMENTS IN THE AREA OF LOCATION 15

FIGURE 4–1
PROPOSED SEDIMENT MANAGEMENT UNITS
SANDERS CREEK
CARRIER FACILITY THOMPSON ROAD
SYRACUSE, NEW YORK

REQUESTED BY: B.M.
DRAWN BY: E.R.
DWG DATE: 11SEPT08
DWG NO: 806464R007

ENSAFE
(800) 588–7962
MEMPHIS, TENNESSEE

I:\Projects–BST\0803666 Carrier\805086R007.dwg 9/11/2008 13:56:24 PM CST

Table 4-2
Calculation of Sediment Volume and Mass PCB for Sediment Management Units
UTC Sanders Creek
Syracuse, New York

SMU	Length (ft.)	Width (ft.)	Depth (ft.)	Sediment Volume (cu. ft.)	Representative Sediment Samples	PCB (mg/Kg)	Calculated Sediment Mass (Kg)	Calculated PCB Mass (Kg)	Calculated PCB Mass (lbs)	Percent PCB
Sanders Creek between Kinne St. and Thompson Rd.										
Loc. 1	75	17.5	2.5	3281.25	SD01, SD02	ND	196875	ND	ND	ND
Loc. 2	68	15	1.25	1275	SD01, SD02	ND	76500	ND	ND	ND
Loc. 3	100	18	3.25	5850	SD01, SD02	ND	351000	ND	ND	ND
Loc. 4a	38	24	2	1824	008	0.348	109440	0.03809	0.08379	1.0%
Loc. 4b	26	4	1.5	156	008	0.348	9360	0.00326	0.00717	0.1%
Loc. 4c	78	10	0.75	585	008	0.348	35100	0.01221	0.02687	0.3%
Loc. 5	97	8	0.75	582	007	2.22	34920	0.07752	0.17055	2.1%
Loc. 6a	100	6	1.25	750	006	0.603	45000	0.02714	0.05970	0.7%
Loc. 6b	50	8	0.5	200	006	0.603	12000	0.00724	0.01592	0.2%
Loc. 6c	6	4	1	24	006	0.603	1440	0.00087	0.00191	0.02%
Loc. 7	74	10	1.5	1110	005	1.18	66600	0.07859	0.17289	2.2%
Loc. 8a	125	12	0.5	750	004	0.634	45000	0.02853	0.06277	0.8%
Loc. 8b	48	12	2.5	1440	004	0.634	86400	0.05478	0.12051	1.5%
Loc. 8c	86	12	1	1032	004	0.634	61920	0.03926	0.08637	1.1%
Loc. 9	58	9	1.25	652.5	SED09	4.0765	39150	0.15959	0.35111	4.4%
Loc. 10a	100	6	1	600	SED09, '003	3.9925	36000	0.14373	0.31621	4.0%
Loc. 10b	40	12	0.5	240	002	ND	14400	ND	ND	ND
Loc. 11	174	10	1.5	2610	001, L102, SED08	15.223	156600	2.38392	5.24463	65.7%
Sanders Creek between Thompson Rd. and Court St.										
Loc. 12a	6	2	0.5	6	L101, L103, SED07	6.9225	360	0.00249	0.00548	0.1%
Loc. 12b	50	8	1.5	600	SED06	0.147	36000	0.00529	0.01164	0.1%
Loc. 13	13	10	1	130	L18, SED03	0.533	7800	0.00416	0.00915	0.1%
Loc. 14	131	10	1.5	1965	SED03, SED04	0.848	117900	0.09998	0.21995	2.8%
Loc. Bank	10	3	2	60	SED05	6.67	3600	0.02401	0.05283	0.7%
Loc. 15 pool	25	25	1.75	1093.75	SED05	6.67	65625	0.43772	0.96298	12.1%
Sanders Creek between Court St. and Large Culvert										
Loc. 16	8	2	0.5	8	SED01, SED02	0.44	480	0.00021	0.00046	0.01%
Loc. 16	18	6	0.5	54	SED01, SED02	0.44	3240	0.00143	0.00314	0.04%
Loc. 17	57	15	0.5	427.5	L17	ND	25650	ND	ND	ND
						Total	**1013985**	**3.63**	**7.99**	**100.0%**

Notes:

SMU	Sediment management unit location
Sediment Volume (cu. ft.)	Length x width x depth
Representative Samples	Historical sediment samples collected near and within the corresponding SMU; PCB results are shown on Figure 4-1.
PCB (mg/Kg)	Total PCBs in sediment; when multiple results were reported for the same aroclor in different samples, the arithmetic mean of the detected results were used.
Calculated Sediment Mass (Kg)	Sediment volume converted to mass based on bulk density, where sediment mass = sediment volume x 132 lbs/cu. ft. / 2.2 lbs/Kg
Calculated PCB Mass (Kg)	Mass of PCBs in corresponding sediment volume, calculated as PCB x Calculated Sediment Mass x 1E-6 Kg/mg
Calculated PCB Mass (lbs)	Mass of PCBs in Kg converted to lbs, where PCB (lbs) = Mass PCB (Kg) x 2.2 lbs/Kg
Percent PCB	Percent contribution of the PCB mass in a corresponding SMU to the total mass
Total	Sum of the corresponding column

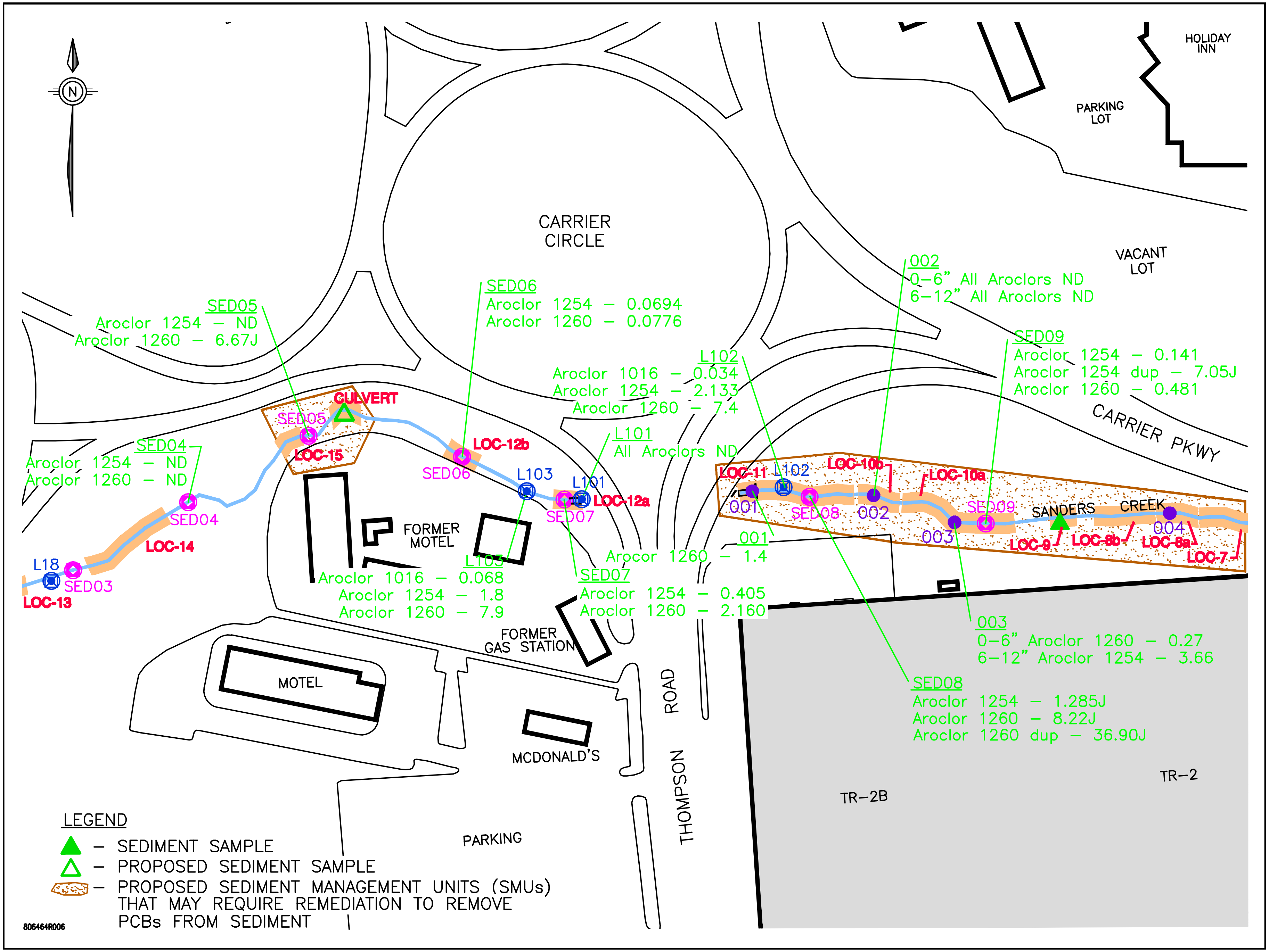
The mass of PCBs was calculated for each SMU by using the sediment volume, representative PCB concentration for each SMU, and bulk density. The bulk density was determined by researching wet sediment bulk density in Hudson River sediments, which was reported to range from 62 to 187 lbs./cubic ft in the *Hudson River Reassessment RI/FS Phase 3 Report: Feasibility Study* (TAMS 2000). Glacial-drift deposits in Onondaga Trough soil would be common at the site (Yager et al. 2007). Therefore, the wet bulk density for glacial till was used to perform calculations in this report. Bulk density for glacial till would be 145 lbs/cubic ft, as reported in *Foundation Engineering* (Peck et al. 1974), which is within the range of sediment bulk density reported in the Hudson River Feasibility Study (TAMS 2000). Sediment PCB results were reported as dry weight, so the dry bulk density was used to calculate the mass of PCBs. The dry bulk density for glacial till would be 132 lbs./cubic ft. (Peck et al. 1974). Table 4-2 shows the mass of PCBs calculated for each SMU based on the measured sediment volume, historical PCB concentrations dry bulk density, and representative samples.

As shown on Table 4-2, the SMU at Location 11 represents 66% of the PCB mass in sediment based on the calculations described above. This was calculated based on PCB results reported at sediment sample locations 001, L102, and SED08, as shown on Figure 3-1. SMUs at locations 9 through 11 and SMU 15 comprise 86% of the PCB mass, so only these SMUs were evaluated for remedial alternatives to meet the goals in this CMS.

No sediment samples were collected from the SMU at location 9, so the PCB mass for SMU 9 is based on nearby sediment data at SED09. Sampling at location 9 is recommended to define the PCB mass and to provide the rationale for including location 9 in the remedial area or for excluding it. Therefore, it may be possible to eliminate location 9 from the proposed remedial area.

The representative sample nearest SMU 15 is SED05, which was collected nearby but not from the same location. The SMU at location 15 contributes 12% of the total PCB mass, so remediation near location 15 may be warranted. Consequently, sediment samples are proposed at location 15 to determine the mass of PCBs in the sediment measured to determine if remediation would be effective in this SMU.

The following figure shows proposed sediment sample locations and SMU locations discussed above.



N
HOLIDAY INN
PARKING LOT
CARRIER CIRCLE
VACANT LOT
CARRIER PKWY
SED05
Aroclor 1254 – ND
Aroclor 1260 – 6.67J
SED06
Aroclor 1254 – 0.0694
Aroclor 1260 – 0.0776
L102
Aroclor 1016 – 0.034
Aroclor 1254 – 2.133
Aroclor 1260 – 7.4
002
0–6" All Aroclors ND
6–12" All Aroclors ND
SED09
Aroclor 1254 – 0.141
Aroclor 1254 dup – 7.05J
Aroclor 1260 – 0.481
L101
All Aroclors ND
SED04
Aroclor 1254 – ND
Aroclor 1260 – ND
CULVERT
SED05
LOC-15
LOC-12b
SED06
L103
L101
LOC-12a
SED07
LOC-11
L102
LOC-10b
LOC-10a
001
SED08
002
003
SED09
SANDERS CREEK
004
LOC-9
LOC-8b
LOC-8a
LOC-7
SED04
LOC-14
L18
SED03
LOC-13
FORMER MOTEL
L103
Aroclor 1016 – 0.068
Aroclor 1254 – 1.8
Aroclor 1260 – 7.9
001
Arocor 1260 – 1.4
SED07
Aroclor 1254 – 0.405
Aroclor 1260 – 2.160
003
0–6" Aroclor 1260 – 0.27
6–12" Aroclor 1254 – 3.66
SED08
Aroclor 1254 – 1.285J
Aroclor 1260 – 8.22J
Aroclor 1260 dup – 36.90J
FORMER GAS STATION
MOTEL
MCDONALD'S
THOMPSON ROAD
TR–2B
TR–2
PARKING
LEGEND
– SEDIMENT SAMPLE
– PROPOSED SEDIMENT SAMPLE
– PROPOSED SEDIMENT MANAGEMENT UNITS (SMUs) THAT MAY REQUIRE REMEDIATION TO REMOVE PCBs FROM SEDIMENT
806464R006

5.0 IDENTIFICATION, SCREENING, EVALUATION, AND RANKING OF REMEDIES

Generally, engineering practice and experience are used to identify the corrective action technologies that appear most suited to the SWMU. The initial step in assessing a remedy is a review of the RFI results and corrective action objectives, followed by identification of technologies applicable to corrective measures for the SWMU. The selection of the corrective measures technology is based on site-, waste- and technology-specific characteristics using current literature, vendor information, USEPA's treatability databases, technology databases, guidance documents and handbooks, and experience in developing remedies for similar sites and releases.

Ongoing SPDES Study (PSWS)

Carrier is required by the Special Conditions listed in their State Pollutant Discharge Elimination System (SPDES) Permit (No.: NY 000 1163) to meet a permit limit (quantification level) of 300 ng/L per Aroclor. In preparation towards meeting this goal, Carrier is currently implementing a PCB Storm Water Quality Study (PSWS) to gather information needed to address PCB-contaminated storm water discharges into Sanders Creek. This engineering control will ultimately aid the consent order-driven goal of reducing downgradient fish tissue PCB concentrations by reducing storm water related PCB discharges.

As such, this FCMS assumes that the presumptive remedy — installing an end-of-pipe treatment system that would prevent any future PCB discharges to Sanders Creek — will be part of any remedial alternative presented below. The estimated costs associated with an end-of-pipe treatment system are summarized in Table 5-1.

Table 5-1
Estimated End-of-Pipe Treatment Costs

Work Element	Subtask	Total
	Capital/Startup Costs	
End-of-Pipe Treatment	Cost ranges depending on flowrates treated and method of treatment. Flowrates used in developing cost range from 150gpm to 5,000 gpm. Treatment options considered included particle filtration, carbon, and Mycelx.	\$450,000 — \$5,000,000
	Contingency (20% on capital costs)	\$90,000 — \$1,000,000
	Project management costs (10%)	\$55,000 — \$600,000
Total Capital / Startup Costs		**\$595,000 — \$6,600,000**
	Monitoring Costs	
Annual Sampling and O&M	Annual sediment sampling to confirm efficacy of treatment system	\$30,000 — \$40,000
	Annual O&M on end-of-pipe treatment system. Cost ranges depending on flowrates treated and method of treatment. Flowrates used in developing cost range from 150gpm to 5,000 gpm. Treatment options included particle filtration, carbon, and Mycelx.	\$20,000 — \$750,000
	Contingency (20%)	\$10,000 — \$158,000
Total Sampling and O&M		**\$60,000 — \$948,000**

Evaluation of Remedies

Based on the findings of previous studies, four corrective measures options have been evaluated using existing data, and are presented in Table 5-2 below:

Table 5-2
Potential Remedies to be Evaluated in CMS
Sanders Creek Sediments
Carrier Corporation, Thompson Road Facility, Syracuse, New York

Technology	Description
Sanders Creek Sediments	
No Action	No action is taken.
Institutional Controls & Monitoring	Controls such as deed restrictions, posting signs, erecting fences and other barriers, which may restrict use or access to contaminated area. Period monitoring of sediments and fish and wildlife to track the concentrations of PCBs and the effect of on wildlife.
In-Situ Capping	An engineering control in which an area of contamination is covered/lined to reduce biological uptake, sediment transport downstream, and direct contact with the contaminants.
Excavation/Dredging and Offsite Disposal	Contaminated material is removed and transported to permitted offsite treatment and disposal facility.

5.1 No Action

No action is not considered a viable alternative for addressing PCB-contaminated sediments in Sanders Creek because it does not meet the goal of facilitating the reduction of bio-accumulated PCBs in the tissues of fish and wildlife in Sanders Creek by: 1) preventing direct exposure to PCBs in sediments in Sanders Creek and 2) minimizing future migration of PCBs offsite (downstream).

5.2 Institutional Controls and Monitoring

The Institutional Controls and Monitoring (IC&M) corrective measure has been identified as a potential remedy because the facility is required by the Special Conditions listed in their State Pollutant Discharge Elimination System (SPDES) Permit (No.: NY 000 1163) to meet a permit limit (quantification level) of 300 ng/L per Aroclor. This engineering control along with traditional institutional controls such as signs, fencing and deed restrictions, have allowed IC&M to be included for consideration as a potential remedy. Tables 5-3a and 5-3b present a description of the remedy against specific CMS criteria and an estimate of costs associated with implementing institutional controls.

Table 5-3a
Evaluation of IC&M Against CMS Criteria

Primary Criterion	Description and Evaluation
(1) Protection of human health and the environment	• Through institutional/site access controls to minimize exposure and the future use of engineering controls to minimize continued contamination, risks to human health and the environment are reduced. • IC&M does not immediately protect the fish and wildlife in and around Sanders Creek, nor does it prevent the down-stream migration of contaminated sediments. • IC&M cannot immediately work toward the stated goal of reducing fish tissue PCB concentrations.
(2) Attainment of cleanup standards	• IC&M may meet this criterion. However, established fish tissue concentrations (upgradient of the Carrier facility) will first need to be documented (through sampling & analysis program). This program will be followed continued sampling that will show whether PCBs in fish tissue have decreased over time. • IC&M may take longer to achieve this goal than other remedial alternatives.
(3) Source control	• The assumed source of contamination to Sanders Creek is being addressed via end-of-pipe treatment of storm water discharges is planned for mid-year 2010. This planned treatment system, the evaluation of which is being performed under Carrier’s SPDES permit, will minimize/eliminate any future discharges of PCBs to Sanders Creek. • Creek sediments as a source of PCB migration would not be addressed under the IC&M option.

Table 5-3a
Evaluation of IC&M Against CMS Criteria

(4) Compliance with applicable waste management standards	• The sediments and/or treatment media collected and used during the end-of pipe storm water treatment process would be disposed of with all waste management standards. • There would be no waste management issues dealing directly with the sediments in Sanders Creek, as they will remain undisturbed.
Secondary Criterion	**Description and Evaluation**
(1) Long-term reliability and effectiveness	• IC&M is not expected to reliably control the continuation of contaminant mass migration. Sediment and wildlife monitoring must be continued to confirm efficacy of engineering and natural processes.
(2) Reduction in waste toxicity, mobility, or volume	• IC&M would not reduce waste toxicity, mobility, or volume in the creek, but may prevent an increase in concentrations with the use of engineering controls.
(3) Short-term effectiveness	• IC&M is not expected to immediately control the continuation of PCB uptake by fish and wildlife in the Sanders Creek ecosystem. • Sediment and wildlife monitoring must be continued to confirm efficacy of engineering and natural processes.
(4) Implementability	• IC&M is easily implemented.
(5) Cost	• Costs associated with IC&M are low and are presented in Table 5-3b below.

IC&M Estimated Costs

Generally, traditional IC&M costs are moderate, largely using site access controls and informational devices. The costs for the engineering control component that would potentially be part of this remedy has been presented in Table 5-1 above.

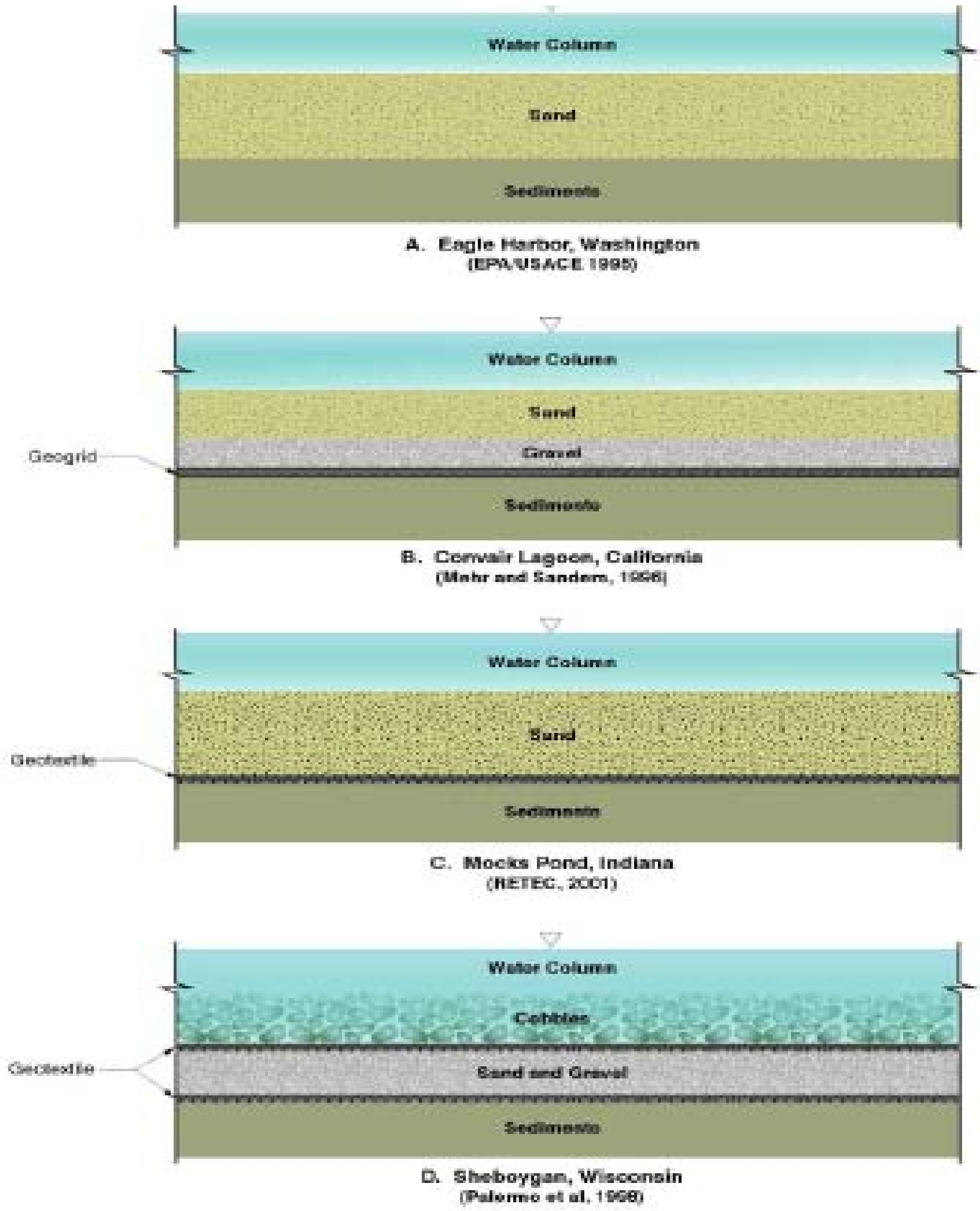
Table 5-3b
Estimated IC&M Costs

Work Element	Subtask	Total
	Capital/Startup Costs	
Site access controls	Fences, gates, signs, etc. along designated SMUs, on both sides of Sanders Creek.	\$15,000 — \$30,000
Informational devices	Deed restrictions, ground water use restrictions, etc.	\$15,000 — \$20,000
	Contingency (20% on capital costs)	\$6,000 — \$10,000
	Project management costs (10%)	\$3,600 — \$6,000
Total Capital / Startup Costs		**\$39,600 — \$66,000**
	Monitoring Costs	
Annual Sampling and O&M	Annual sampling & reporting of fish and other wildlife in Sanders Creek	\$15,000 — \$30,000
	Contingency (20%)	\$3,000 — \$6,000
Total Sampling and O&M		**\$18,000 — \$36,000**

IC&M is not considered a viable alternative for addressing PCB-contaminated sediments in Sanders Creek because it does not meet the goal of facilitating the reduction of bio-accumulated PCBs in the tissues of fish and wildlife in Sanders Creek by: 1) preventing direct exposure to PCBs in sediments in Sanders Creek and 2) minimizing future migration of PCBs offsite (downstream).

5.3 In-Situ Capping

ISC has been identified as a remedy for consideration within Sanders Creek. In-situ capping (ISC) is defined as the placement of an engineered subaqueous cover, or cap, of clean isolating material over an in-situ deposit of contaminated sediment. Capping of subaqueous contaminated sediments is an accepted engineering option for managing dredged materials and for in-situ remediation of contaminated sediments (USACE 1998). ISCs are generally constructed using granular material, such as clean sediment, sand or gravel, but cap designs can include geotextiles, liners, and multiple layers. Such engineered caps are also called isolation caps. Below are some examples of traditional ISC designs using natural materials (WDNR/EPA, 2002).



The National Research Council (NRC) has provided general guidance on where conditions would be favorable, or not favorable, for the consideration of ISC. Table 5-4 summarizes these general conditions and whether these conditions are present at Sanders Creek (WDNR/EPA, 2002).

Table 5-4
Site Conditions that are Favorable/Unfavorable for ISC

Conditions Favorable for ISC	Present at Sanders Creek	Conditions Which May Rule Out ISC	
• Contaminant sources have been sufficiently abated to prevent re-contamination of the cap	False	• Contaminant sources have not been sufficiently abated to prevent re-contamination of the cap	True
• Contaminants are of moderate to low toxicity and mobility	True	• Unacceptable risk of catastrophic failure due to wave events, flood events, ice scour, slope failure or seismic events	True
• Monitored natural recover is too slow to meet goals in a reasonable time frame	True	• Contaminant mobility and transport conditions cannot be effectively controlled by a designed cap (e.g. some combination of high contaminant concentrations, presence of non-aqueous phase liquids, and advective groundwater flow conditions)	True
• Cost and/or environmental effects of removal are very high	False	• Public use of groundwater, if surface water recharges a shallow aquifer underneath the contaminated sediment	False
• Suitable types and quantities of cap materials are available	True	• Unacceptable short-term risk posed by placement of the cap.	False
• Hydrologic conditions will not compromise the cap	False	• Presence of infrastructure, such as piers, bridges, or pipelines that is incompatible with a permanent cap.	False
• Weight of the cap can be supported by the original bed	unknown	• Cap is incompatible with water body uses such as navigation, flood control, or recreation.	False
• Cap is compatible with current and/or future waterway uses	True		
• Site conditions are not favorable for complete removal of contaminated sediment	False		

Another ISC considered is AquaBlok®, a clay polymer composite that is designed to swell and form a continuous and highly impermeable isolation barrier between contaminated sediments and the overlying water column (EPA SITE, 2007). AquaBlok® is typically used in shallow environments making it a good capping alternative for the Sanders Creek SMUs. AquaBlok® was evaluated under the USEPA Superfund Innovative Technology Evaluation (SITE) program over a 3-year period on PCB-containing sediments and overall, was found to be highly stable and generally more effective at controlling contaminant flux than traditional sand capping materials.

As with traditional capping materials, the operability of AquaBlok® at a sediment site may be affected by the following factors (EPA SITE, 2007):

- Hydrology (including depth of surface water, groundwater discharge and recharge characteristics, and/or local flow velocities and shear stresses)
- Physical and geochemical properties of the surface water
- Physical, geotechnical, and ecological properties of the contaminated sediment site
- Ecological properties of the contaminated sediment site
- Nature, distribution and magnitude of contamination
- Climatic conditions
- Site characteristics and land use features
- Remediation goals
- Short- and long-term monitoring requirements

As discussed in Section 4.2, only SMUs 9 through 11 and 15 would be capped under this scenario because these are the sediment locations that contribute the majority of the PCB mass (see Figure 4-1). Table 5-5 presents a description of the remedy against specific CMS criteria.

Table 5-5
Evaluation of ISC Against CMS Criteria

Primary Criterion	Description and Evaluation
(1) Protection of human health and the environment	• ISC will immediately isolate PCB-contaminated sediments from Sanders Creek ecosystems. Along with the future use of engineering controls (i.e. end-of-pipe treatment) to minimize continued contamination, risks to human health and the environment are reduced, and potentially eliminated. • There are immediate benefits to ecosystems in terms of PCB uptake, though some damage to existing ecosystems may occur as collateral damage during capping activities. • ISC reduces and/or prevents the down-stream migration of contaminated sediments.
(2) Attainment of cleanup standards	• While a cleanup standard is not the goal for this CMS, the mass of PCBs in sediments is expected to be significantly reduced, which will subsequently reduce downgradient tissue concentrations over time.
(3) Source control	• The assumed source of contamination to Sanders Creek is being addressed via end-of-pipe treatment of storm water discharges is planned for mid-year 2010. This planned treatment system, the evaluation of which is being performed under Carrier's SPDES permit, will minimize/eliminate any future discharges of PCBs to Sanders Creek. • Creek sediments as a source of PCB migration will be isolated as part of the dredging option. • Scouring during high flow events could reduce effectiveness of ISC
(4) Compliance with applicable waste management standards	• No disposal site or ex-situ treatment for dredged sediment is needed. However, removal of creek debris (rocks, tree limbs, trash) would create a separate waste stream that would have to be handled/disposed of in accordance with appropriate regulations.
Secondary Criterion	**Description and Evaluation**
(1) Long-term reliability and effectiveness	• A well-designed, properly constructed and placed cap along with effective long-term monitoring and maintenance can prevent bioaccumulation by providing long-term isolation of bottom-dwelling organisms from the contaminated sediments, and the prevention of contaminated sediments into the surface water. • ISC effectiveness as a long-term remedy may be diminished as scouring during high-flow events and groundwater infiltration occur over time. • ISC may change the existing hydrodynamic conditions of Sanders Creek and flow-carrying capacity may be altered. • Ice-related damage through freeze-thaw cycles may lead to ice lenses, blistering or from penetration may present significant impacts on the cap performance.
(2) Reduction in waste toxicity, mobility, or volume	• ISC will not reduce waste toxicity or volume of contaminated sediments, but will reduce mobility by isolating them and minimizing exposure to the Sanders Creek ecosystems. • Contaminated sediments are isolated by the cap in-place and do not require removal.

Table 5-5
Evaluation of ISC Against CMS Criteria

(3) Short-term effectiveness	• ISC would provide immediate isolation of contaminated sediments from the Sanders Creek ecosystems • Risks to the public and site workers are negligible in application of this alternative.
(4) Implementability	• ISC is a remediation technology that has been used effectively for many years and is easily implemented.
(5) Cost	• The short-term costs associated with ISC are moderate, but the long-term costs associated with operations and maintenance of the cap in perpetuity are high, as presented below.

ISC Estimated Costs

Because the Sanders Creek site presents specific performance criteria (freeze-thaw cycles in Sanders Creek and advective flow of groundwater) that make using ISC unadvisable, a fully-developed cost estimate was not prepared. However, for comparison purposes, general ranges of costs for ISC using traditional capping materials and/or AquaBlok® are presented below.

- ISC costs using traditional capping materials are largely dependent on the thickness of the cap, cost of capping materials, and associated transportation and placement costs. Monitoring costs can be significant when long-term needs are considered. Local and state government requirements can have a significant impact on these costs. In WDNR/EPA, 2002, construction costs at four sites ranged from $100K to $290K per acre, with the higher end cost per acre including elevation changes to create new habitats. Monitoring costs ranged from $125K/year to $250K/year.

- The estimated costs for a full-scale application using AquaBlok® was not independently verified by the SITE program discussed above. Rather, the costs presented in the report were submitted by AquaBlok, Ltd.

  Site specific factors affecting cost include project location and accessibility, which can impact project costs as a result of shipping and packaging costs; project size, which influences the per-acre cost; the relative thickness of the AquaBlok® layer and its use in isolation or in a composite cap; performance criteria; and other regulatory constraints.

  The SITE report provides a cost detail for a typical AquaBlok® capping project, with the ISC comprising a 10-acre AquaBlok® cap with sand cover. The total estimated cost is approximately $2 million ($200K/acre).

The Sanders Creek project remediation area, based on the four identified SMUs, would be roughly 2 acres. Because the project area would not be comprised of a single contiguous area, but rather two to four separate areas, the equipment mobilization/demobilization, support equipment, and construction laydown areas would drive the per-acre cost up. Based on the information from the WDNR/EPA and SITE reports and other factors presented in this section, the cost to place and in-situ cap using traditional materials or AquaBlok® is roughly $200,000 to $400,000.

The costs for the engineering control component that would potentially be part of this remedy has been presented in Table 5-1 above.

While ISC would meet the goal of facilitating the reduction of bio-accumulated PCBs in the tissues of fish and wildlife in Sanders Creek by: 1) preventing direct exposure to PCBs in sediments in Sanders Creek and 2) minimizing future migration of PCBs offsite (downstream), the Sanders Creek site presents specific performance criteria that make using ISC unadvisable.

5.4 Sediment Removal (Dredging)

Dredging is an excavation activity or operation usually carried out at least partly underwater, in shallow seas or fresh water areas with the purpose of gathering up bottom sediments and disposing of them at a different location. Dredging can produce materials for land reclamation or other purposes (usually construction-related); however, the sediment that will be removed from Sanders Creek contain PCBs, thus making them unsuitable for land reclamation uses. Dredging can create disturbance in aquatic ecosystems, often with adverse impacts, unless stream conditions are adequately monitored, both during and after construction activities (USACE 1983).

Dredging can create disturbance to aquatic ecosystems, often with adverse impacts unless stream conditions are adequately monitored, both during and after construction activities. The sediments proposed for removal from Sanders Creek may contain high levels of PCBs — and the process of dredging often dislodges chemicals residing in benthic substrates and injects them into the water column. Other potential concerns related to dredging contaminated sediments include:

- Release of PCBs from bottom sediments into the water column resulting in the secondary effects from water column contamination of uptake of PCBs, via food chain uptake and subsequent concentrations in higher organisms including humans.

- Short term increases in turbidity, which can affect aquatic species metabolism and interfere with spawning.

- Tertiary impacts to avifauna which may prey upon contaminated aquatic organisms

- Secondary impacts to aquatic and benthic organisms' metabolism and mortality

However, with proper site and construction management, the above-mentioned impacts can be minimized while successfully removing contaminated sediments from the creek. Impacts can be minimized by:

- Confining work areas and laydown areas to the smallest extent practical

- Identifying impacts to aquatic systems before, during and after dredging operations

- Identifying suitable climatic windows for dredging operations (i.e during the drier summer months, as supported by data obtained from flow devices in Sanders Creek during the period from December 2007 through August 2008 — available on request)

- Complying with measures required by local, state and federal agencies

There are several methods that can be used to remove sediments from Sanders Creek consisting of various suction and mechanical dredging techniques. Because the size of the area to be remediated is relatively small (less than 1000 linear feet) and shallow both in terms of water depth and sediment depth), one of two dredging techniques will be used:

- A small-scale suction dredge, perhaps with a cutting tool on the end of the suction device, can be extended into the creek to remove the sediments. The dredged sediment is usually sucked up by a wear resistant centrifugal pump and discharged through a pipe to holding container. The cutter can be used for hard surface materials like gravel that may underlay the sediments.

- A mechanical dredge technique in the form of a backhoe can be used to dig and scrape sediments from the creek bottom and load them into a roll-off on the stream bank. The bucket of a backhoe can also loosen the earth in the creek for maximum sediment removal from these areas. The sediments would then be loaded into roll-off or other container suitable for temporarily storing water-laded sediments.

In both cases, the dredging equipment along with other support equipment will be mobilized to the project area(s), with the heavier portion of the equipment remaining on the stream bank.

Table 5-6a presents a description of the remedy against specific CMS criteria.

Table 5-6a
Evaluation of Sediment Removal (Dredging) in Sanders Creek Against CMS Criteria

Primary Criterion	Description and Evaluation
(1) Protection of human health and the environment	• By removing contaminated sediments and minimizing exposure and the future use of engineering controls to minimize continued contamination, risks to human health and the environment are reduced, and potentially eliminated. • There are immediate benefits to ecosystems in terms of PCB uptake, though some damage to existing ecosystems may occur as collateral damage during dredging activities. • Dredging also reduces and/or prevents the down-stream migration of contaminated sediments.
(2) Attainment of cleanup standards	• While a cleanup standard is not the goal for this CMS, the mass of PCBs in sediments is expected to be significantly reduced, which will subsequently reduce downgradient tissue concentrations over time.
(3) Source control	• The assumed source of contamination to Sanders Creek is being addressed via end-of-pipe treatment of storm water discharges is planned for mid-year 2010. This planned treatment system, the evaluation of which is being performed under Carrier's SPDES permit, will minimize/eliminate any future discharges of PCBs to Sanders Creek. • Creek sediments as a source of PCB migration will be removed as part of the dredging option.
(4) Compliance with applicable waste management standards	• The sediments and/or treatment media collected and used during the treatment process would be disposed of in accordance with all waste management standards.
Secondary Criterion	**Description and Evaluation**
(1) Long-term reliability and effectiveness	• Dredging creek sediments is expected to reliably control the continuation of contaminant mass migration. Sediment and wildlife monitoring must be continued to confirm efficacy of engineering and natural processes.
(2) Reduction in waste toxicity, mobility, or volume	• Dredging contaminated sediments will reduce waste toxicity, mobility, or volume by removing them from the environment.
(3) Short-term effectiveness	• Risks to the public and site workers are negligible in application of this alternative. • PCB-contaminated sediments would be immediately removed from affected areas.
(4) Implementability	• Dredging is a remediation technology that has been used effectively for many years. While it can sometimes be complicated to implement, the management issues related to its success have been thoroughly practiced.
(5) Cost	• Costs associated with continued monitoring and engineering controls are moderate, and are presented in Table 5-6b below.

Sediment Removal (Dredging) Estimated Costs

Field measurements and computations have been made to determine the location, characteristics, and quantities of material to be removed. Only SMUs 9 through 11 and 15 would be capped under this scenario because these are the sediment locations that contribute the majority of the PCB mass. Table 5-6b presents the estimated costs for dredging contaminated PCBs from these areas. As with ISC, because the project area would not be comprised of a single contiguous area, but rather two to four separate areas, the equipment mobilization/demobilization, support equipment, and construction laydown areas would drive the per-acre cost up. Disposal costs of PCB-contaminated water and sediment can be a proportionally large factor contributing to the overall cost of this remedy.

The costs for the engineering control component that would potentially be part of this remedy has been presented in Table 5-1 above.

Table 5-6b
Estimated Sediment Removal (Dredging) Costs

Work Element	Subtask	Total
	Capital/Startup Costs	
Permitting Management	Preparation of permits, permit reviews, access agreements	$15,000 — $30,000
Informational devices	Preparation of work plans, bid documents, contract management	$50,000 — $100,000
Site Work/Dredging	Preconstruction meetings, multiple mob/demob, equipment rental, stream diversion, dewatering sediments, staging sediments, transportation/disposal costs, erosion control measures during construction, water monitoring during fieldwork	$350,000 — $700,000
	Contingency (20% on capital costs)	$83,000 — $166,000
	Project management costs, sediment removal report	$60,000 — $120,000
Total Capital / Startup Costs		**$558,000 — $1,116,000**
	Monitoring Costs	
Post construction O&M	Visual inspections, sediment and water monitoring, annual reporting, erosion control maintenance	$20,000 — $40,000
Sampling and O&M	Semi-annual sampling & reporting of fish and other wildlife in Sanders Creek	$40,000 — $80,000
	Contingency (20%)	$11,000 — $22,000
Total Sampling and O&M		**$66,000 — $132,000**

Sediment removal is an easily implemented, cost-effective corrective measure for Sanders Creek PCBs that will meet the goal of facilitating the reduction of bio-accumulated PCBs in the tissues of fish and wildlife in Sanders Creek.

5.5 Recommended Corrective Measure

Four corrective measures alternatives (no further action, institutional controls and monitoring, in-situ capping, and sediment removal) have been evaluated to address PCB-contaminated sediments in Sanders Creek. The alternatives were evaluated based on accepted primary and secondary CMS criteria.

The first to alternatives considered — no further action and institutional controls and monitoring — were removed from consideration because they did not meet the stated goal of facilitating the reduction of bio-accumulated PCBs in the tissues of fish and wildlife in Sanders Creek. While ISC would meet CMS goals the Sanders Creek site presents specific performance criteria that make using ISC unadvisable.

Sediment removal (dredging) has been selected as the preferred corrective measure because:

- the measure will meet the goal of facilitating the reduction of bio-accumulated PCBs in the tissues of fish and wildlife in Sanders Creek

- the measure satisfies the CMS primary and secondary criteria

- the measure is easily implemented

- the measure is cost-effective

6.0 PUBLIC INVOLVEMENT PLAN

The following Public Involvement Plan (PIP) is included as part of this report in accordance with the EPA's guidance on RCRA CMS. Under RCRA, no interaction is required with the community during the CMS process. It is assumed that the same requirements hold for this focused CMS. Public input is required to be solicited only at the beginning of the permitting process, or during certain permit modifications.

Statement of Basis Public Involvement Plan

Upon completion of the focused CMS, when the preferred alternative has been proposed, the following activities are required <u>if a modification to the RCRA permit is required</u>. Since a permit modification is not necessary, Carrier may choose to implement all, some, or none of the following actions, depending on the level of public interest or concern:

- A Statement of Basis will be prepared, explaining the proposed remedy and the method by which it was chosen. The Statement of Basis acts as a summary of the focused CMS.

- A 45-day comment period will be provided to allow community members the opportunity to review and comment on the proposed alternative. The comment period may be as short as 30 days in cases where no permit modification is necessary, but a public comment period is warranted.

- Availability of the comment period and Statement of Basis will be announced in a public notice.

- The community will be provided an update on the proposed remedy through the informal and publicized meetings.

7.0 REFERENCES

EnSafe Inc., September 2006, Sanders Creek Sediment and Fish Sampling Work Plan, Rev No.: 1.

EnSafe Inc., April 2007, Sanders Creek Sediment and Fish Sampling Report, Rev No.: 0.

Peck, R. B., W. E. Hanson, T. H. Thornburn. *Foundation Engineering*. 2nd Ed. John Wiley & Sons, Inc. 1974. (Peck et al. 1974)

New York State Department of Environment and Conservation (NYSDEC) correspondence dated May 23, 2008, related to the requirements outlined in the NYSDEC Corrective Action Order

NYSDEC Corrective Action Order - Index Consent Order CO 7-20051118-4 (order) dated February 13, 2006.

NYSDEC, 1999, Technical Guidance for Screening Contaminated Sediments.

TAMS and YEC Inc. 2002. *Onondaga Lake Baseline Ecological Risk Assessment*. Original document prepared by Exponent, Bellevue, Washington, for Honeywell, East Syracuse, New York. Revision prepared by TAMS, New York, New York and YEC, Valley Cottage, New York, for New York.

TAMS Consulting. *Hudson River Reassessment RI/FS Phase 3 Report: Feasibility Study* (TAMS 2000)

U.S. Army Corps of Engineers, *Dredging and Dredged Material Disposal.* Engineer Manual 1110-2-5025. March 25, 1983. (USACE 1983).

U.S. Corps of Engineers, Buffalo District. *Outline of Findings and Data Gaps: Preparation of a Comprehensive Habitat Restoration Plan for the Onondaga Lake Watershed*. Contract Number: DACW49-01-D-0003, Delivery Order: 0006. September, 2003. (USACE 2003).

U.S. Environmental Protection Agency (USEPA), Onondaga Lake, Downloaded 2007 at URL http://www.epa.gov/region02/water/lakes/onondaga.htm (USEPA 2007)

USEPA. *National Remedy Review Board Recommendations for the Lake Bottom Sub Site of the Onondaga Lake Superfund Site.* Letter from the USEPA Region 2 Emergency and Remedial Response Division to the National Remedy Review Board. March 25, 2005. http://www.epa.gov/superfund/programs/nrrb/pdfs/ononresp.pdf (USEPA 2005)

USEPA. *Demonstration of the AquaBlok Sediment Capping Technology. Innovative Technology Report*. EPA/540-07/008. September 2007. (SITE 2007).

U.S. Fish and Wildlife Service. *Natural Resource Damages Preassessment Screen for Onondaga Lake Onondaga County*, New York. November 2005. (USFWS 2005)

Wisconsin Department of Natural Resources and the USEPA under contract to M. Palermo, T. Thompson, and F. Swed. *White Paper No. 6B – In-Situ Capping as a Remedy Component for the Lower Fox River.* December 2002. (WDNR/USEPA 2002)

Yager, Richard M. William M. Kappel, and L. Niel Plummer. *Halite Brine in the Onondaga Trough near Syracuse, New York: Characterization and Simulation of Variable-Density Flow*. U.S. Geological Survey Scientific Investigations Report 2007-5058. 2007.