Fox River Environmental Dredging Project

Design and Quality Assurance

The Design Engineer's Perspective

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WEDA XXI

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Background

Dredge utilized at Deposit N.

- PCBs in seven mile reach – DePere Dam to Green Bay
- Deposit N Demonstration – 1996 by WIDNR-Fox River Group
- SMU 56/57 Demonstration – 1998 by WIDNR –Fox River Group

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SMU 56/57 Demo -Goals

- Evaluate the potential impact of large scale dredging of PCBs
- Evaluate efficacy of large scale dewatering and land disposal
- Evaluate potential costs of large scale remediation

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SMU 57/57 Demo - Results

- Hydraulic cutter head dredge, passive / mechanical dewatering / landfill
- 31,000 cy of targeted 90,000 cy removed
- Low percent solids
- Dredging operator experience and control
- Deposits of high concentrations of PCBs left exposed

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SMU 57/57 Full Scale Project – Negotiated Basis for Design

56/57-2000 on the Fox River

- AOC between Ft James Paper / USEPA / WIDNR
- Established target removal depths, removal volumes and acceptable residual concentrations
- Established criteria for release from liability

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Key Design Elements

September 6, 2000 air photo of 56/57 river operations

- Additional geotechnical characterization
- Realistic dredge prism
- Eliminated passive settling ponds
- Post dredging verification sampling of sediment “not fluff”
- Provided for cover over dredged area

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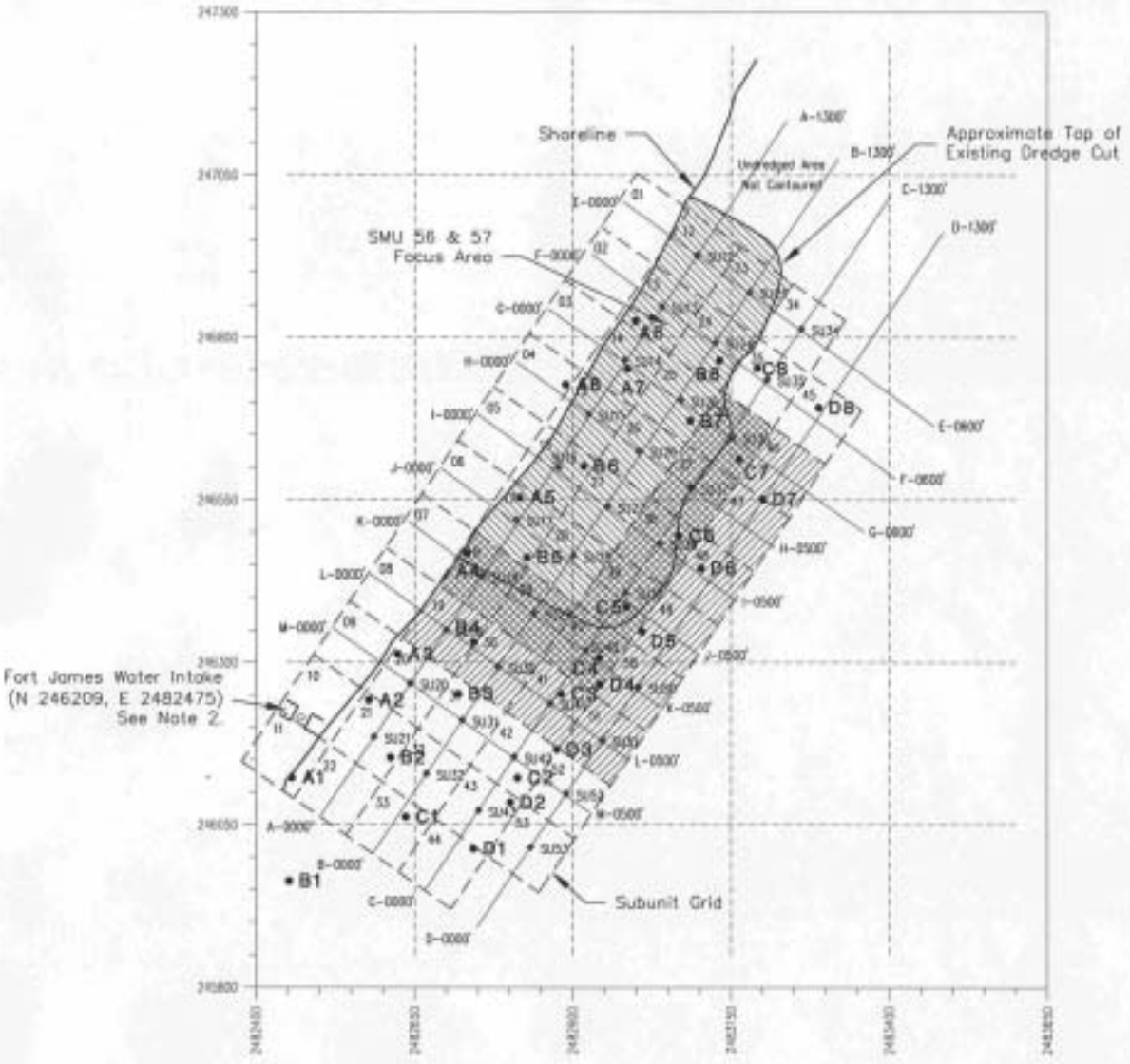
Proposed Phased Dredging Plan



NOTE:
1. Horizontal datum based on Wisconsin state plane coordinate system, Central Zone, NAD83. Vertical datum based on Mean Sea Level, NGVD 29.

2. Water intake coordinates were originally obtained based on the NAD 27 datum (N 246210.18, E 2514017.33) and were converted to NAD 83 as shown on the drawing.

SU	Target Elevation in Feet (NGVD 29)
12	565
13	565
14	562
15	562
16	562
17	563
18	563
19	562
23	565
24	565
25	564
26	563
27	564
28	563
29	562
30	563
36	565
37	565
38	565
39	563
40	560
41	556
46	565
47	565
48	565
49	565
50	556
51	556

NOTES:
1. Overdredge not included.

2. The actual dredge plan elevations and the calculated volume to be removed are governed by the cross sections given in the Work Plan/Design Memorandum.

Phase I Dredging

Phase II Dredging

Partial Dredging During Phase I

N

0 200 400

Scale in Feet

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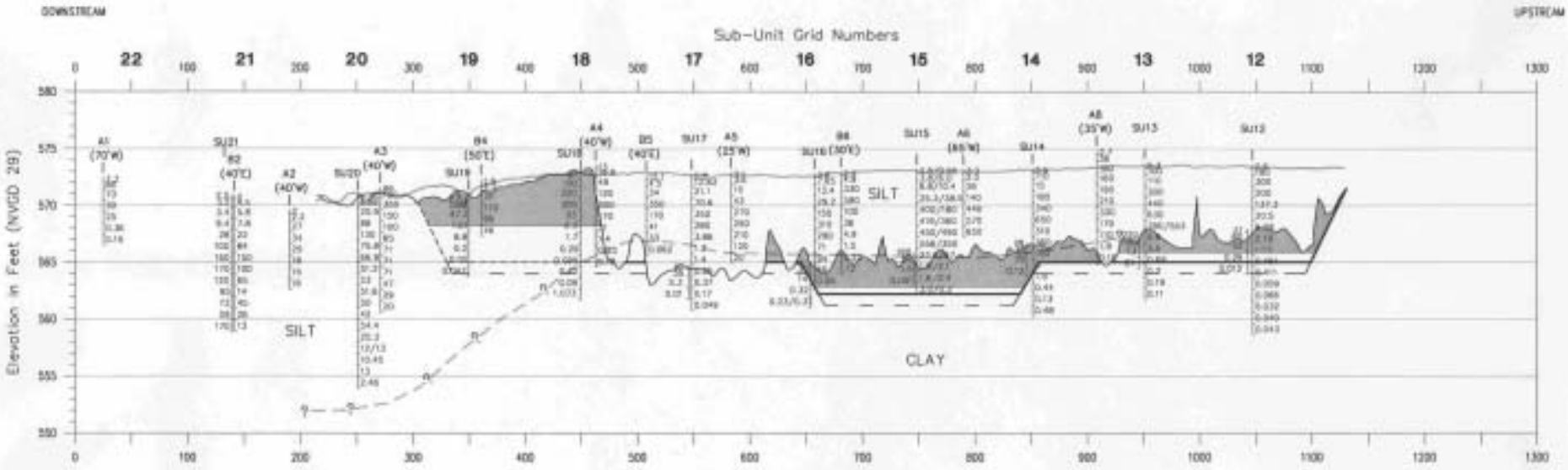
Figure 2

Cross Section A-A'



- — — — — 1 Foot Overdredge Allowance
- ——— Proposed Phase I Dredging
- ---------- Proposed Phase II Dredging
- ——— 08/23/99 ACOE Pre-Dredging Survey
- ——— 12/20/99 Superior Post-Dredging Survey
- – – – – – Interpreted Interface Between Silt, Clay, or Sand
- Greater than 50ppm Total PCB Concentration

A1 (70'W) — Exploration Identification; Offset Distance and Direction

Exploration Log of Total PCB Concentration

Horizontal Scale in Feet
0 100 200
0 10 20
Vertical Scale in Feet
Vertical Exaggeration x 10

Notes:

The data shown was obtained from Vibracores that were driven until refusal. Therefore the bottom elevation of the core data is representative of the depth of refusal.

Pre-Dredging Survey data collected by the A.C.O.E. and obtained by Superior from Montgomery Watson. Survey data were collected using a single beam sonar system on 08/23/99. Survey data were collected in the State Plane NAD83 coordinate system. The A.C.O.E. survey depths were referenced to IGLD 55 datum (water surface elevation = 576.8'); thus, the depths were converted to vertical datum based on Mean Sea Level (MSL), NGVD29 by adding 1.24'.

Post-Dredging Survey data collected by Superior Special Services – Hydrographic Survey Team. Survey data were collected using a multibeam sonar system on 12/20/99. The multibeam system utilizes DGPS and corrects for heave, pitch, roll, latency, heading, sound velocity, and datum/tide fluctuations in real time. Data were collected in the State Plane NAD83 coordinate system and depths were collected in the vertical datum based on MSL, NGVD29 and the Fort James intake staff gage.

Proposed Phase I and Phase II Dredging Cuts are based on interpolation of chemistry data from pre-dredging and/or post-dredging explorations presented in the following:

1. Basis of Design Report, by Montgomery Watson (May 1998)

2. Effectiveness of Proposed Options for Additional Work at SMU 56/57, by Blasland, Bouck, and Lee, for Fox River Group (March 2000).

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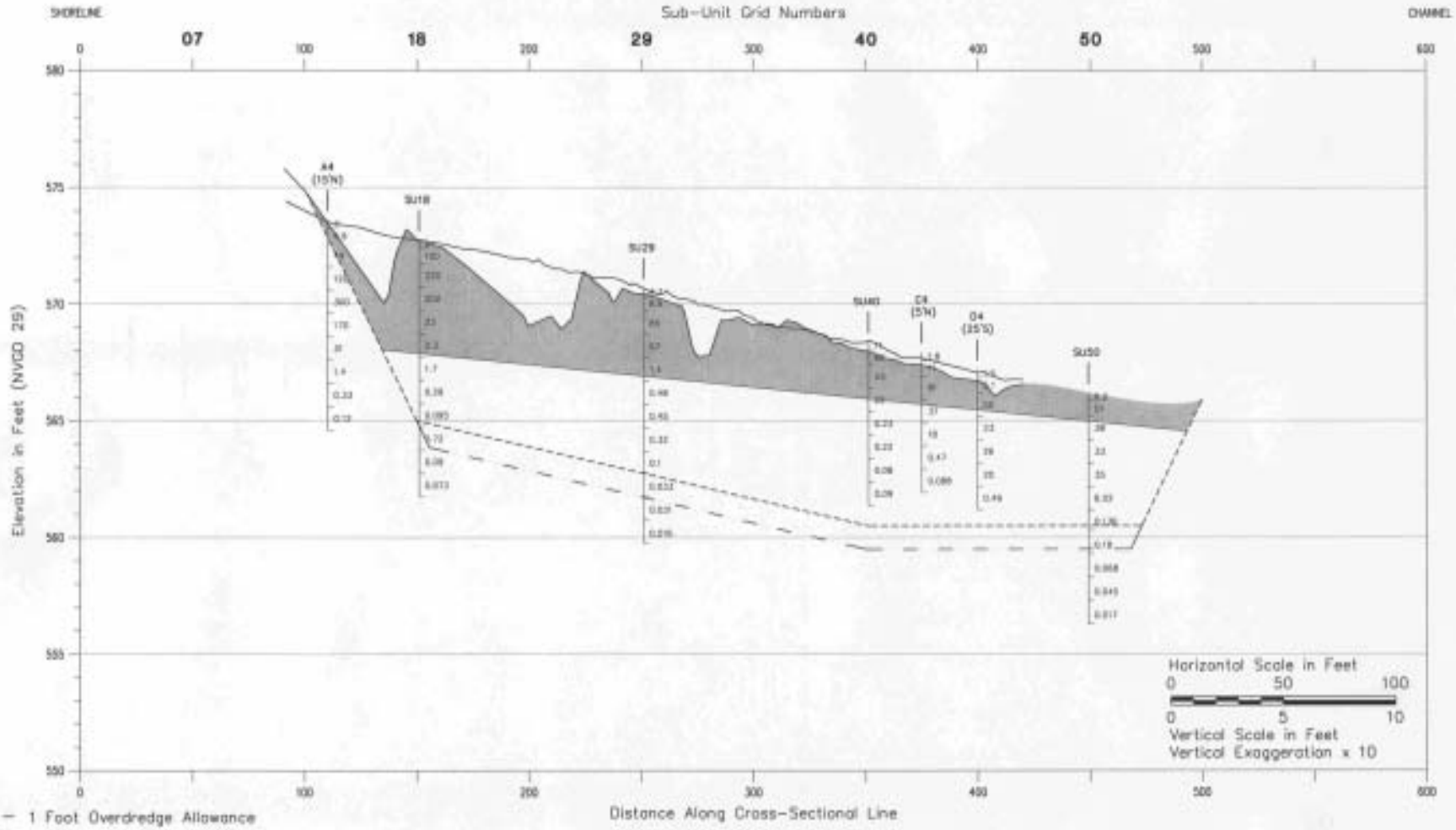
Figure 3

Cross Section K-K'



1 Foot Overdredge Allowance

Proposed Phase I Dredging

Proposed Phase II Dredging

08/23/99 ACOE Pre-Dredging Survey

12/20/99 Superior Post-Dredging Survey

Interpreted Interface Between Silt, Clay or Sand

Greater than 50ppm Total PCB Concentration

D6 Exploration Identification

(25' W) Offset Distance and Direction

Exploration Log of Total PCB Concentration

Notes:
The data shown was obtained from Vibracores that were driven until refusal. Therefore the bottom elevation of the core data is representative of the depth of refusal.

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Figure 13

Conceptual Design Post Dredging Bathymetry and PCB Concentrations

NOTES:

1) Figure was developed to show various concentrations of total PCB on exposed surfaces of proposed dredge prism. The colors are shown to represent general trends in PCB concentrations. Minor fluctuations in concentrations were disregarded. The prism bathymetry shown does not include overdredge allowances.

2) Proposed Phase I and Phase II Dredging Cuts are based on interpolation of chemistry data from pre-dredging and/or post-dredging explorations presented in the following:

A. Basis of Design Report, by Montgomery Watson (May 1998)

B. Effectiveness of Proposed Options for Additional Work at SMU 56/57, by BB&L, for Fox River Group (March 2000).

N

PCB Concentrations (ppm)

- 0 -1
- 1 - 10
- 10 - 50
- 50 - 100
- 100+

△ Indicates Spot Concentration Greater than 500ppm

0 100 200

Scale in Feet

bts 06/14/00 1=1 (xref)NA/color.pc2
48750501

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Figure 16B

Remediation Goals

Dredging Underway in Section 1 of SMU 56/57.

- Up to 50,000 CY to be removed from 30 subunits
- Target removal varied from 2-10 feet
- Residual PCB < 1 PPM = release from liability
- Residual PCB 1-10 PPM w/ cover = release from liability
- Downstream turbidity </= upstream
- SAP for sampling sediment not “fluff”

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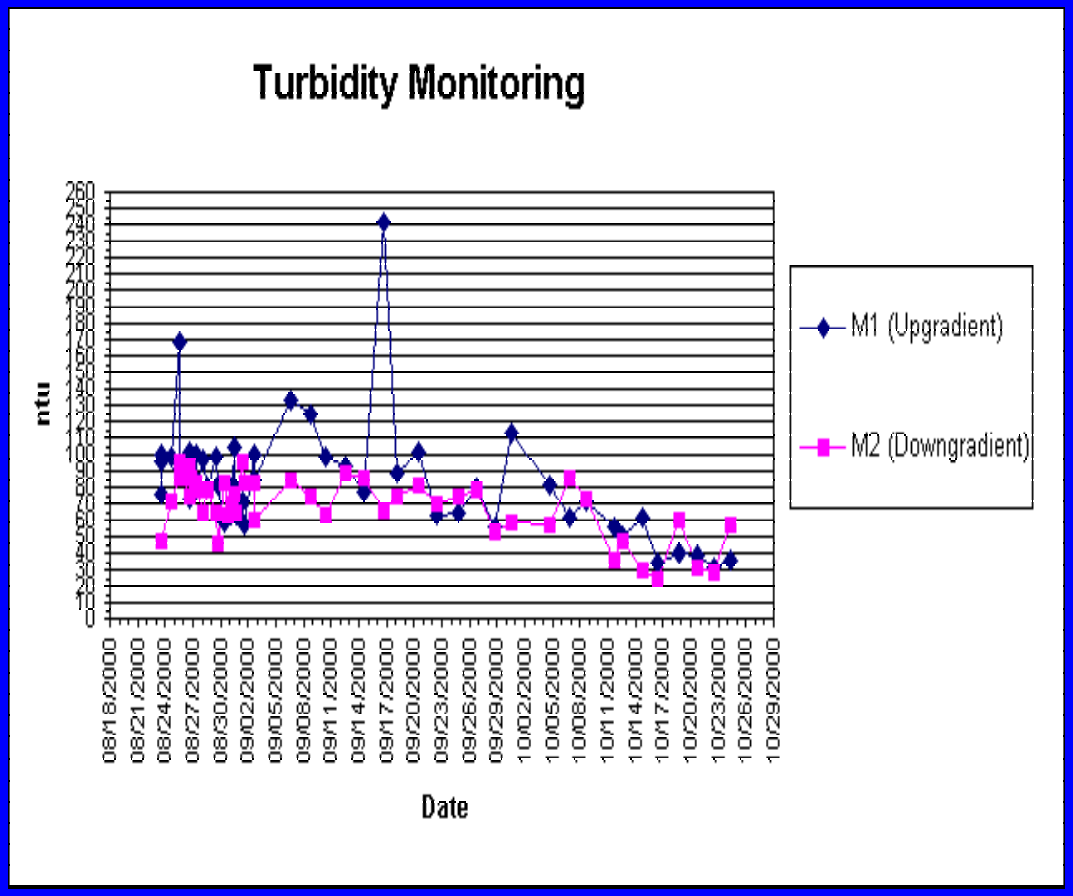
SMU 56/57 Full Scale - Results



- 28 of 30 subunits dredged to cleanup objectives
  - 11<1PPM
  - 17<10 PPM
- All cells w/ sand cover
- 51,600 CY removed
- Few turbidity values above upstream background

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Removal Cost

- SMU 56/57 Demo
  - 31,346 CY @ $286/CY
  - 1,441# @ $6,223 / #
- SMU 56/57 Full Scale
  - 50,316 CY @ $296 CY
  - 670# @ $22,243/#
- Total
  - 81662 CY @ $292/CY
  - 2,111# PCB @ $11,308 / #
- If non-TOSCA <$200/CY and <$8,000/# PCB

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Conclusions

EPA Personnel measuring turbidity in the river.

- Large scale hot spot dredging is practical
- A key is the desire to succeed among the regulators, PRPs and engineer /contractor
- Clear, measurable goals are critical
- Need accurate design data and experienced operators
- Separation of TSCA vs non TSCA could have reduced costs

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