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Delivery Order No. 01

March 2005

Final Work Plan

Centredale Manor Current Velocity/Stage Height Data Collection Activities

**Centredale Manor Restoration
Project Superfund Site
North Providence, Rhode Island**

**Final Work Plan
Task RI-10B – Sediment Stability Evaluation Phase Two
Current Velocity/Stage Height Data Collection Activities
Centredale Manor Restoration Project (CMRP) Superfund Site**

Prepared for:

U.S. Army Corps of Engineers, New England District

March 2005

Prepared by:

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INTRODUCTION

This work plan is based on the scope of work provided by the U.S. Army Corps of Engineers (COE) dated October 15, 2004. This work will be performed under Task Order No. 01 for Contract No. DACW33-01-D-0004, *Centredale Manor Restoration Project Superfund Site*. Sampling will be conducted at the Centredale Manor Restoration Project (CMRP) site in North Providence, Rhode Island. Current velocity and stage height data will be collected from Lyman Mill and Allendale Ponds under moderate to high flow conditions during a one-day (12 hours or as limited by daylight) sampling event. The data will be used to calibrate and update the hydrodynamic model and will be incorporated into the Phase 2 Sediment Stability Study. The current monitoring data collection will be conducted in accordance with the *Final Health and Safety Plan for the Human Health and Ecological Risk Assessment for the Centredale Manor Restoration Project Superfund Site* (HASP; May, 2002) and procedures described below.

CURRENT AND STAGE HEIGHT DATA COLLECTION

A site visit was conducted by Battelle and TG&B on January 4, 2005 to determine access locations and assess logistics for stage height measurements. The most significant outcome of the site visit was the determination that benchmarks must be set in each pond to determine relative stage height during the current monitoring survey. Benchmarks will be set during the Lyman Mill Pond sediment coring survey, as both TG&B and Battelle will be on site during this time. Benchmark stage height staffs will be established at the Lyman Mill Dam abutment, the Allendale Dam abutment, and at an upstream location within each of these ponds. Due to the nature of the work and the analytical objectives, the sediment coring survey must be conducted under low flow conditions. This will create an optimal opportunity for the establishment of the stage height staffs under low flow, "reference", conditions.

Following the completion of the coring survey, and the establishment of the stage height staffs, Battelle will be in frequent communication with TG&B to monitor the flow conditions for an appropriate sampling window. For the purposes of this task, "moderate to high flow" will be defined as flow rates in excess of 400 cubic feet/second (cfs). While 400 cfs is the threshold discharge, every attempt will be made to sample under higher flow conditions because the threshold discharge (400 cfs) represents currents near the lower end of the detection range. Precipitation forecasts from the National Weather Service, and on-line flow data from USGS stream gauge #01114500 on the Woonasquatucket River will be used to predict the timing of the current monitoring survey. Once the appropriate conditions are met, TG&B will initiate the field investigation within 24-hr of notice from Battelle. However, given the opportunistic nature of this investigation, and the short notice time, TG&B may not be available to conduct the field investigation when contacted by Battelle. If over a six month period the investigation has not been successfully completed then Battelle will contact USACE to evaluate whether the study should be reconsidered. Once in the field, TG&B will collect as many measurements as possible in each pond within a one day (12 hours or as limited by daylight) event. A minimum of two readings per location will be collected; at a total of six locations per pond (Table 1 and Figures 1 and 2). Six locations, spatially distributed throughout each pond, were selected so that data are collected for a representative range of water depths and current velocities, which should provide adequate data for calibration and validation of the hydrodynamic model.

TG&B will supply the vessel and all survey equipment for this effort. Mr. Robert Reynolds is the TG&B point of contact, and will be available by cell phone during the field activities at (508) 326-3685. Alex Mansfield is the Battelle field task leader and will be available during the survey activities at (781) 424-3817.

Data will be obtained using the following protocol:

- Current velocity will be collected from 6 locations in each pond (Table 1, Figures 1 and 2). For valid model-data comparisons, measured current velocities need to represent the depth-averaged value. This goal is accomplished as follows.
 - For water depth less than 1.5 ft, obtain a current velocity measurement at $0.6h$ below the water surface, where h is water depth. For example, at 1 ft water depth, reading will be measured at 0.6 ft.
 - For water depth greater than 1.5, obtain current velocity measurements at $0.2h$ and $0.8h$. For example, at 10 ft water depth, readings will be measured at 2 ft and 8 ft.

The depth-averaged velocity is the average of the values obtained at these two depths.

- Positioning will be determined with a Differential Global Positioning System (dGPS) with sub-meter accuracy. The GPS unit will be calibrated in the field against a benchmark (surveyed location) provided there is an available (and accessible) benchmark located within the sampling area. If a benchmark is not available, the GPS will be verified at the beginning and end of each day at a reference checkpoint (e.g., stage height staff located at Allendale Dam abutment).
- Current measurements will be made with a Marsh McBirney Flo-Mate[®] portable current monitoring system. The current monitoring system will be calibrated and documented in the field based on the manufacturer's specifications.
- Stage height readings will be taken from the staffs established during the coring survey.
- All current flow and stage height data will be recorded on the field log sheets (attached).

Table 1. Proposed Monitoring Locations at Allendale and Lyman Mill Ponds.

Pond	Location No.	Northing (NAD 83)	Easting (NAD 83)
Allendale	1	279971	333067
	2	279949	332913
	3	280201	332587
	4	280378	332683
	5	280346	332258
	6	280553	332186
Lyman Mill	1	275650	334361
	2	276103	334048
	3	276503	333805
	4	277031	333753
	5	277352	333753
	6	277518	333376

DATA MANAGEMENT AND REPORTING

Current velocity and stage height results will be documented (field notes) by TG&B and forwarded to Battelle (and Battelle's sub-contractor, Quantitative Environmental Analysis, Inc. (QEA)) for inclusion in the Sediment Stability Evaluation Phase Two Letter Report. USGS gage data will be obtained by QEA from the USGS website for the field study period, and the Phase Two data analysis will examine possible correlations between USGS data and field study data. Electronic tables that summarize station coordinates and the associated measurements will be prepared by Battelle and QEA along with the Letter Report. QEA will use the collected data for inclusion in the hydrodynamic model.

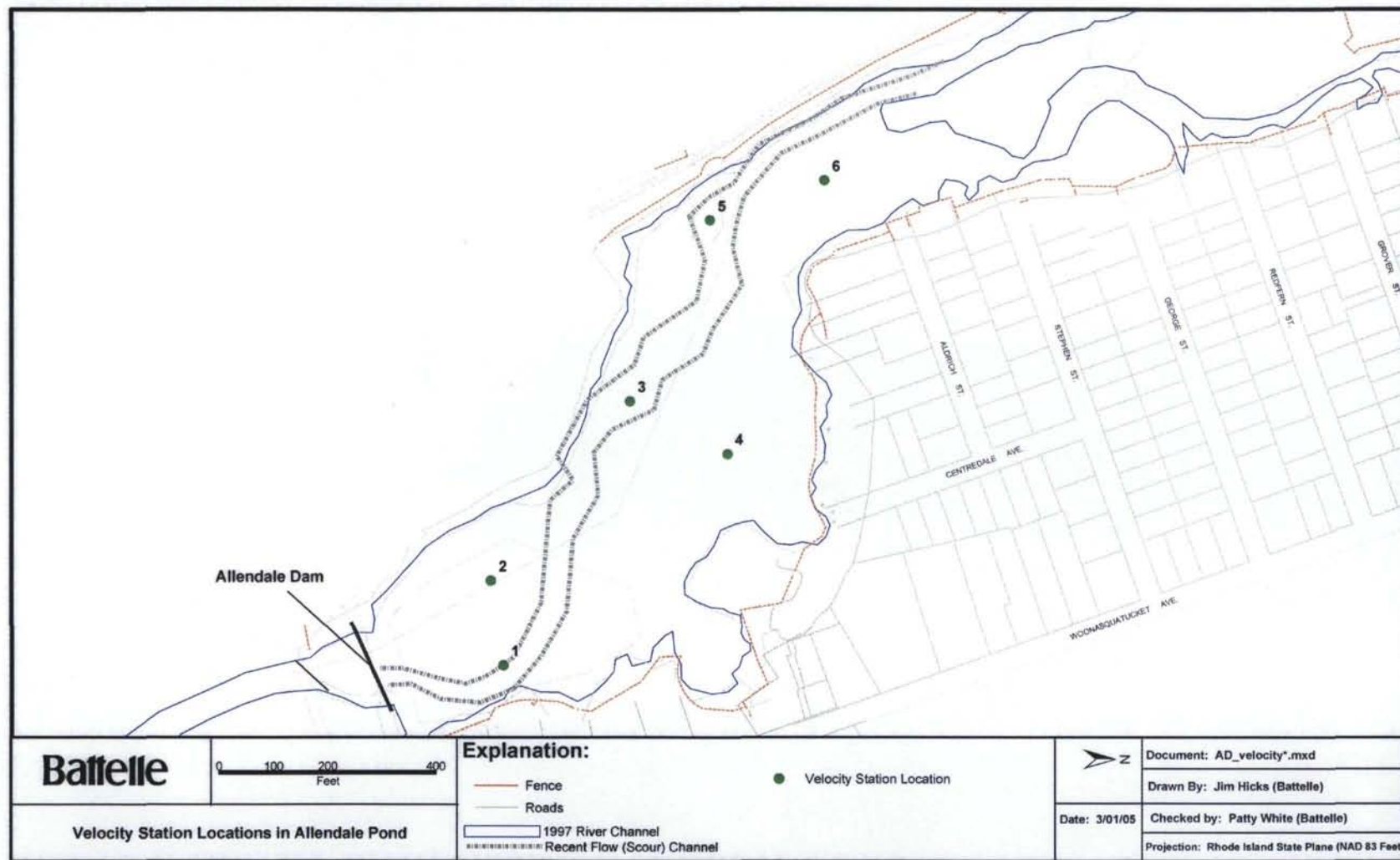


Figure 1. Allendale Pond Sample Locations

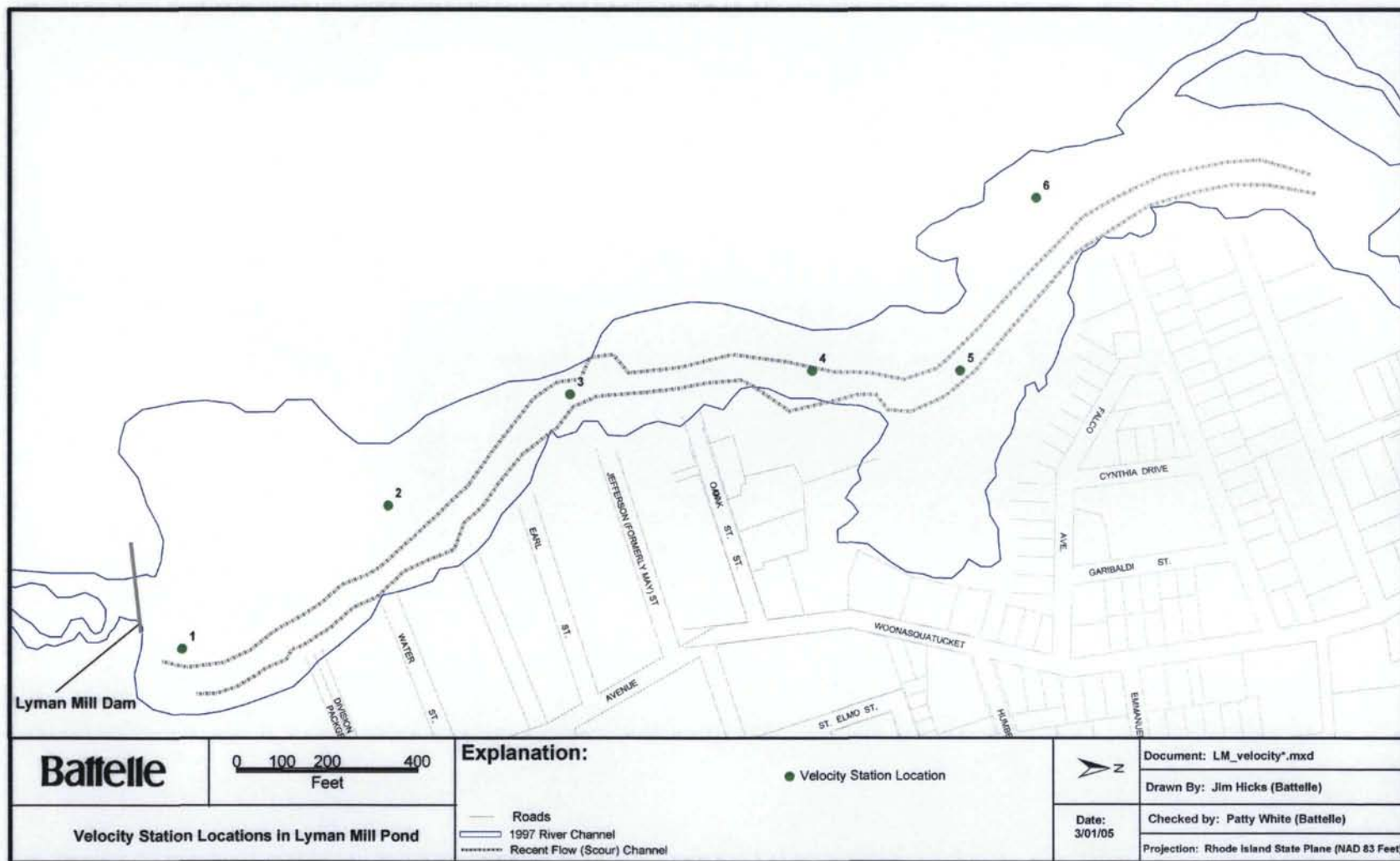


Figure 2. Lyman Mill Pond Sample Locations

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Centredale Manor Restoration Project (CMRP) Superfund Site
Current Velocity Log Sheet

Date: _____ Field Crew: _____

Pond (circle one): Allendale Lyman Mill

Location:	1	2	3	4	5	6
Time						
Northing / Latitude						
Easting/ Longitude						
Depth 1 (ft)						
Current Reading 1 (f/s)						
Depth 2 (ft)						
Current Reading 2 (f/s)						
Time						
Northing / Latitude						
Easting/ Longitude						
Depth 1 (ft)						
Current Reading 1 (f/s)						
Depth 2 (ft)						
Current Reading 2 (f/s)						

Comments:

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Stage Height Log Sheet

Date: _____ Field Crew: _____

Stage Height Staff Location	Time	Stage Height (ft, in)

Comments: