**SITE SPECIFIC PROJECT PLAN FOR:**

# Suncook River Avulsion, Epsom, NH
# Geomorphology-based Alternatives Evaluation

**Operated Under:**
**Generic QAPP for Stream Morphology Data Collection**
RFA# 03285
(June 17, 2003)

Final
August 20, 2007

*Prepared by:*
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Project Manager: _____
Signature/Date
Peter J. Walker, VHB

Technical Project Manager/QA Officer: _____
Signature/Date
Randy Sewell, VHB

Program Manager: _____
Signature/Date
Eric Williams, NHDES

Program Quality Assurance Coordinator: _____
Signature/Date
Jillian McCarthy, NHDES

NHDES Quality Assurance Manager: _____
Signature/Date
Vincent Perelli, NHDES

US EPA Project Manager: _____
Signature/Date
Warren Howard, US EPA Region I

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## 3- Distribution List

Table 1 lists people who will receive copies of the approved Site Specific Project Plan (SSPP) under the *Generic Quality Assurance Project Plan for Stream Morphology Data Collection* dated June 17, 2003.

**Table 1. SSPP Distribution List**

| SSPP Recipient Name | Project Role | Organization | Telephone number and e-mail address |
|---|---|---|---|
| Randy Sewell, PE | Technical Project Manager | Vanasse Hangen Brustlin, Inc. | 757-220-3286 csewell@vhb.com |
| Peter Walker | Project Manager | Vanasse Hangen Brustlin, Inc. | 603-644-0888 pwalker@vhb.com |
| Aaron Corr, PE | Project Assistant | Parish Geomorphic | 506-472-8440 acorr@parishgeomorphic.com |
| Matt Bernier, PE | Project Assistant | Kleinschmidt Associates | 207-416-2274 mbernier@kleinschmidtUSA.com |
| Eric Williams | Program Manager | NHDES, Watershed Management Bureau | 603-271-2358 ewilliams@des.state.nh.us |
| Jillian McCarthy | Program QA Coordinator | NHDES, Watershed Management Bureau | 603-271-8475 jmccarthy@des.state.nh.us |
| Vince Perelli | NHDES QA Manager | NHDES, Planning, Prevention, & Assistance Unit | 603-271-8989 vperelli@des.state.nh.us |
| Steven Landry | NHDES Project Manager | NHDES, Watershed Management Bureau | 603-271-2969 slandry@des.state.nh.us |
| Joni Kitson | Town of Epsom Project Coordinator | Town of Epsom, NH | 603-736-9002 nostikinoj@yahoo.com |
| Warren Howard | USEPA Project Manager | USEPA New England | 617-918-1587 Howard.Warren@epa.gov |

## 4- Project Task Organization

Figure 1 outlines the organization structure of the project personnel.

**Figure 1. Project Organizational Chart**

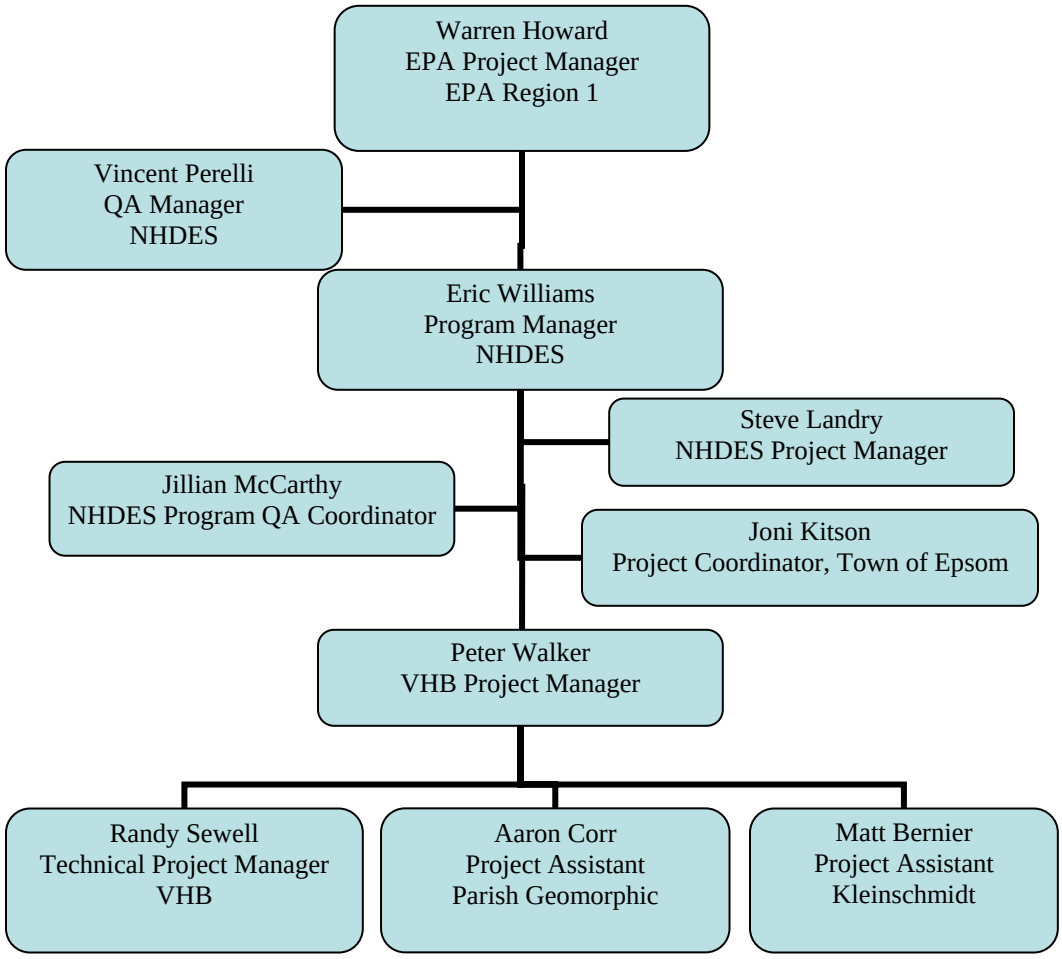



Table 2 identifies the roles and responsibilities of those individuals involved in the project.

**Table 2. Personnel Responsibilities and Qualifications**

| Name and Affiliation | Responsibilities | Qualifications |
|---|---|---|
| Peter Walker, VHB | Project Manager | Trained in data management and experienced project manager |
| Randy Sewell, VHB | Technical Project Manager<br>Project QA/QC Officer | BS in Agricultural Engineering; Trained in stream morphology data collection, analysis, interpretation, and stream survey techniques |
| Aaron Corr, Parish Geomorphic | Project Assistant | BS in Bio-Resources |

| | | |
|---|---|---|
| | | Engineering; Trained in stream morphology data collection, analysis, interpretation, and stream survey techniques |
| Matt Bernier, Kleinschmidt Assoc. | Project Assistant | BS degree in civil & environmental engineering; trained in hydrological and hydraulic modeling |
| Jillian McCarthy, NHDES, Watershed Management Bureau | Reviews QAPP preparation and other QA/QC activities | On file at NHDES |
| Eric Williams, NHDES, Watershed Management Bureau | Reviews and oversees projects funded by DES 319 Restoration Grants in Connecticut, Saco, and Androscoggin watersheds. | On file at NHDES |
| Vince Perelli, NHDES Planning, Prevention & Assistance Unit | Reviews and approves QAPPs | On file at NHDES |
| Steven Landry, NHDES Watershed Management Bureau | Supervises DES 319 Grants in the Merrimack River watershed | On file at NHDES |
| Joni Kitson, Selectmen, Town of Epsom | Overall Project Coordinator for the Town of Epsom | Elected municipal official |
| Warren Howard, US EPA Region I | EPA Project Manager | On file at US EPA |

The data generated during this project will be used principally by the consulting team including geomorphologists, scientists and engineers who will be developing an understanding of the causes of and potential solutions to the Suncook River avulsion (i.e., the sudden change in the course of the river) that occurred near Bear Island in Epsom, NH in May 2006. Additional users will include reviewers from NHDES and other resource agencies that will have a role in guiding the project and providing feedback on the most appropriate interpretation of the data and the most reasonable course of action. Ultimately, Peter Walker the Project Manager, together with Joni Kitson, the Town of Epsom representative and Steve Couture and Steve Landry will be the principal decision makers for this project. Although no laboratory analysis is expected in the course of this project, VHB has retained Parish Geomorphic of Fredericton, New Brunswick, Canada and Kleinschmidt Associates of Pittsfield, Maine as sub-consultants for this project.

## 5-Site Information

The Suncook River originates in the town of Gilmanton at the outlet of Crystal Lake, which collects the inflow of several smaller brooks and streams draining the southern flanks of the Belknap Mountains in Gilmanton and Alton. Over its 35-mile length, the Suncook River drains an area of 256-square miles in southeastern New Hampshire including portions of 16 towns in four counties. The Suncook River flows south-southwest and joins the Merrimack River at Suncook Village, approximately six miles south of Concord, NH.

The Suncook River flows through Epsom roughly parallel to NH 28, crossing the western border of Epsom just southeast of the village of North Chichester. It follows NH 28 southeast until it crosses NH 9/US 4/US 202 at Gossville near the Epsom Traffic Circle.

It then flows south and west, again along the NH 28 corridor, until it crosses the municipal boundary with Allenstown just north of Bear Brook State Park.

Prior to the May 2006 avulsion, at Huckins Mill in Epsom (at the northern end of Bear Island), two dams at heights of 13 and 5 feet height blocked the main and a secondary channel of the Suncook respectively, creating a 31-acre impoundment (New Hampshire Department of Environmental Services Dam Inventory). The dams were constructed in the late 19th century and reconstructed in the 1930s (Orff, 2006). The main channel flowed east over the main dam in this location to form the western shoreline of Bear Island, while higher flows crested the dam in the overflow channel to form the eastern shoreline.

However, just upstream of Huckins Mill, as a result of flood conditions during a May 15-16, 2006 flow event, an avulsion of the Suncook River occurred, approximately 9.5 miles upstream of the confluence of the Suncook River with the Merrimack. During the avulsion event, the Suncook River cut a new channel through an area of wetland, forest and an active gravel pit. As a result of the avulsion, the Suncook River now flows through a single channel through the gravel pit to the northeast of Bear Island before rejoining a portion of a pre-existing secondary channel that formed the eastern boundary of the island.

The area in the vicinity of the avulsion is shown in Figure 2, Project Study Area.

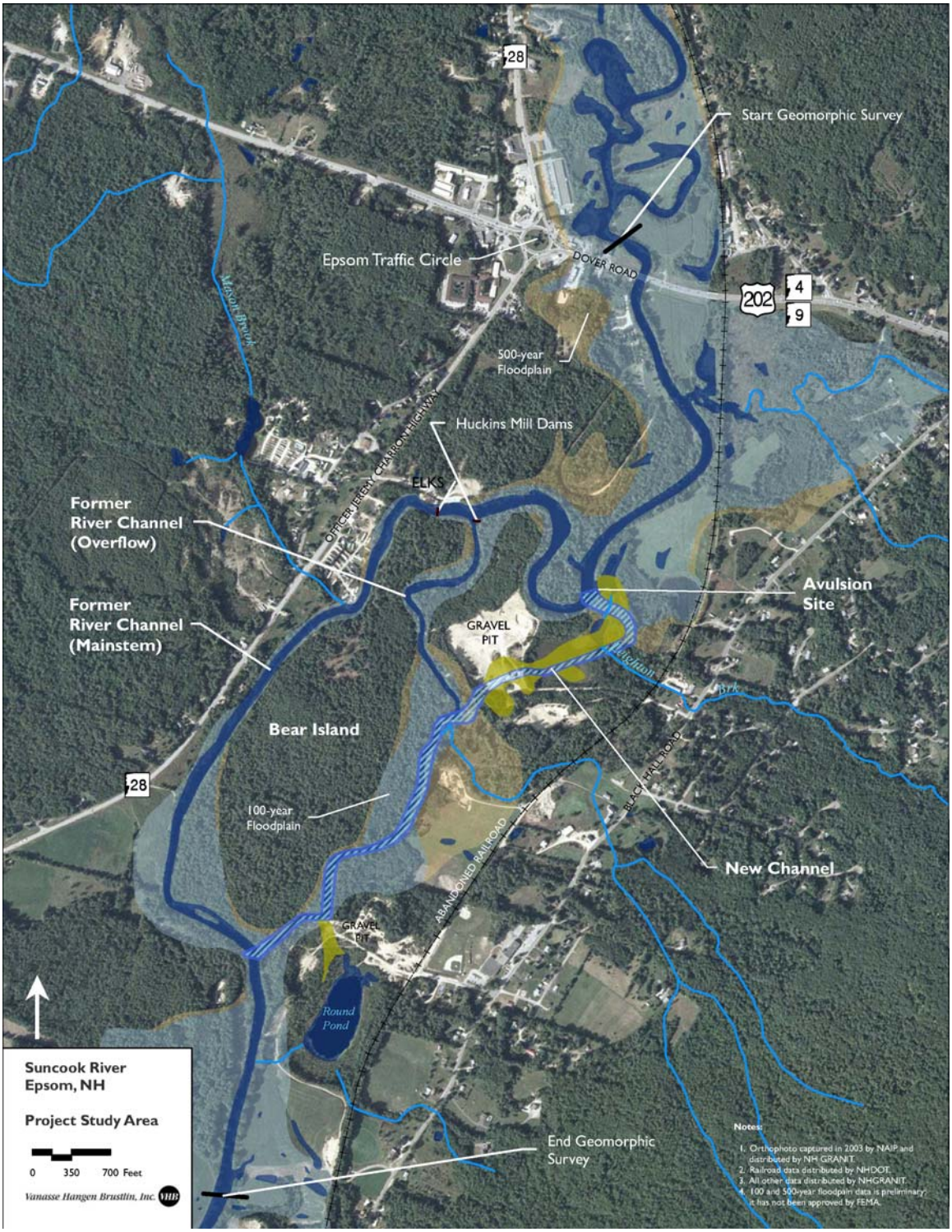
## 6-Project Rationale

### *A. Problem Definition*

It is estimated that 150,000 cubic yards of sediment were introduced into the Suncook River as a result of the new channel through the gravel pit and adjacent wetlands (Wittkop, et al. 2006). Sheets of silt and sand were deposited downstream of the avulsion channel which impacted riparian landowners. Additionally, aggradation of this new sediment downstream may decrease the channel depth and increase the frequency of overbank flooding. In the avulsion area and upstream, downcutting of the stream continues to occur due to the increase in the Suncook River gradient and the convergence of flow, and it is expected that this will lead to increased rates of bank erosion in the avulsion area and upstream (Wittkop, et al. 2006).

In addition to actual and potential future impacts to riparian landowners, it should be noted that sediment in streams can have many adverse effects when conditions are not in equilibrium as in this case. These effects can include degradation of water quality, aquatic habitats and life, as well as present a hazard to downstream locations and residents. Depending on the conditions, the suspended fine sediments may reduce the clarity of the water, which could result in a reduction of biologic productivity. Conversely, suspended sediments can carry nutrients that may increase biological productivity, even leading to eutrophic conditions. Coarse suspended sediments can bury stream habitats, which can result in diminishing overall species abundance and diversity. For this reason, a careful assessment of the future management of the river is critical. The

**Figure 2. Project Study Area**



overall goal for the project is to provide sufficient information on the Suncook River to allow an informed decision about what action, if any, the Town, State and Federal agencies should take in response to the May 2006 avulsion. Specific objectives are:

- To complete fluvial geomorphological surveys to characterize the watershed and the current and former river channels;
- To develop an analysis of options for the future of the river including, but not limited to leaving the river in its current location and restoring the river to its former channel;
- To develop conceptual designs for those alternatives using a natural channel design approach;
- To communicate the study findings to the public in a way that facilitates the decision making process.

The project will result in a master plan that is expected to guide the management of this reach of the Suncook River for years into the future. A second phase of the project would be required to fully analyze and design the selected alternative.

### *B. Historical Data*

There are no known site level geomorphological data sets for the study area. Historical mapping will be acquired to conduct a basin-scale assessment. These data include aerial photographs which will be acquired through the NH GRANIT GIS System (http://www.granit.sr.unh.edu/), as well as through the Natural Resources Conservation Service and the NH Wetlands Bureau. Channel changes will also be assessed using historical topographical maps available on-line will be used to identify changes in channel position and human land use during the past 50 to 100 years on the Suncook River (http://docs.unh.edu/nhtopos/nhtopos.htm). Other data such as the FEMA-produced Digital Flood Insurance Rate Maps and data from applicable Flood Insurance Studies for the area will be incorporated into the basin-scale assessment.

## 7 - Project Description and Schedule

Geomorphic data will be collected in July and August, 2007 following the procedures outlined in the *Generic Quality Assurance Project Plan for Stream Morphology Data Collection*, NHDES, dated June 17, 2003. The project will include the following components:

### *A. Basin-Scale Geomorphic Assessment: August 9 - 31, 2007*

A basin-scale assessment facilitates an understanding of broad level functions, including sources of sediment and large woody debris, as well as the locations of production, transfer and deposition zones. This helps provide a context for the findings of the reach assessment. Basin-scale data will be collated in a geo-referenced Geographical Information System (GIS) database. Depending on data availability, other information can also be analyzed at the basin scale using GIS tools.

***B. Reach Scale Assessment: August 9 - 31, 2007***

Each identified reach will be assessed in the field based on its physical state and condition. Channel reaches will be identified using topographic mapping and aerial photography. Reaches will be characterized by gradient, planform, valley form and geology. Each identified reach will be classified following the Rosgen Level 2 method and Schumm's Channel Evolution Model. These reaches and classifications will be re-assessed after the field program has been completed.

***C. Historic Analysis: August***

This task will seek to better understand and discuss the cause of the avulsion, which will facilitate our understanding of how and why the river channel came to occupy its current planform. The analysis will also help predict channel migration rates and where a channel will be in the future, how significant events like the May 2006 and April 2007 floods altered the river and tributaries, and when infrastructure, such as dams and bridges, were constructed. The historic evaluation also includes a review of the hydrologic history of the basin.

***D. Alternatives Development and Analysis: Fall-Winter 2007***

Once the geomorphic data is collected and analyzed, it will be used to assist the Town of Epsom, as well as the state and federal resource agencies, to decide what to do about the avulsion. During this work, VHB will collaborate with NHDES and the Town, including the general public, to identify the potential alternatives for action. It is expected that the analysis will examine three main scenarios:

- A No-action Alternative, leaving the condition to continue to evolve without intervention;
- A Modified No-action Alternative, whereby the current river course would be maintained, but with channel modifications and/or infrastructure modifications intended to limit further property damage; and
- A Restoration Alternative that would put the river back into its former channel.

Potential alternatives will be assessed based on the following draft criteria, which will be reviewed and modified as necessary in collaboration with NHDES and the Town:

- scope and severity of stability and flooding problems;
- impact to landowners and infrastructure;
- extent of ecological degradation;
- potential for recovery without intervention;
- potential to meet objectives with restoration measures;
- project constraints and feasibility of installation;
- uncertainty in assumptions;
- ecological impacts of construction; and
- relative costs.

Using the screening criteria specified above, we expect that a preferred alternative will emerge as having the greatest potential for meeting restoration goals and objectives.

### *E. Restoration and Management Plan: Winter-Spring 2008*

By spring 2008, the project will produce a comprehensive plan summarizing the results of the background research, fluvial geomorphic assessments, alternatives for restoration, and conceptual restoration designs. The plan will have the following components:

- Basin description, including land use, infrastructure (roads, bridges), soils, wetlands, topography and hydrography
- Overview of climate and basin hydrology, including the May 2006 and April 2007 floods
- Delineation and description (e.g., slope, sinuosity) of reaches along the River
- Overview of water quality characteristics in the basin, as summarized from existing information
- Description of methodology for fluvial geomorphic assessment
- Results of fluvial geomorphic assessments, including assessment scores, site photographs, in-stream measurements (e.g., channel cross section surveys, reach profiles, pebble counts)
- Discussion of restoration alternatives and proposed approach
- Identification of restoration methodology for each site and reach
- Conceptual restoration designs, with an evaluation of each
- Recommendations for additional monitoring or studies
- Maps, aerial photographs, and engineering drawings as needed.
- Documentation that the project complies with the *Generic Quality Assurance Project Plan for Stream Morphology Data Collection* dated June 17, 2003.

The plan would guide any subsequent assessment or design phase needed to develop the final plan for river restoration.

**Table 3. Project Schedule**

| EVENT | TARGET DATE |
|---|---|
| Project Kickoff - Discuss Schedule & Work Plan | July 2, 2007 |
| Geomorphological Assessment Begins | August 9, 2007 |
| Public Meeting #1 - Project Introduction & Alternatives Identification | July 24, 2007 |
| Draft Geomorphic Assessment | August 31, 2007 |
| Draft Project Alternatives with Input from Public (Internal Draft) | September 8, 2007 |
| Preliminary Evaluation of Alternatives (Internal Draft) | September 24, 2007 |
| Meeting Notice & Public Draft Alts. Descript. & Prelim. Assessment | October 15, 2007 |
| Public Meeting #2 - Alternatives Development and Preliminary Evaluation | November 1, 2007 |
| Draft Restoration/Management Plan with Input from Public | Winter 2008 |
| Public Meeting #3 – Alternatives Evaluation | March 2008 |
| Final Report Issued | May 2008 |

## 8-Final Products and Reporting

The final products for this project include the following:

- An interim Geomorphological Assessment Report, including an Explanations of Methods, Field Data, Results, Historical Analysis and Geomorphic Interpretations. Target Submittal Date: August 31, 2007
- A preliminary Alternatives Evaluation, containing refined CAD-based Restoration Concept Plans, Cost Opinions, and a Preliminary Discussion of Advantages and Issues associated with each Alternative. Target Public Release Date: October 15, 2007
- Final Restoration/Management Plan, which will contain narrative and CAD Drawings of Alternatives sufficient to explain each of the alternatives, and to provide an Alternatives Analysis which compares the major features, advantages and disadvantages for each of the Alternatives brought forward for analysis (expected to be three). The final report will discuss any problems encountered and will document compliance with the *Generic Quality Assurance Project Plan for Stream Morphology Data Collection* dated June 17, 2003. Target Public Release Date: May 2008

All products will be submitted by Vanasse Hangen Brustlin, Inc., in both electronic and paper copies, to the NHDES Watershed Assistance Section for review and approval.