

May 21, 2008

Ms. Maria Tur  
US Fish & Wildlife Service  
NE Ecological Service Field Office  
70 Commercial Street, Suite 300  
Concord, NH 03301 - 5087

**RE: North Country Environmental Services, Inc.  
Landfill Facility - Bethlehem, NH  
Aesthetic Remediation**

Dear Ms. Tur:

NCES (North Country Environmental Services, Inc.) writes to provide proposed design plans for an aesthetic remediation on an adjacent property to our landfill site in Bethlehem, New Hampshire. Within our site's Groundwater Management Permit as issued by the by the NHDES (New Hampshire Department of Environmental Services) we have a condition that requires an investigation for possible remediation to remove discolored soils and vegetation along a heavily forested, steep embankment above the Ammonoosuc River.

The focus of the proposed Seep Restoration Project is to physically remove an accumulation of iron and manganese precipitate on soil and vegetation in the area of the "Main Seep" (water quality sampling location S-1). The Seep is located off the landfill property, about 250 feet northeast of NCES's property line. The Seep emerges from the south bank of the Ammonoosuc River at an elevation approximately 80 feet above the River. The bank seepage at the Seep start spans a lateral distance of about 25 feet. The slope of the south bank of the River in the vicinity of the Seep is about 1.5H:1V, and in some areas steeper. The slope is covered with dense brush, trees and boulders and, in areas of bank seepage along the slope, wetland-type vegetation.

The presence of the Seep along the south bank of the river is a direct reflection of the hydrogeology of the area. Three prominent soil units have been observed to comprise the stratigraphy at our Landfill site. From the ground surface down, these soils include an upper glacial till unit consisting mainly of fine to medium sand and silt with moderate amounts of coarse-grained material and lesser amounts of clay; a heterogeneous sequence of stratified drift deposits comprised of silt and fine sands commonly inter-fingered with coarser-grained "fill-like" subunits; and a very dense lower glacial till unit comprised mainly of sand and gravel with lesser amounts of silt. In the northeast portion of the NCES site, the stratigraphy consists primarily of stratified drift overlying the lower glacial till unit. The texture and distribution of soils in the vicinity of the Seep and landfill imply a complicated depositional environment associated with glaciation of the area, and include ice-contact deposits and

moving and/or stagnant water deposits inter-fingered among the prominent soil units.

In the vicinity of the Seep, groundwater moves from higher elevations in the south to the north toward the Ammonoosuc River. While groundwater moves through the entire saturated soil column (up to 250 feet in thickness in the vicinity), flow is locally more prominent in zones of coarser-grained materials. The Seep is a surficial expression of such a zone of coarser-grained materials. It is likely that either a former glacial meltwater channel or stringer of gravelly soils provides for a zone of convergent groundwater flow from south to north, discharging at the Seep. The Seep emerges at the contact between stratified drift and less permeable lower glacial till soils, discharging to the bank above the River. The Seep contains considerably higher flow than other areas of bank seepage in the vicinity. While the flow is expected to vary seasonally, on the basis of visual observations, typical flow rates at the head end of the Seep are estimated to be in the range of approximately 50 gallons per minute.

On the basis of groundwater quality conditions (discussed below) it is known that the Seep discharges groundwater migrating from beneath the former unlined landfill at the NCES Site. The exact flow pathway from the former unlined landfill vicinity to the Seep is not known and made even more evident by the fact that there are smaller seeps adjacent to the Main Seep where evidence of current or historical water quality impacts has not been observed (based on prior sampling data).

When first investigated in 1984, water quality conditions downgradient of the former unlined landfill at the NCES Site, including water quality at the Seep, were found to be degraded by a number of constituents present in landfill leachate. As part of subsequent development of the lined NCES landfill facility, landfilled materials and visibly stained soils in the former unlined landfill were removed by NCES, and placed in Stage I of the lined landfill. This relocation project began in December 1991 and was completed in October 1993. The presence and concentration of leachate constituents detected in the water quality samples collected at the Seep increased. This increase was a result of exposing landfill materials during the waste relocation project and reached maximum concentrations in 1994. Leachate constituent concentrations detected in the Seep samples have decreased markedly since that time with many constituents; most notably VOCs (volatile organic compounds) no longer detected. Iron and manganese continue to persist in groundwater discharging at the Seep; although an overall decreasing trend in the concentrations of these metals is apparent, with current concentrations substantially below those historically detected prior to the waste re-location effort.

The discoloration observed at the Seep is due to precipitation of iron and manganese from groundwater when the groundwater emerges at the ground surface and is oxidized. The current appearance of the Seep is the result of over 25 years of iron and manganese deposits on the slope above the river. Since removal of the source of contamination (the former unlined landfill) in 1993, groundwater quality in the areas downgradient from the former unlined landfill has improved

significantly. The primary remaining impact is the presence of iron and manganese and the discoloration associated with iron and manganese precipitation.

Decomposition of waste materials and the production of leachate in the former unlined landfill consumed oxygen present in groundwater beneath the landfill, creating anaerobic (i.e., oxygen-deficient), reducing conditions in groundwater beneath and downgradient of the landfill. Iron and manganese, which are naturally present in soils, are dissolved under reducing conditions, and transported to the north with groundwater flow. When the groundwater discharges under atmospheric (oxygen-rich) conditions at the Seep, the dissolved iron and manganese in groundwater are oxidized and precipitate out of solution, resulting in the iron and manganese oxide deposits along the bank at and below the Seep. Natural attenuation processes would eventually restore the dissolved oxygen concentration in groundwater moving beneath the former unlined landfill which would, in turn, stabilize dissolution of iron and manganese from this vicinity and its eventual deposit at the Seep. In summary, the record of water quality data for the Seep indicates that water quality conditions at the Seep continue to improve with time, as a result of removal of the former unlined landfill and natural attenuation.

As the Main Seep is located in a wetland area, delineation of the associated wetlands and completion of related preliminary work necessary to prepare an application for a permit from NHDES' Wetlands Bureau to complete the removal program were an integral part of the initial development work. Other regulatory permits are likely necessary prior to commencement of the project.

NCES has completed the following work on this project to date:

- On February 2007 we had an on site meeting with remedial contractors to review conditions in the area of the Main Seep and discuss potential means and methods that the contractors may employ to remove the precipitate. The site meeting provided a basis for the responding contractors to prepare preliminary cost estimates. It is anticipated that final costing would be developed following completion of the wetlands permitting work.
- Development of an access agreement (executed May 1, 2007) with the off-site property owner (Daniel Tucker), allowing NCES to access the area of the Main Seep for purposes of implementing the selected remedy.
- Topographic survey of the Main Seep area, tied into the existing NCES Site datum (work completed by Alpine Survey in May 2007);
- Delineation of the wetland areas in the vicinity of the Main Seep (work completed by BH Keith Associates in June 2007), and survey of wetlands flags to show the limits of the wetland areas on the May 2007 topographic plan;

- Meeting with NHDES (September 21, 2007) to review the wetlands delineation work and discuss, in concept, the general scope of the project and the anticipated wetlands permitting process/requirements.
- Meeting with NHDES (October 31, 2007) to familiarize Wetlands Bureau staff assigned to the project with the information presented at the initial (September 21, 2007) meeting.
- An on site meeting with NHDES (November 27, 2007), as suggested by NHDES Wetlands Bureau staff, to review conditions in the area of the Main Seep.
- Development of a draft plan set presenting the wetlands delineation and a suggested construction sequence (including proposed wetlands protection and sedimentation/erosion controls) for implementation of the selected remedy.
- Meeting with Mr. Bill Thomas, NHDES Wetlands Bureau Supervisor (April 4, 2008) to review the scope of the project in response to re-assignment of personnel from the Wetlands Bureau.

We are requesting your review of this correspondence along with the attached Engineering drawings as prepared by SHA (Sanborn, Head & Associates, Inc.) of Concord, New Hampshire. Upon your review of the information provided, we would like to request a written determination from your agency if jurisdiction over the proposed project is required.

Should you have any questions or require additional information, please contact Paul Rydel of SHA at (603) 229-1900 or me at (802) 223 - 7221.

Sincerely,

NORTH COUNTRY ENVIRONMENTAL SERVICES, INC.

John Gay, E.I.  
Engineering, Permitting, Compliance & Construction

- c. Karlee Kennison, NHDES  
Kevin Roy, North Country Environmental Services, Inc. (via email, w/o encl.)  
Karen Flanders, North Country Environmental Services, Inc. (via email, w/o encl.)  
Larry Lackey, North Country Environmental Services, Inc. (via email, w/o encl.)  
Paul Rydel, SHA (via email, w/o encl.)  
Barry Keith, BH Keith Associates, Inc. (via email, w/o encl.)