

TABLE OF CONTENTS

	<u>PAGE</u>
I. Introduction . . . . .	2
II. The Soil Survey: Materials in Greenfield . . . . .	2
Description of Materials . . . . .	3
III. Construction Materials in Greenfield . . . . .	4
IV. Groundwater Identification . . . . .	4
V. Excavation Operations in Greenfield. . . . .	5
VI. Opportunities for Excavation . . . . .	6

# CONSTRUCTION MATERIALS ANALYSIS

## I. INTRODUCTION

### Enabling Legislation

In 1989 the New Hampshire Legislature amended the statute that addressed the purpose and description of a Master Plan: RSA 674:2, VIII-a called for a “construction materials section which summarizes known sources of construction materials which are available for future construction needs, including, at a minimum, the location and estimated extent of excavations which have been granted permits under RSA 155-E, as well as reports filed pursuant to RSA 155-E: 2, I (d) with respect to non-permitted excavations.” RSA 155-E is the enabling statute for communities in New Hampshire to adopt regulations as may be reasonably necessary to carry out the excavation of material including operational and reclamation standards. If the community does not have such regulation, an applicant can apply to the Zoning Board of Adjustment for a special exception. Greenfield adopted the *Regulations Governing Earth Excavations* on November 25, 1990 and a revised it on January 26, 2015.

The statute, however, does not define “construction materials” nor does it specify what the “construction needs” might be; however, since the statute addressing earth excavations is referenced (RSA 155-E), it is logical to assume that, at a minimum, sand and gravel are intended. The primary source for identifying sand and gravel resources is the Soil Survey of Hillsborough County, which was completed in 1984<sup>1</sup> by the USDA Soil Conservation Service (SCS). Developed according to the National Cooperative Soil Survey standards by soils scientists, the soil survey identifies distinct properties and characteristics of different soil types, from which certain predictions are made about the suitability of a soil for different uses. The document includes a table entitled “Construction Materials” that lists four types of material by soil category; these are roadfill, sand, gravel, and topsoil.

The purpose of this section of the Master Plan is to identify such materials that may be located in Greenfield. Soils information is an important consideration in land use planning since the various characteristics of soils such as steepness, wetness, flood susceptibility, and flood storage have an impact on development potential. The soil types are listed in tables and the boundaries of the soil units are illustrated on maps.

## II. THE SOIL SURVEY: MATERIALS IN GREENFIELD

The following descriptions of the four types of construction materials are based on the above-referenced Soil Survey of Hillsborough County. Soil categories are identified in the Survey by number and letter; the number represents the composition of the soil, and the letter designates the steepness - “A” being the flattest and “E” the steepest. Note that the maps developed for this

---

<sup>1</sup> Soil Survey of Hillsborough County, New Hampshire, US Department of Agriculture, Soil Conservation Service, 1984. (The SCS is now the Natural Resource Conservation Service.)

report show the soil unit boundaries but not the identifying number and letter, as the scale of the maps would render this information illegible. The designation is described below.

The classifications used to designate the construction materials are based on a number of factors, including observed performance of the soil, soil properties, and site features that affect the removal of the material and its' use as a construction material.

## **A. DESCRIPTION OF MATERIALS**

### **Roadfill**

Roadfill is defined by the Survey as soil material that is excavated in one place and used in road embankments in another place. Only soils suitable for low embankments (under six feet) were rated by the Survey. Roadfill is rated as being either "good", "fair" or "poor". "Good" soils are those that are comprised of significant amounts of sand or gravel or both, and slopes of 15% or less. "Fair" soils have in excess of 35% silt and clay-sized particles, and slopes of 15-25%. "Poor" soils contain many stones, or slopes of more than 25%.

Roadfill materials in Greenfield are primarily of the "poor" classification, with much smaller areas of "good" and "fair" identified. Areas of good roadfill soils range in size from several rather large concentrations to numerous smaller pockets distributed all over town in no particular pattern. The larger areas are primarily located to the south and west of Route 31.

The fair materials are also distributed virtually all over town, with the largest concentration to the east of Hancock and north of Peterborough. The remaining soils in Greenfield are classified as poor roadfill material.

### **Topsoil**

Topsoil is defined in the Survey as material used to cover an area in order to establish and maintain vegetation. For the purposes of the Survey, only the upper 40 inches of soil were evaluated for its use as topsoil. Topsoil is also rated as being either "good", "fair" or "poor". Soils rated as "good" contain no stones or cobbles, have little or no gravel, and slopes of less than 8%. "Fair" soils are sandy, have considerable amounts of gravel or stone, or slopes of 8-15%. "Poor" soils are comprised of a lot of sand or clay, have a large amount of gravel or stone, and slopes of more than 15%.

All topsoil in Greenfield is rated as "poor", with one exception: a very small (less than 2 acres) pocket of fair topsoil is indicated on the west side of Old Bennington Road about midway between County Road and the Bennington Town Line.

### **Sand and Gravel**

The properties used to evaluate sand and gravel soils include the thickness of the material, the size of the grain, and the content of rock fragment. In addition, the material must be at least three feet thick and have less than 50%, by weight, large stones.

The soils are rated "good," "fair," or "poor" as potential sources of sand or gravel. A rating of "good" or "fair" means that sand is likely to be in or below the soil. The bottom layer and the thickest layer of the soil are assigned numerical ratings which can range from "good" to "poor".

The distribution of sandy soils is much more defined than roadfill soils; the probable sandy soils are almost all concentrated in the center of Town in a northwest-southeast pattern. Gravel deposits in Greenfield follow almost the same disbursement pattern as the sand, but there are fewer acres deemed probable for the presence of this material.

### III. CONSTRUCTION MATERIALS IN GREENFIELD

The following table presents the calculated acreages for all four construction material types. Based on the Soil Conservation Service information, Greenfield clearly has more sand and gravel than roadfill or topsoil, the quality however, is predominantly rated as poor by the Soil Survey of Hillsborough County. Subsequently, 35 percent of topsoil is rated as fair in quality. An accurate analysis cannot be made for the roadfill category since 61 percent has not been rated.

#### CONSTRUCTION MATERIALS BY TYPE AND ACREAGE

CONSTRUCTION MATERIAL	AREA	% OF TOTAL LAND AREA
<b>Roadfill</b>		
Good	219.3	1.3%
Fair	2,317.6	13.4%
Poor	4,181.4	24.2%
Null or Not Rated	10,586.4	61.2%
<b>Topsoil</b>		
Fair	6,064.7	35.0%
Poor	10,781	62.3%
Null or Not Rated	458.9	2.7
<b>Sand</b>		
Fair	562.9	3.3%
Poor	16,282.8	94.1%
Null or Not Rated	458.9	2.7%
<b>Gravel</b>		
Fair	2,887.0	16.7%
Poor	13,958.7	80.7%
Null or Not Rated	458.9	2.7%
<b>Total Land Area – 17,304.6 Acres</b>		

*Sources: Soil Survey of Hillsborough County; US Department of Agriculture*

### IV. GROUNDWATER IDENTIFICATION

To refine the identification of sand and gravel deposits in the Town of Greenfield, aquifer delineation studies are examined and compared to the SCS soil survey. This information is useful, since the identification of potential groundwater is based in part on the inferred presence of sand and gravel soils; thus, the interpretation that where an aquifer exists, so too, do sand and

gravel deposits. Groundwater identification should not, however, be solely relied upon to locate sand and gravel deposits, as these data present only part of the total picture.

The reason for this is that sand and gravel deposits were created by glaciers and rivers, and can be deposited on valley floors, hillsides and hilltops. The aquifer studies identify those soils that were deposited on valley floors - known as stratified drift. The other formations that must also be considered are eskers and deltas, both of which can be prodigious sources of sand and gravel deposits, which are not found in valley floors, but rather on hillsides and hilltops. Therefore, they would not show up on an aquifer map. These formations all have something in common, namely that the materials have all been sorted by water; however, while good aquifers are also good sand and gravel sites, good sand and gravel sites are not always good aquifer sites.

Examination of the region-wide aquifer map titled: *Stratified Drift Aquifers with Watersheds/Basins, Southwest Region*, found in the Natural Resources Analysis Chapter of the Master Plan, shows that Greenfield lies within portions of three major watersheds: the Upper Contoocook to the west; the Piscataquog to the northeast; and the Souhegan to the southeast.

The map of Greenfield’s aquifer, at the end of this chapter, has greater detail for the Town and shows a fairly large aquifer deposit exactly in the center of town, underlying areas that are considered probable for sand and gravel.

## V. EXCAVATION OPERATIONS IN GREENFIELD

Earth excavation has not been an actively sought land use in Greenfield. There are four excavation sites of which only two are considered “*active*”. The Town of Greenfield has a sand and gravel pit on Forest Road. The other active excavation site is a commercial operation on Old Bennington Road.

Two sites in the following chart are listed as *inactive*. The excavation site on Sawmill Road was an incidental site during construction of a subdivision. The subdivision has been completed and the removal of earthen material has since ceased. The other inactive site is owned by the New Hampshire Department of Transportation. This site has not been used in many years and it is unknown when the state may again remove material.

**Excavation Sites**

Location		Status	Comments
R7/Lot 28 Forest Rd	Forest Road Town Pit	Active	Town Pit-First Excavated 2013
R2/Lot 17.1 Sawmill Rd	Sawmill Road	Inactive	Revegetated
R1/Lot 3	Muzzy Hill Road	Active	Commercial Pit-Only one in town
R1/Lot 28	The DOT Garage	Inactive	Not excavated for many years.

*Source: Town of Greenfield records*

**Permitting**

The table below is used in New Hampshire to provide a listing of requirements in RSA 155-E for consideration of earth removal operations:

**NEW HAMPSHIRE EARTH EXCAVATION REGULATIONS**

	No Permit Required	Permit Required	Must Comply w/ Minimum Standards	Must Post Reclamation Bond	Excavation Report
Existing as of 8/24/79	X	For Expansion	X	For Expansion	X
Begun since 8/24/79		X	X	X	
In connection with statutory manufacturing plants	X		x	For Expansion	
Highway Excavations	X		x	For Expansion	
Incidental to building, etc.	X				
Incidental to agriculture, etc.	X				
Granite Excavations	Not regulated by the Planning Board				
Abandoned pre 8/24/79	No Regulation				
Abandoned post 8/24/79				X	
Nonconforming as of 8/4/89		For Expansion	X	For Expansion	

Source: NH Department of Environmental Services

**VI. OPPORTUNITIES FOR EXCAVATION**

The information on construction materials in this chapter is intended to be used for land use planning. Once locations of sand, gravel, roadfill and topsoil have been identified, the Planning Board can make informed decisions regarding the appropriate locations for the excavation of these materials.

The Town of Greenfield is zoned for six districts, the largest being the Rural/ Agricultural District. The zoning ordinance permits excavation in the Industrial Areas, of which there are two: one on Sawmill Road near the Bennington Town Line, and one in the Russell Station area.

Based on the maps generated for this chapter, the Soil Survey, and the available information on excavation sites in Greenfield, it would appear that the Town has a fair to large supply of sand and gravel, however, most of the sand and gravel appear to be located beneath the Town's aquifer deposits and the quality of this material is predominantly rated as *poor* or *fair*. Today,

given the pattern of development, location of the aquifer, and quality of material, opportunities for any large-scale excavations appear to be quite limited.

The following are considerations of the Planning Board with regard to earth excavation:

- The Board will consider whether to permit excavations (by special exception) in the Rural/Agriculture District.
- The Board will recommend that the NH Department of Environmental Services Environmental Fact Sheet on Best Management Practices for Fueling and Maintenance of Excavation and Earthmoving Equipment is followed by all operators.