

CONSTRUCTION MATERIALS ANALYSIS

DRAFT

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CONSTRUCTION MATERIALS ANALYSIS

I. INTRODUCTION

The primary source for identifying sand and gravel resources is the Soil Survey of Hillsborough County, which was completed in 1985⁶ by the USDA Soil Conservation Service (SCS). 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. The soil types are listed in tables and the boundaries of the soil units are illustrated on maps. These maps were created by the Southwest Region Planning Commission using computer technology known as the Geographic Information System (GIS). The soil information from the SCS Survey was digitized, and the maps printed out at 11"x17" size for inclusion in this chapter of the Master Plan.

This section addresses Greenfield's opportunities for earth excavation as defined by RSA 155-E. Amendments made to this law in 1989 and 1991 made it incumbent on towns to ensure that their zoning ordinances provide for excavation. Otherwise "excavation shall be deemed to be a use allowed by special exception . . . in any non-residential area of the municipality, . . ." ⁷ and the zoning board of adjustment shall grant the special exception upon a finding by the board that the excavation would not diminish property values, unreasonably change the character of the neighborhood, create traffic hazards, or create any health or safety hazards.

II. THE SOIL SURVEY

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 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 complete designation is, however, provided in the following tables.

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.

⁶ Soil Survey of Hillsborough County, New Hampshire, US Department of Agriculture, Soil Conservation Service, 1985. (The SCS is now the Natural Resource Conservation Service.)

⁷ RSA 155-E: 4, III.

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, with slopes of 15% or less. “Fair” soils have in excess of 35% silt and clay-sized particles, with slopes of 15-25%. “Poor” soils contain many stones, or slopes of more than 25%.

▪ **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, with slopes of more than 15%.

▪ **Sand and Gravel**

Sand and gravel are defined in the Survey as natural aggregates suitable for commercial use with a minimum of processing. The Survey evaluated only the probability of finding materials in quantities large enough as to be suitable for removal.

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. A soil rated as “probable” has either a layer of clean sand or gravel, or a layer of sand or gravel with up to 12% silty fines. In addition, the material must be at least three feet thick and have less than 50%, by weight, large stones.

III. CONSTRUCTION MATERIALS IN GREENFIELD

The four types of construction materials found in Greenfield are described below; accompanying maps illustrate the extent and location of these materials. “Good”, “fair” and “poor” roadfill and topsoil are identified; for sand and gravel, both the “probable” and the “improbable” soil units are identified. The source for all four tables is the Hillsborough County Soil Survey of 1985.

Note that the survey assumes that all of the land area in Greenfield is comprised of some amount of these four soil types. Therefore, when roadfill, for example, is calculated, the total of the “good”, “fair”, and “poor” roadfill soils equals the total land area of the town, based on the SCS study.

A. ROADFILL

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.

B. TOPSOIL

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.

C. SAND

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.

D. GRAVEL

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.

The table below presents the calculated acreages for all four construction material types. Based on the SCS information, Greenfield clearly has more sand and gravel than roadfill or topsoil. Good, or even fair, topsoil, in fact, is virtually non-existent in town. Sand is slightly more in abundance than gravel, with each estimated at 69 and 66 percent of the land area, respectively.

**TABLE #1:
CONSTRUCTION MATERIALS BY TYPE AND ACREAGE**

CONSTRUCTION MATERIAL	AREA (in acres)	% OF TOTAL LAND AREA
Roadfill		
Good	2,772	9%
Fair	8,083	28%
Poor	18,232	63%
Topsoil		
Fair	1.7	1%
Poor	29,086	99%
Sand		
Probable	19,985	69%
Improbable	9,102	31%
Gravel		
Probable	19,256	66%
Improbable	9,831	34%

Total Land Area – 29,087 Acres

SOURCES: SOIL SURVEY OF HILLSBOROUGH COUNTY,
US DEPARTMENT OF AGRICULTURE, 1985

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.

The following map illustrates the latest available aquifer information, for Greenfield specifically. Aquifers, river basins and watersheds for the entire southwest region are presented on a map entitled *Stratified Drift Aquifers with Watersheds/Basins, Southwest Region* found in the Natural Features Chapter. These maps represent the results of a statewide aquifer-mapping project by the NH Department of Environmental Services in cooperation with the US Geological Survey, begun in 1985.

The goal of the project was to update the reconnaissance level mapping that was completed in the mid-1970s (commonly known as "the Cotton Maps"). In addition, GIS technology was used to develop the maps. The methodology employed to develop these maps included drilling observation wells at selected sites around the state. The project divided the state into 14 study areas whose boundaries largely coincide with natural drainage basins.

The new maps identify significant stratified-drift aquifers by their location as well as their hydraulic properties and internal characteristics. Thus, these new maps don't just illustrate the estimated boundaries of an aquifer, they also provide information on ground water flow, depth of deposits, volume of sediment, etc.

Examination of the region-wide map found in the Natural Resources 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.

A more detailed aquifer map for Greenfield alone can be found on the following page. This map 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

As part of this report, all known existing and abandoned sand and/or gravel pits in town were identified. They are described below based in part on information from Excavation Reports that were submitted to the Planning Board in 1991, and are located on the accompanying map by a number corresponding with the table. All of the sites are in private ownership.

**TABLE #2:
KNOWN EXCAVATION SITES IN GREENFIELD, NH**

Site Location	Acreage	Zoning District	Status of Operation
1. Sawmill Road (Map R-2, Lot 17.1)	178	Industrial	Active
2. Slip Road (Map V-4, Lot 8)	24.9	Village	Inactive since 1979
3. Zephyr Lake Road (Map R-6, Lot 22)	30+	Industrial	Inactive since 1978
4. Route 31 South (Map R-7, Lot 5)	198	Rural/Agriculture	Active
5. Forest Road (Map R-6, Lot 18)	55	General Residence	Reclaimed
6. Old Bennington Road (Map R-1, Lot 1)	271	Rural/Agriculture	Active
7. New Boston Road (Map R-7, Lot 23.1)	57	Rural/Agriculture	Active
8. Peterborough Road		General Residence	Inactive
9. Peterborough Road		General Residence	Reclaimed
10. Longwood Drive		General Residence	Inactive
11. Old Bennington Road		Rural/Agriculture	Reclaimed
12. Route 31 south		General Residence	Inactive. Never used commercially; Town used materials for road building.
13. Cavender Road		Rural/Agriculture	Reclaimed

<u>Site Location</u>	<u>Acreage</u>	<u>Zoning District</u>	<u>Status of Operation</u>
14.Old Bennington Road		Rural/Agriculture	Inactive

SOURCE: GREENFIELD PLANNING BOARD

In addition to these active and formerly active sites, there are two sites for which permits were requested, but were not granted by the town; one is located off of Muzzy Hill Road, and the other on Slip Road. Both sites contain materials suitable for excavation, but the applications were not able to satisfy the town or state requirements for earth excavations.

Excavation has not been a dominant land use activity in Greenfield, although there are, according to town records, four active sites and eight inactive sites. Most of the current activity is on a small scale, with perhaps only one or two truck trips a year hauling from the property.

VI. OPPORTUNITIES IN GREENFIELD 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.

As noted earlier, RSA 155-E requires towns to allow some opportunity for earth excavation. The law also allows towns that have adopted a Water Resource Management and Protection Plan consistent with RSA 674:2,VIII to include in their local excavation regulations provisions that are aimed at protecting water resources.

The Town of Greenfield is zoned for five 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 (refer to accompanying zoning map). As the map of Excavation Sites illustrates, most of the known sites are located in either the General Residence District or the Rural/Agriculture District. In fact, of the four active sites, only one is located in the Industrial District; the other three are in the Rural/Agriculture District. This means that three of the four sites are nonconforming uses, thereby operating under certain restrictions regarding expansions. Even though the law does make provisions for expansions of earth excavations, generally speaking, nonconforming uses do not automatically have the same rights to change and expand, as do permitted uses.

VII. CONCLUSION

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, and most of the sand and gravel appear to be located beneath the Town's aquifer deposits. In addition, three-quarters of the existing permitted and active sites are located in a district in which they are not a permitted use.

Issues around excavation in Greenfield have primarily revolved around the permitting process, i.e., the Board's need to understand which sites would be considered under the law and which

would not. Today, given the pattern of development, 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 develop an aquifer protection district.
- 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.