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State of Rhode Island  
Development Council

U. S. Department of the Interior  
Geological Survey

Cooperative geologic project

Open File Report

Geology of the proposed highway from Kitts Corner,

West Greenwich, to a few hundred feet north of Bartons Corner,

West Warwick, Rhode Island

by

J. Hiram Smith, Geologist, U. S. Geological Survey

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OPEN FILE REPORT

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West Warwick, Rhode Island

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Purpose

This report was prepared at the request of the Rhode Island Development Council in order to make available basic geologic information which will be useful in the construction of a proposed highway from the vicinity of Kitts Corner, in the northeastern part of West Greenwich, to a point on Route 2, a few hundred feet north of Bartons Corner, in the southwestern part of West Warwick.

Basic geology

Bedrock.

Exposures of bedrock appear at only three points along the proposed highway site; at all three places the rock is granitic. Elsewhere bedrock underlies the site at various depths, but for the most part is believed to be too deep to be reached by shallow cuts. However, moderately deep cuts in the vicinity of these exposures, and especially those areas marked as ground moraine (gm), may penetrate bedrock; the depths to bedrock and the general profile of the bedrock surface could be determined by seismic tests.

In general, the distribution of bedrock exposures and the logs of wells that reach bedrock indicate that the bedrock surface is highly irregular. The overlying unconsolidated deposits (soils in the engineering sense) are commonly thicker in the valleys than on the hills, so that the relief of the bedrock surface is considerably greater than the surface relief of the area.

#### Unconsolidated materials.

Except for a few small areas of thin swamp deposits, the unconsolidated deposits are of glacial origin and of varied texture. These are differentiated on the map both as to kinds of materials and land-forms. The principal categories are textural, the areas underlain chiefly by coarse granular materials (in large part of cobble and pebble gravels) are indicated by shades of green, those chiefly of medium textured materials (largely of well-bedded sands and subordinate interbedded pebble gravel) are indicated in shades of orange, those chiefly of fine materials (fine sand and silt) are indicated in shades of yellow, and those of greatly variable texture (till, a heterogeneous and unsorted mixture of materials ranging from boulders to clay sizes) are indicated in brown. Thus the colors indicate at a glance the general areas in which granular deposits of the various types may be found.

#### Relation of land forms to kinds of materials

As the continental glacier advanced over the area, preexisting soils were scraped up, and part of the bedrock was abraded. As the ice melted some of these materials were left as an irregular, unsorted deposit of till (ground moraine) and some were sorted by meltwaters and deposited as gravel, sand, and silt. Thus the till was left both on hills and in valleys. The

sorted gravel, sand, and silt were deposited within and partly filled the valleys. Such sorted, water deposited materials go under the general name of outwash, and constitute various characteristic land-forms, such as ice-channel fillings (eakers), kames, kame terraces, and outwash.

For the most part coarse granular materials are to be found in the ridge-shaped deposits (ic) and hillocks or knobs called kames (k, ~~or kf~~); such deposits are likely to contain many boulders. Some parts of kame terraces contain small amounts of coarse gravel.

Medium textured granular materials (sand and pebble gravel) are more typical of kame terrace deposits (kt); in these boulders are sporadic. Such deposits lie along the walls of valleys well above the valley floors. These materials are also predominant in broad low areas of outwash (ow<sub>2</sub>). In kame terraces and outwash plain (op) areas, the predominant material is well-sorted sand, but intercalated thin beds of fine gravel are common.

Fine sand and silt are characteristic of certain areas of outwash deposits (ow<sub>3</sub>) that show no distinctive land-forms, but constitute broad plain-like areas or broad low sloping areas, in the larger valleys.

Ground moraine areas (ga) have varied topography and comprise the higher hills. The material composing the ground moraine is unsorted and contains all textural sizes from clay to boulders. Some tills are notably compact but the till of this area is somewhat more open textured than is commonly true of tills elsewhere, and sufficiently loose to be used for backfill. Boulders of all sizes are common.

### Specific sources of granular materials

Gravel.—The outwash plain area ( $ow_1$ ) in the vicinity of Kitts Corner consists in large part of interbedded gravels and coarse sands, and beds containing a large percentage of cobble gravel (4 to 10 inches in diameter) are exposed near Kitts Corner School.

Gravel may also be found in places in the kame terrace (kt) on the south and east side of Hungry Hill.

Coarse granular material may be found as small lenses in a few places along the south side of Mishnock Pond, but probably little if any is to be found elsewhere between the kame terrace on the side of Hungry Hill and the vicinity of Phelps Pond. Several gravel pits around Phelps Pond expose interbedded pebble and cobble gravel with a very coarse sand matrix. Buried boulders 3 to 4 feet in diameter are common <sup>in these pits.</sup> in places. Gravel may probably be found at many places in the part of the kame terrace (kt) north of Phelps Pond, but sand is abundant in this deposit.

Gravel pits in the part of the outwash ( $ow_1$ ) between Shippeetown Road and Moosehorn Road are now abandoned but still contain a considerable amount of gravel. Test pits and natural exposures indicate that this is an excellent source area for coarse granular material. However, large boulders that are abundant throughout this area may hinder the operation of gravel pits.

Medium to coarse sand.—Gravel beds are commonly underlain by medium or coarse sand, and pits opened chiefly for gravel may also become an adequate source of sand. Beds of medium to coarse sand are widespread throughout the area, although many of them contain minor amounts of pebble gravel. The outwash area, ( $ow_2$ ), south of Kitts corner and along Burnt Sawmill Road is

probably the largest source of supply. Medium to fine gravel is present throughout much of the large kame terrace on the south side of Division Street, in the outwash plain northwest and north of Mishnock Pond, and in the outwash plain southeast of Tiogue Lake at the intersection of Greenwich Avenue and New London Turnpike.

Fine sand, silt, and muck.--Mishnock Swamp and the swampy bottom of Carr River and Big River are composed chiefly of sandy, silty muck underlain in most places by fine sand and silt. The low outwash areas ( $ow_3$ ) which have no characteristic topographic form are composed chiefly of fine sand and silt. The thick deposit of fine sand and silt exposed in the large pit between Mishnock Pond and Division Street is unusual in that it is part of a kame terrace, a glacial form which is ordinarily composed of coarser granular material.

Unsorted granular material.--Most of the source areas for unsorted granular material (till or ground moraine ( $gm$ )) are located along the eastern part of the line of route. The till is derived chiefly from hard crystalline rock and contains a minor percentage of silt and clay sizes, so that it is suitable for "borrow" material.

In some places in the areas of coarse outwash along Washington Tiogue Road about 1/2 mile east of the New London Turnpike, sorting is poor and the material has many of the characteristics of till. Outwash of this nature may be found.

Estimated thickness of surficial material.--From the information now available, depths of the bedrock surface below the present land surface can be interpreted only in a general way. Wherever deep cuts are to be made, seismic traverses along the line of route are recommended.

The surficial material in the vicinity of Kitts School probably ranges from 20 to 40 feet in thickness according to well data. Toward the intersection of Hocseneck Hill Road and Division Street it becomes thinner. Bedrock is exposed at B.M. 284 and probably rises slightly under Hungry Hill.

No data are available on the depths to bedrock along the line of route between B.M. 284 and a point nearest the southeast end of Mishnock Pond. In the vicinity of Hopkins Hill Road along the proposed highway site, the bedrock surface was reached at depths ranging from 50 to 100 feet in wells. Eastward from here the bedrock surface probably rises to a few feet from the surface under the ground moraine area about 1/2 mile east of Phelps Pond.

Most of the remainder of the area to the east is ground moraine; outcrops are common and the bedrock surface should be within a few feet of the surface.