ENVIRONMENTAL IMPACT ANALYSIS

PERTAINING TO WETLAND ALTERATION

BIBLE ROCK BROOK

MIDDLETOWN ,CT.

BAYSTATE ENVIRONMENTAL CONSULTANTS INC.

LIST OF FIGURES

I. SITE LOCATION/GEOGRAPHIC SETTING/PRESENT LAND USE

The Crele Construction Co. is located approximately 4.5 miles southeast of the City of Middletown along the northeast edge of Connecticut Route 9 in south central Connecticut. The site occupies a 6.0 acre parcel of land situated along the east side of Bible Rock Brook and between Interchange #10 on Route 9 and Old Saybrook Road (see Figures 1 and 2).

At the present time, two buildings are present on the site having lot frontage along Old Saybrook Road. Each of the buildings are utilized by the Crele Construction Co. for repair and maintenance of construction related equipment, or storage of parts and supplies which are used by the construction company. Additionally, the larger of the two buildings contains office space for the Crele Construction operations.

All of the land area east of the old dirt road and at the highest elevations on the site is presently graded and used for parking of numerous construction related equipment. Field observations indicated that at any given time, a number of different types of equipment are parked varying with uses and needs of the Crele Construction Co. Equipment observed are listed below but not limited to the following.

1 Heavy duty Caterpillar bulldozer
1 Front end loader
3 Truck cabs - 10 wheel
3 Oil trucks
Several 30 c.y. dump trucks
2 Large flatbed trailers - 8 wheel
1 Backhoe
2 40 ft. long demolition trucks
1 U.S. Air Force fuel tanker

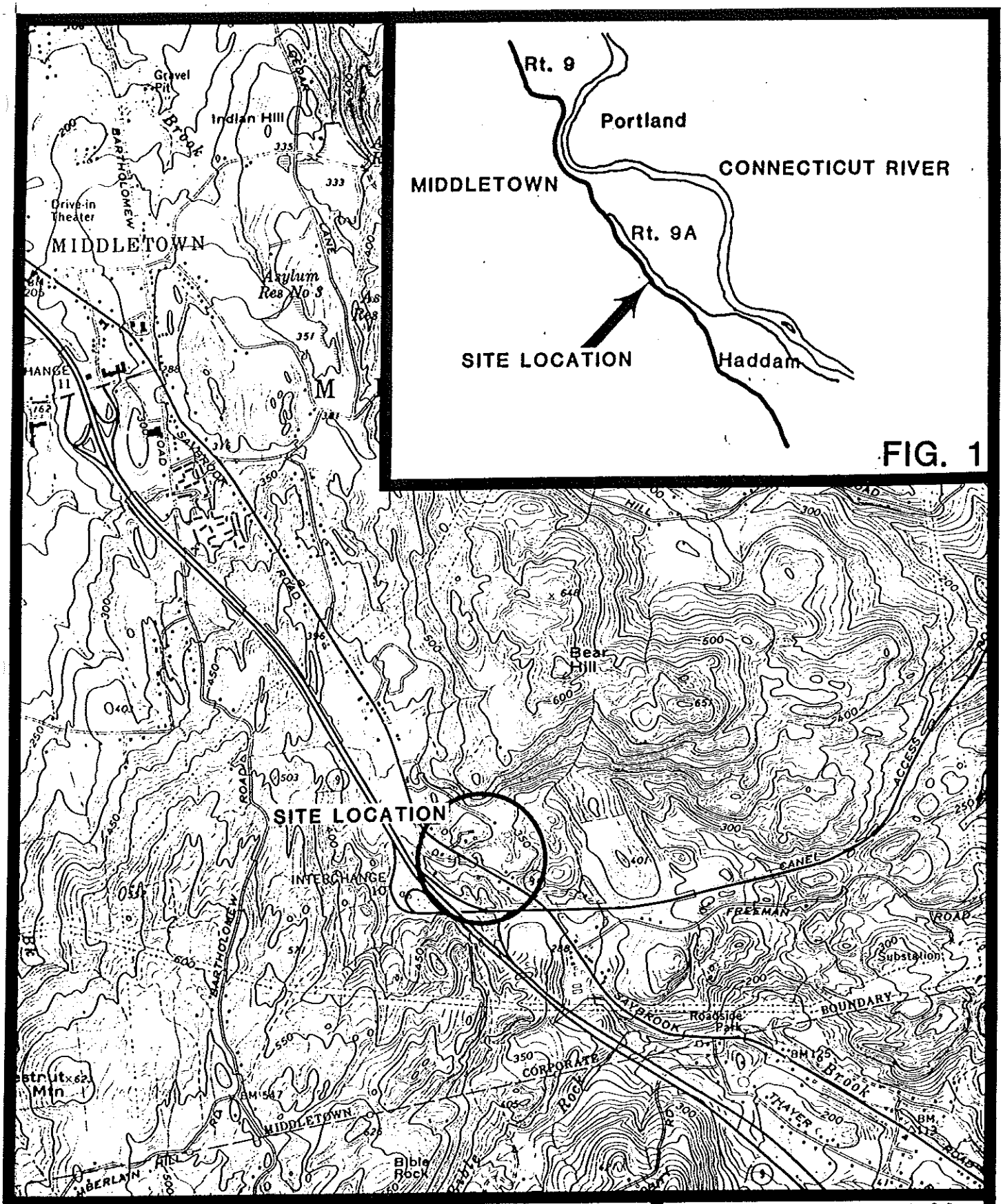


FIG. 1

SITE LOCATION MAP

U.S. MIDDLE HADDAM QUADRANGLE

SCALE

1" = 2000'

FIG. 2

The larger of the two buildings serves as a repair/maintenance garage, containing four large service bays and appurtenant supplie storage areas. This area is presently being used as the main service area, while the smaller and older building contains three service bays and is apparently used for storage.

The Crele Construction site also contains fuel and oil supply pumping capacity to maintain equipment operation. Two underground storage tanks are present extending in a southerly direction adjacent to the southern edge of the largest building. Storage tank details are listed below.

1 Diesel fuel storage tank and pump, 4,000 gal. capacity.
1 Fuel oil storage tank and pump, 5,000 gal. capacity.

The Crele Construction Co. presently utilizes waste oil from equipment maintenance by burning the oil as heating fuel to warm the garages during winter months. The oil is collected in 55 gallon drums in the larger garage and transferred to a larger 300 gallon tank situated at the rear outside of each building. Additionally, each bay in the garage has a drain which collects waste generated during repair and manintenance procedures. The waste is comprised of liquid fuels, hydraulic oil, oil, grease, and solid refuse, and is piped to a dry well located outside the garage in the area of the fuel storage tanks. Additionally, a surface drain is present along the front edge of the garage which collects drainage from the graded area in front of the garage and diverts it northward and then westward around the garage via an asphalt swale to the top of slope (see Figure 6).

Sanitary sewer needs of the Crele Construction site are provided for by means of an on-site septic system. The septic tank is located between the two buildings and adjacent to the edge of slope (see Existing Site Map, Figure 6, rear pocket).

The lower portion of the site between the old dirt road and Bible Rock Brook has been extensively altered from its previous condition. Much of the land is graded and remains as exposed soil, while the southern portion of this area is used as a storage area for logs and various types of soils which are utilized as needed for construction purposes.

At the present time, logs are stockpiled in three different locations on the site (see Figure 6). At any given stockpile, logs 15-25 ft. in length, having diameters ranging from 6-8" and 1-2 ft., exist. Log piles are approximately 15-20 ft. high and 100-150 ft. in length. Logs are stored on the site and periodically transported from the site as needed by Crele Construction Co. for designated use.

II. SITE TOPOGRAPHY, SOILS & UNDERLYING GEOLOGIC CONDITIONS

A. Existing Conditions - Topography/Soils & Geologic Conditions

Topography

The Crele Construction site has a distinct two level terrace appearance having maximum surface elevations of 373 ft± above sea level at the garage and parking area, and a minimum surface elevation of 334 ft± above sea level along the southwestern edge of the property adjacent to Bible Rock Brook (see Figure 6). As previously stated, the lower graded portion of the site extends from the old dirt road to the edge of Bible Rock Brook. The land in this location is relatively flat, with the exception of where the graded fill abuts natural land along Bible Rock Brook (see Figure 6). Along the periphery of the graded area, the fill slopes are approximately 1:1, 1.5:1 & 5:1 with a height of exposed fill of approximately 10 to 12 ft. The lowest areas on the site occur in and around Bible Rock Brook. This area extends from the edge of fill southward and is bounded by elevations of 340 ft±. Both of these areas are truncated to the southwest by a 40 ft± fill embankment for Connecticut

Bedrock

The Crele Construction Co. is situated in an area where the topography and surface of the ground is controlled to a large extent by the underlying bedrock (ledge). Bedrock is present at, or within, a few feet of the ground surface throughout much of the site and adjacent lands. For example, large continuous

outcroppings of bedrock exist southwest of the site along highway cuts at Interchange 10, Connecticut Route 9. Additionally, bedrock is exposed at numerous localities along the south slopes of Bear Hill just northeast of the site. One particular bedrock exposure of interest is the 700 ft. highway cut for Old Saybrook Road, directly across the street from the Crele Construction garages (see Figure 3).

A 15-20 ft. vertical cut into bedrock is present here exposing a rusty orange brown and sooty bluish black weathered metamorphic crystalline mica schists and granite pegmatite. Bedrock is also exposed at numerous places in and around the drainage course of Bible Rock Brook on the site. The bedrock exposures here to a large part control the drainage pattern for Bible Rock Brook with the brook winding around isolated bedrock knobs upstream and downstream of the site.

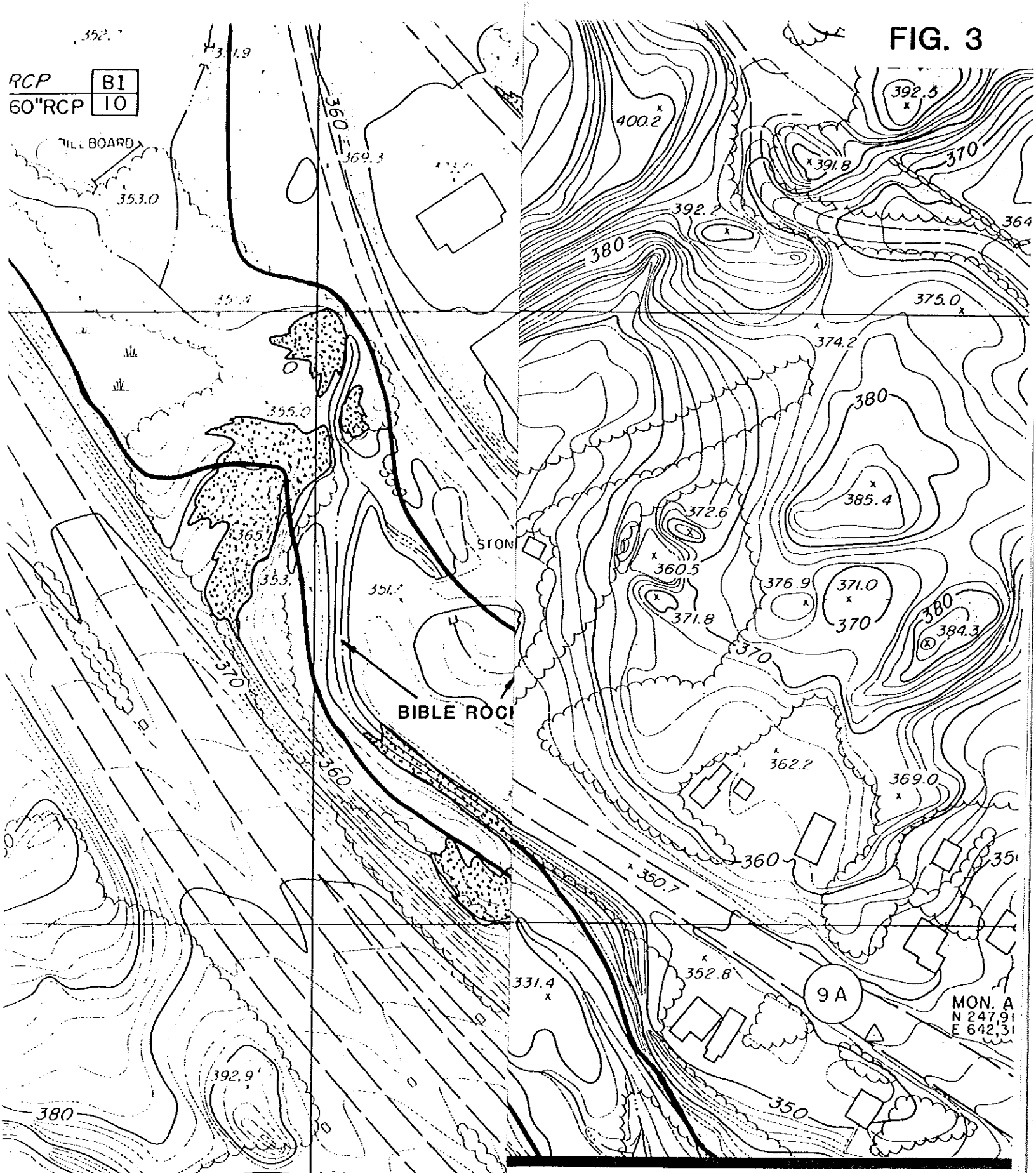
Additional exposures of bedrock exist in the parking area at grade and in small isolated patches (see Figure 3).

Throughout the site, a foliation is present in the bedrock having a strike approximately N80W, dipping 20-30° toward northeast.

Soils

The entire site contains two basic soil types which developed either directly on the surface of bedrock, or on a thin layer of glacial till which was derived from the bedrock existing in the area.

FIG. 3



EXISTING SITE CONDITION & GEOLOGIC MAP

scale 1"=100'

Poorly drained Leicester Soils (LG) are present at lower elevations on the site, particularly adjacent to Bible Rock Brook. Leicester Soils are extremely stony, fine sandy loams which developed on glacial till (see Figure 4 & 5). Rock fragments are numerous throughout the soil in amounts ranging from 5-30%. Fragments are subrounded to angular in appearance, and consist of pebbles, cobbles and boulders of granite, gneiss, and rusty weathered mica schists.

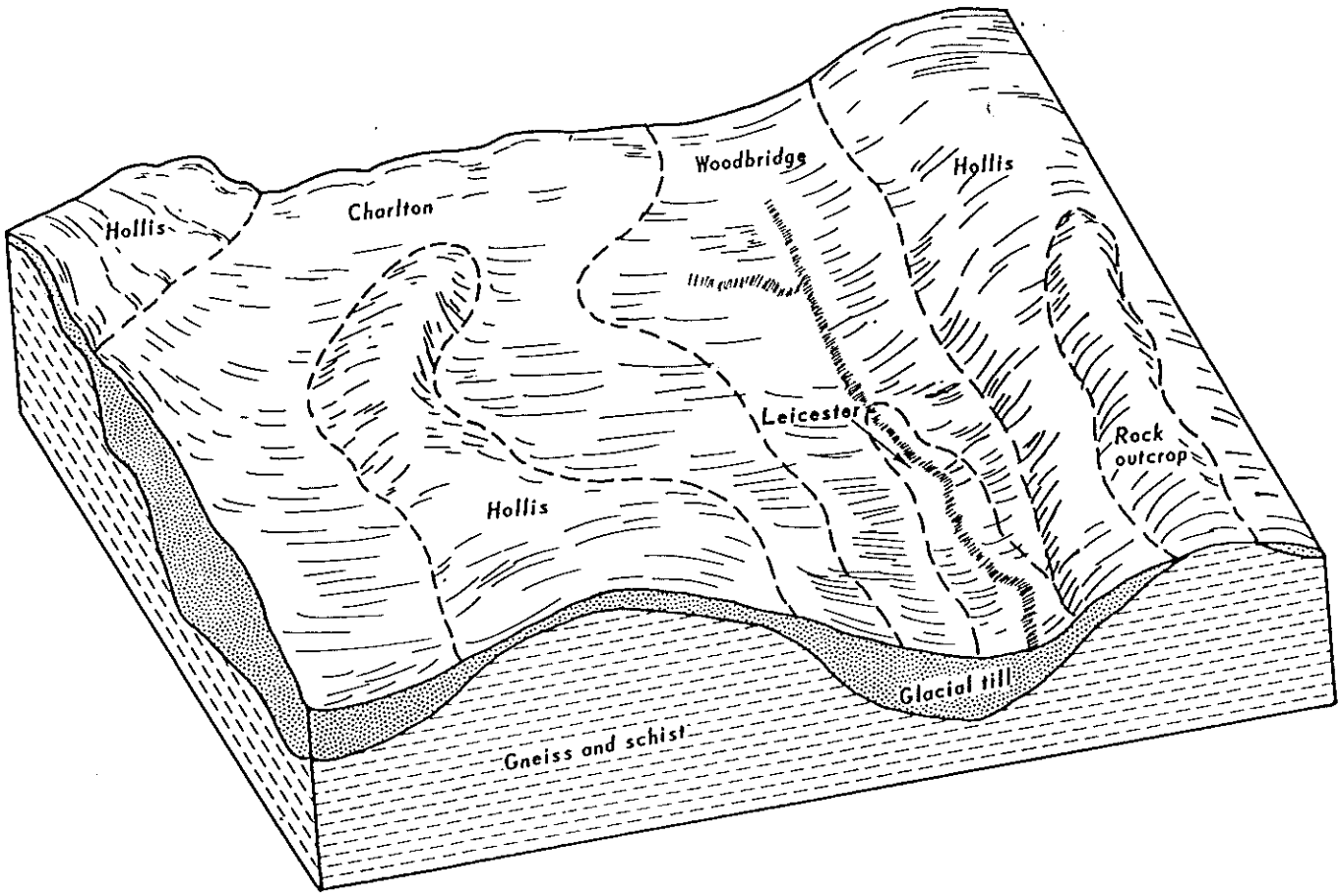
Adjacent to the Leicester Soils are Hollis Rock Outcrop Soils (HSE) throughout the site. Such soils exist at higher elevations at the site where bedrock is at, or within, a few feet of the ground surface. Hollis Soils developed on a thin mantle of glacial till, or bedrock, being very similar to Leicester Soils in composition, but having a somewhat excessively drained capacity as contrasted to the poorly drained nature of Leicester Soils (see Figure 5). Hollis Soils consist of very stony fine sandy loam having abundant weathered rock fragments. At the Crele Construction site, the Hollis Soils are mixed with altered filled land and blasted rock fragments.

Artificial Fill

Approximately 3.1± ac. of the lower graded area on the Crele Construction Co. site exists as filled land. It is important to note that the fill is comprised of numerous type of soil, rock and unnatural material, and the character of filled land changes from one location to another across the site (see Existing Site Condition Map, Figure 6).


SOILS MAP
scale
North
¼
0
2 000
1 000
0
MIDDLETON
BEAR
Rock
Brook
Bible
HrC
HSE
Rp
CrC
LG
HpE
WzC
PbD
WxB
UD
Aa
PdC
PdB
PeD

FIG. 4



SCHEMATIC DIAGRAM DEPICTING SOILS UNDERLYING THE SITE AREA

SOURCE: U.S. SOIL CONSERVATION SERVICE

FIG. 5

Figure 6 illustrates the areal extent and distribution of different types of fill and delineates the location of four test pits which were excavated into the fill to determine its character.

The area of fill can be characterized as having a total area volume of 15,175± c.y. which varies greatly across the site. The largest thicknesses of fill occur along the southern limit of encroachment where fill is adjacent to natural ground. At this area and throughout this edge of the fill the thickness ranges from 3 to 12 ft. The soil is comprised primarily of a light brown medium-coarse sand and fine-coarse gravel. Gravel fragments consist of cobble sized mica schists, pegmatite, granite, red sandstone and/or siltstone, amphibolite, chlorite schists and traprock. Additionally, numerous 4-5' boulders of granite, pegmatite, gneiss and schist are present. Many of these appear freshly broken from blasting activities. The edge of filled land here also contains appreciable amounts of demolition materials and relatively unclean or unnatural artificial debris normally associated with construction projects. Such materials are comprised of the following materials:

Rusty, contorted and twisted concrete reinforcing rods protruding from the soil, 1/2-1" in diameter.

Wood pieces and slash.

Granite street curbing.

Broken glass.

Whole and broken brick.

Cement manhole tops and sidewall blocks.

Crushed 55 gal. drum.

Asphalt slabs.

Steel plumbing parts.

R.C.P. piping.

Broken clay pipe.

Tires.

6' Diameter rusty fuel storage tank.

Tar paper.

Large cement blocks and sidewalk slabs.

By contrast, the fill attains a minimal thickness where it exists adjacent to the Bible Rock Brook upstream of the small waterfalls for a distance of approximately 200 ft.± (see Figure 6). Here, bedrock is exposed in the bed of the brook and along both sides of the brook in a 405' cut, with fill thicknesses ranging from 0-1 ft. Upstream from this area, the thickness of fill gradually increases to 4 or 5 ft., and is essentially comprised of unsuitable material listed above.

Test pits in the central portion of the graded area indicate that three distinct layers of fill exist. Test pit excavation was extremely difficult because of numerous cobbles, boulders, and the degree of compactness of the soil. At least two of the test pits encountered large boulders, or possibly bedrock. Pits 1 and 4 indicated that a basal fill layer exists at depths ranging from 8-36" and 16-40" in depth. Fill consisted of medium-coarse sand and fine-coarse gravel and freshly broken rock. A 7-10" layer of red brown stony silt loam was observed

overlying the lower fill material. The silt loam was very compact and separated from the lower fill by a sharp boundary indicating that the material was spread and graded over the lower fill (see Figure 6 for test pit locations).

At Test Pit 1, an additional 6" layer of brown medium-coarse sand and fine-medium gravel was present. Each of the 3 test pits in the central filled area contained clean sand and gravel, or broken rock fill, and did not contain demolition debris or any other unnatural or artificial materials included in the previous list.

The southeastern area of fill, next to the old dirt road, serves as an active storage area for large quantities of clean fill soil which are used for various construction projects by Crele Construction Co. (see Figure 6). Fill types include approximately 15± loads light brown fine-coarse sand containing abundant clam shell fragments, 12 loads of brown coarse sand, 20-30 loads of a red brown coarse sand and fine gravel, two loads of organic topsoil loam, distinct cow manure odor, and one small pile of gray pea gravel. Total estimated volume of this fill is approximately 500± c.y.

B. Previous Site Conditions

Throughout this report, previous site conditions for the Crele Construction Co. were determined using a combination of field investigations, existing topographic maps contained within the City of Middletown Wetland and Storm Drainage Report, 1980, and a series of aerial photographs of the site made available

from the U.S. Soil Conservation Service in Haddam, Connecticut for the years 1979, 1980, 1982 (see Figures 7a, 7b, & 7c).

Altered Land Areas

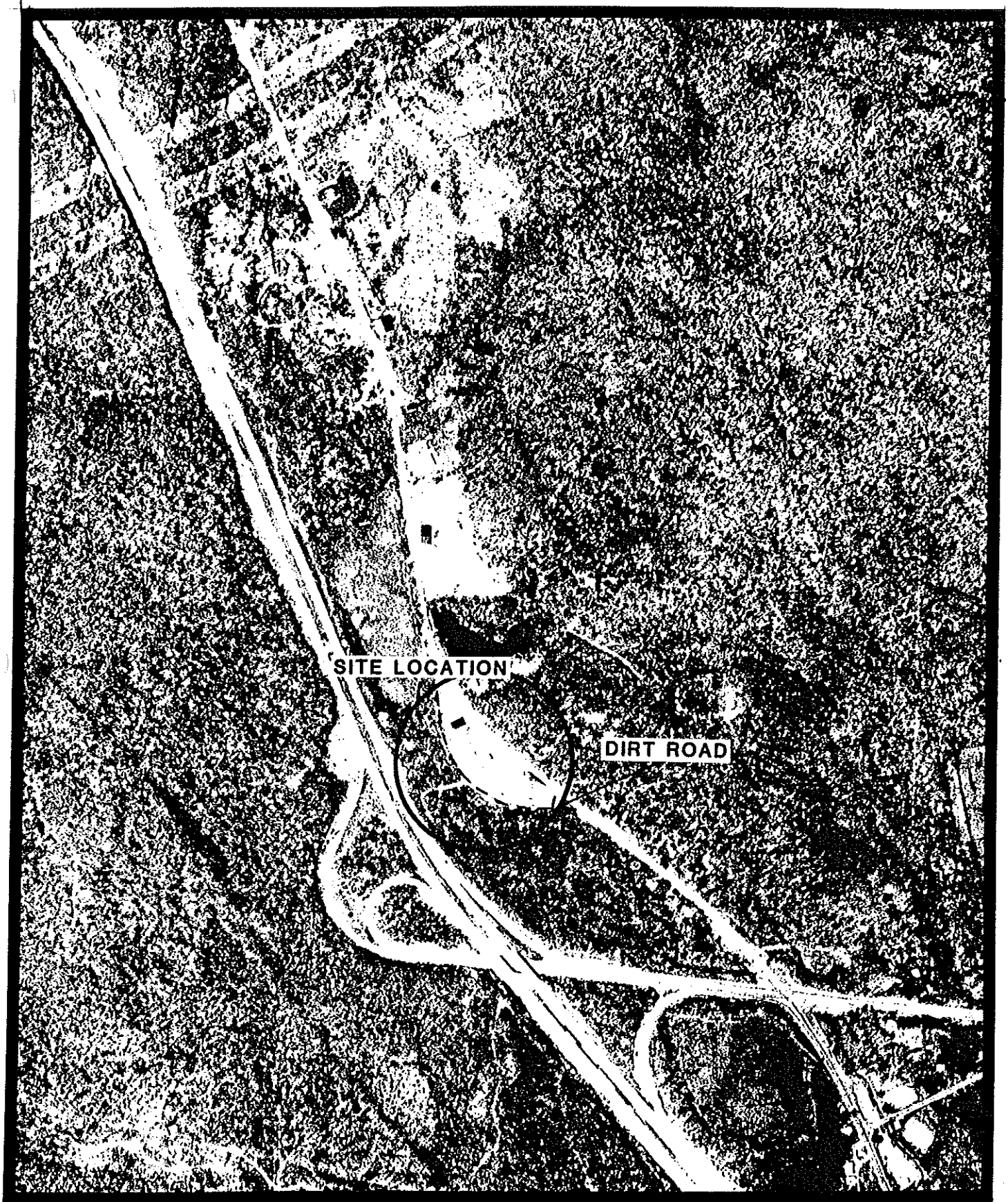
BEC, Inc. findings indicate that much of the natural pre-existing land surface at the lower elevations on the site southwest of the old dirt road, in and adjacent to Bible Rock Brook, has been altered by the placing and grading of fill (see Figures 4 and 6).

Additional alterations of the land surface include a deepening and incisement of the bed of Bible Rock Brook for a distance of 200± ft. upstream of the small waterfalls. This was accomplished by blasting and excavation of the bedrock surface at this locality.

The upper elevations of the site also experienced some alteration in the ground surface at a few isolated areas in the parking area and adjacent to Old Saybrook Road. Prior to this alteration, a few areas existed where bedrock exposures extended above the elevation of the parking area (see Figure 4), to as much as 30± ft. in height.

At each of these areas, the rock was blasted and excavated to provide a suitable grade surface. The excavated material was later used as part of the fill which was placed along and adjacent to Bible Rock Brook.

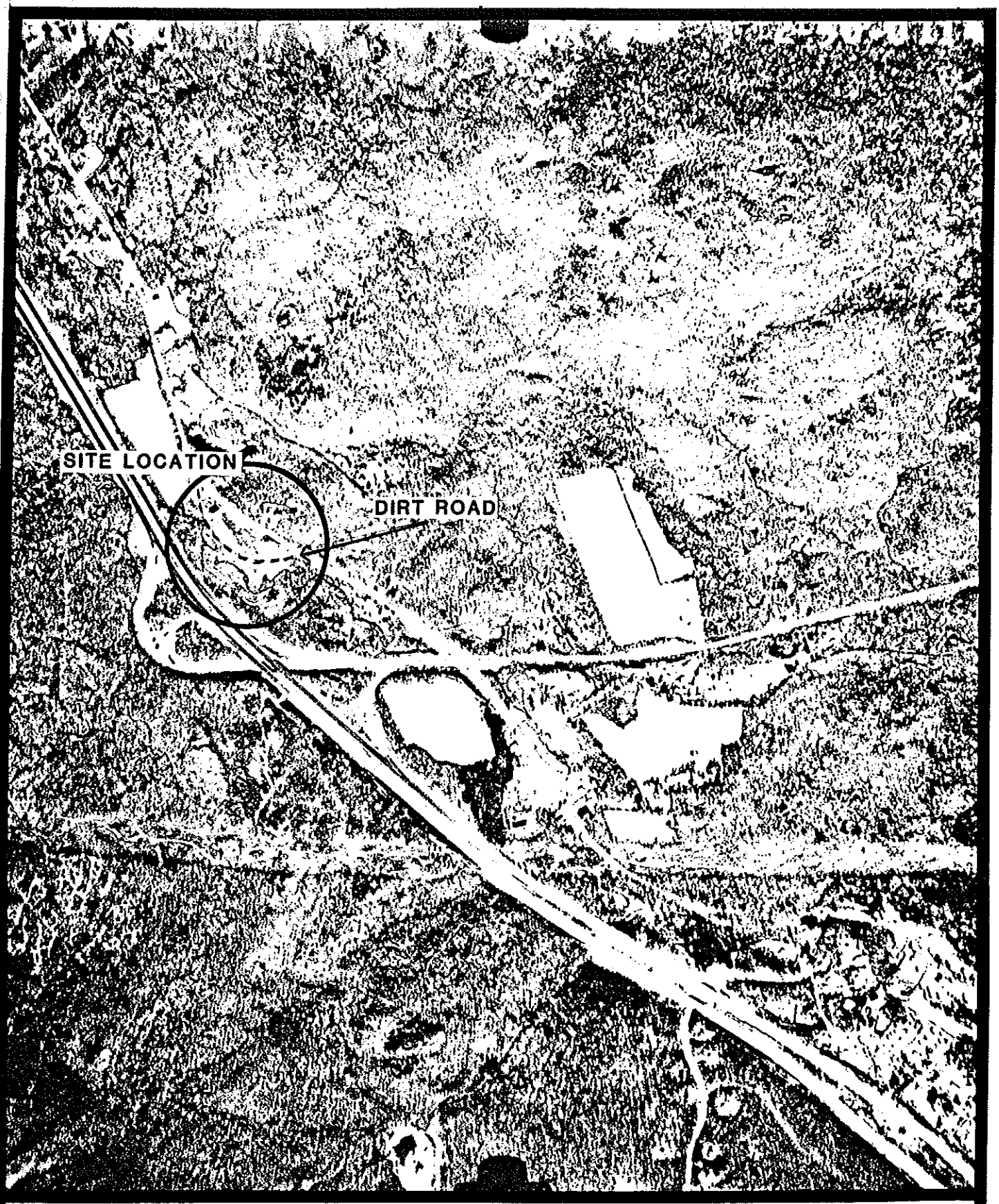
Finally, there exists one smaller portion of the site where the land surface has been changed from its previous



1976 AERIAL PHOTOGRAPH

SOURCE: U.S. SOIL CONSERVATION SERVICE

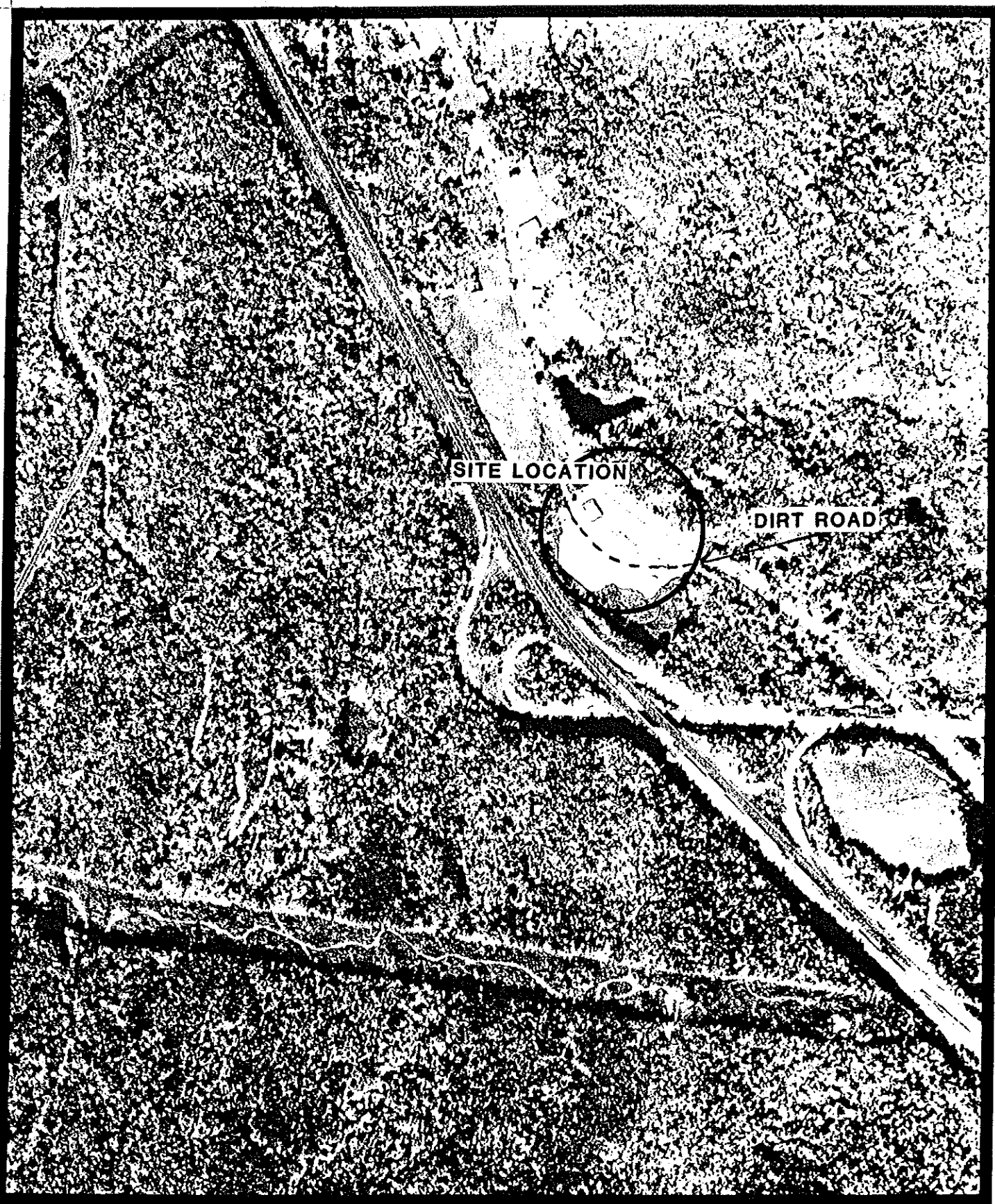
FIG. 7a



1980 AERIAL PHOTOGRAPH

SOURCE: U.S. SOIL CONSERVATION SERVICE

FIG. 7b



1982 AERIAL PHOTOGRAPH

SOURCE: U.S. SOIL CONSERVATION SERVICE

FIG. 7c

condition. Figure 6 indicates that in the area just upstream of the confluence for the previous Bible Rock Brook drainage way and the reloacted channel a series of fine-coarse gravel bars exist in the bed of the brook. The gravel bars are approximately 5-20 ft. in length occupying the central portion of the brook and having thicknesses extending from the bed of the brook to as much as 1-2 ft. Gravel in the bars consists of broken angular fresh rock and subround-round gravel of mixed rock types. It is our professional opinion that the gravel bars have been deposited during high flows from source areas in the previously described loose and exposed material in the area of the small waterfalls on the site.

III. SITE DRAINAGE

A. Existing Conditions - Site Drainage/Watershed and Hydrology of Bible Rock Brook

Site Drainage

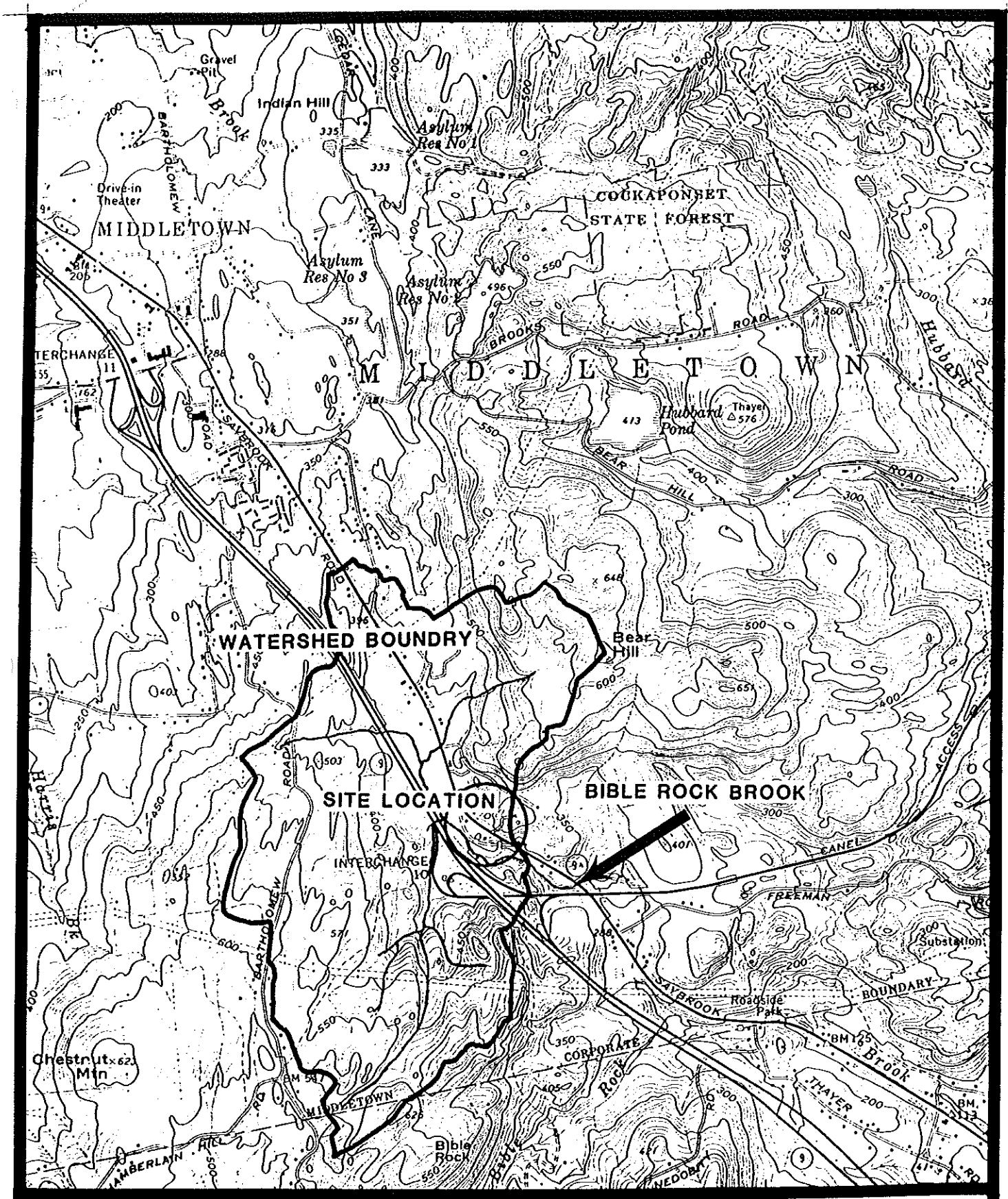
At the present time the underlying site conditions are such that most of the site is underlain by bedrock at or very near to the surface of the ground.

Additionally, storm runoff for the entire site is directed to lower elevations along Bible Rock Brook and away from Old Saybrook Road. Both of these conditions create a situation whereby a very large percentage of precipitation falling on the site during a given storm is discharged as interflow through the soil or as runoff to Bible Rock Brook at the site.

Upstream Watershed Area

Bible Rock Brook is the only brook which passes through the Crele Construction Co. site. The brook at this site is only one of numerous tributaries which flow from the highlands along the southwest and northeast sides of Connecticut Route 9 down to lower elevations at the site and then in a southeasterly direction through Haddam and to the Connecticut River shortly thereafter (see Watershed Map, Figure 3).

The entire watershed which contributes to Bible Rock Brook at Haddam is approximately 3,460± acres; however, only 1,026± acres of this, or one-third, acts as the watershed for the brook upstream from the Crele Construction site. The watershed for Bible Rock Brook upstream of the site consists primarily of



SITE WATERSHED AND DRAINAGE MAP

U.S.G.S. MIDDLE HADDAM QUADRANGLE

SCALE

1"= 2000'

N

FIG. 8

high hills and small crags where slopes commonly range between 8-50%. Much of this area is underlain by very tight glacial till soils (Hydrologic Soil Group D) existing as a thin veneer over a crystaline, igneous and metamorphic bedrock surface. Bedrock outcrops are numerous throughout the higher elevations of the watershed, with much of the land existing in a neavily wooded forested condition.

Although the watershed area that contributes to flows in the Bible Rock Brook at the site may be considered flashy in terms of the storm water retention capability, a 100 year storm flood elevation is not indicated along Bible Rock Brook throughout the Crele Construction Co. site. Additionally, the storm water drainage study for the City of Middletown indicates that major flooding problems have not been reported as occurring at or downstream of the site.

B. Previous Site Conditions

Site Drainage

Prior to filling of the land adjacent to and around Bible Rock Brook, drainage of the site was nearly the same as it is now. Filling of the land and subsequent relocation of the brook has resulted in increasing the amount of time required for surface storm runoff to enter the brook. This has been accomplished by grading the surface of the fill area with a thin layer of fine to coarse sand and fine to medium gravel. Prior to this, storm runoff entered the brook at the edge of the old dirt road without being retained in the fill layer.

Aerial photograph 7b and Figure 4 indicate that Bible Rock Brook in the area adjacent to the site had a braided stream pattern, with at least 2-3 recognizable flow channels (see Figure 4). It appears that the northeastern channel was filled over and abandoned, while the southwestern channel was excavated to handle the flow for the entire brook entering the site.

Hydrology

Prior to placement of fill on the lower portion of the Crele Construction Co. site, Bible Rock Brook flowed in two channels through the site. The flow diverged approximately 100 ft. northwest of the site and converged on the site approximately 700 ft. downstream. The east branch of the brook flowed under a gravel access road via a 5'x7' corrugated metal pipe. The capacity of this culvert was 200 cfs. Placement of the fill has restricted the flow to the west branch.

A hydraulic analysis was carried out for Bible Rock Brook for conditions prior to the placement of fill and for present conditions on the site. The peak flow for the 100 year flood is approximately 770 cfs. This value was calculated for a point downstream of the site and is taken from a report entitled, "Comprehensive Drainage Study", prepared by Purcell Associates for the City of Middletown, dated July, 1982.

Hydraulic analysis indicates that prior to filling the site, the 100 year flood elevation of Bible Rock Brook on the site was approximately 352 ft. Placement of the fill has increased the 100 year flood elevation to approximately 354 ft.

Despite the increase in the flood elevation, the existing channel has the capacity to contain the 100 year flood. The areal extent of flooding that would occur on the site has been reduced by placing the fill. There is, however, a slight loss of flood storage due to the fill. The volume of this flood storage is small relative to the total volume of runoff for the upstream watershed and its loss results in an increase in downstream peak flow of less than 1% for the 100 year flood.

Restricting Bible Rock Brook to flow in a single channel has resulted in an increase in the localized velocity during storm conditions. This increased velocity has the potential of eroding the stream channel. The channel should be inspected periodically for signs of erosion and all locations subject to erosion should be armored with riprap.

IV. WATER QUALITY

During the spring of 1983, water quality samples were taken at various localities upstream, on, and downstream of the Crele Construction Co. site. Water samples were taken on both wet and dry periods of April 8 and May 5 (see Figure 6 for locations of samples taken).

Results of water quality analysis indicate that during both wet and dry sampling periods, the water quality upstream and downstream of the site meets Connecticut water quality standards and still is considered as Class B water (see results of water quality analysis, Figures 9a, 9b, 9c).

By contrast, two areas are present in and at the edge of the lower filled land where a notable difference in water quality occurs. Field observations indicated the presence of small seeps of water emerging from the soil at two different locations. One seep is located at the toe of slope for the southern limit of fill, along the wetland boundary (see Figure 6). At this location water is present, emerging from under the fill and having a distinct turbid, rusty-orange color and sulfide odor. It appears that the location of the seep coincides roughly with the flow direction of the previous brook channel which was filled over. Water emanating from this area collects in stagnant shallow pools within a previous brook channel before flowing into the existing brook further south.

Test results on this water indicates that water flowing from the seep clearly does not meet Connecticut water quality

SAMPLE TAKEN UP STREAM OF THE SITE

		WET	DRY
Lab Number		C 4301	C 4654
Collector		Client	Client
Date Analyzed		4-12-83	5-16-83
Total Solids	mg/l	95	53
Turbidity	N.T.U.	0.77	7.0
Color	Units	20	15
Conductance	Micromhos	80	86
Suspended Solids	mg/l	2	1
Volatile	mg/l	2	1
Fixed	mg/l	0	0
Phosphorous @ P	mg/l	0.04	0.01
Iron	mg/l	0.05	0.09
Copper	mg/l	0.01	0.00
Chromium	mg/l	0.00	0.00
Chloride	mg/l	12.5	11.0
Hardness	mg/l	22	4
Phenol	mg/l	0.00	0.05
Ammonia @ N	mg/l	0.04	0.24
Nitrate @ N	mg/l	0.36	0.00
Sulfate	mg/l		1.6

FIG. 9a

SAMPLE TAKEN AT THE SITE

		WET	DRY
Lab Number		C 4302	C 4656
Collector		Client	Client
Date Analyzed		4-12-83	5-16-83
Total Solids	mg/l	84	61
Turbidity	N.T.U.	0.72	8.0
Color	Units	20	10
Conductance	Micromhos	90	90
Suspended Solids	mg/l	0	1
Volatile	mg/l	0	1
Fixed	mg/l	0	0
Phosphorous @ P	mg/l	0.01	0.01
Iron	mg/l	0.08	0.13
Copper	mg/l	0.00	0.00
Chromium	mg/l	0.00	0.00
Chloride	mg/l	15.5	12.5
Hardness	mg/l	22	138
Phenol	mg/l	0.00	0.05
Ammonia @ N	mg/l	0.05	0.20
Nitrate @ N	mg/l	0.51	0.08
Sulfate	mg/l		2.0

FIG. 9b

SAMPLE TAKEN DOWN STREAM OF THE SITE

		WET	DRY
Lab Number		C 4303	C 4658
Collector		Client	Client
Date Analyzed		4-12-83	5-16-83
Total Solids	mg/l	100	65
Turbidity	N.T.U.	1.4	0.82
Color	Units	20	20
Conductance	Micromhos	95	100
Suspended Solids	mg/l	10	1
Volatile	mg/l	10	0
Fixed	mg/l	0	0
Phosphorous @ P	mg/l	0.01	0.00
Iron	mg/l	0.11	0.11
Copper	mg/l	0.01	0.00
Chromium	mg/l	0.00	0.00
Chloride	mg/l	17.0	14.5
Hardness	mg/l	24	246
Phenol	mg/l	0.00	0.05
Ammonia @ N	mg/l	0.04	0.16
Nitrate @ N	mg/l	0.44	0.00
Sulfate	mg/l		1.6

FIG. 9c

standards. Figure 9d lists those parameters tested which were in excess of Connecticut water quality criteria.

A second seep locality is present along the toe of slope behind the two garages, and along the east edge of the old dirt road (see Figure 6). Water at this locality has a similar rusty-orange turbid color to the previous location. Field observations indicated that water seeping from the hill along the old dirt road flows in small rivulets westward and into Bible Rock Brook. In addition, the bed of the brook at this area is coated with a rusty-orange iron precipitate. This ion oxide coating is extremely localized being restricted to the immediate discharge area. Water at this seep apparently contains lower concentrations of iron compared to the earlier noted one, but does contain notably higher amounts of ammonia

Inasmuch as both seep areas contain water having concentrations of the various parameters tested in excess of Connecticut water quality criteria, it is important to note that neither of the two sources of water have caused a degradation in water quality downstream of the site. This is most likely because water emanating from the seeps is being renovated by soils or wetland vegetation in and along the paths of flow and is then diluted by mainstem flow. Field observations on June 17 indicated that much of the turbid rusty-orange water, at least from the southern seep, is being dispersed and diluted upon entering Bible Rock Brook at the confluence of the previous channel.

SAMPLES TAKEN AT SEEP LOCALITIES

		LOCATION 1		LOCATION 2
		WET	DRY	DRY
Lab Number		C 4304	C 4657	C 4655
Collector		Client	Client	Client
Date Analyzed		4-12-83	5-16-83	5-16-83
Total Solids	mg/l	651	252	248
Turbidity	N.T.U.	200	640	420
Color	Units	300	300	40
Conductance	Micromhos	460	370	320
Suspended Solids	mg/l	319	250	9
Volatile	mg/l	46	135	9
Fixed	mg/l	273	115	0
Phosphorous @ P	mg/l	0.20	0.25	0.00
Iron	mg/l	14.0	42.	5.26
Copper	mg/l	0.00	0.00	0.01
Chromium	mg/l	0.00	0.00	0.00
Chloride	mg/l	38.0	30.5	15.0
Hardness	mg/l	194	160	24
Phenol	mg/l	0.00	0.10	0.10
Ammonia @ N	mg/l	0.07	0.00	0.96
Nitrate @ N	mg/l	0.73	3.56	0.46
Sulfate	mg/l		48.	16.

FIG. 9d

Because both seep areas contained high amounts of iron, chloride, hardness, ammonia, and suspended solids, it is relatively hard to point to one particular source as being responsible for the water quality observed. Water quality observed for the seep areas most likely is a result of one, or a combination of, several factors present at the site, including but not limited to the following:

High iron and sulfide content of bedrock.

Rusting metal drums within the fill.

Iron demolition debris in the fill.

On-site dry well.

On-site septic system.

Decaying vegetation of the pre-existing area along the brook which is now beneath fill.

Without further extensive site work, it is difficult to pinpoint a particular source, and at this time, it is doubtful if such work is warranted in view of total impact significance.

V. WETLANDS

The existing wetlands on the Crete site have developed as a result of progressive modifications of former streambelt Deciduous Forested Wetlands and can currently be classified into three (3) major categories. These categories include:

1. Disturbed Streambelt Wetland
2. Cleared Deciduous Forested Wetland; now existing as Shrub Wetland
3. Undisturbed Deciduous Forested Wetland

Wetland #1, the disturbed streambelt wetland exists in the southwestern portion of the site and borders the rechannelized stream. This area has been highly disturbed and supports a mix of poorly developed successional growth which includes Red Maple (W) and Quaking Aspen saplings, Speckled Alder (W), Skunk Cabbage (W), Sensitive Fern (W), and various field grasses (see Figure 6).

Wetland type #2 encompasses primarily the southeastern corner of the parcel and is bounded by existing fill on the north and west, an undisturbed wooded buffer between Route 9 and the site on the south, and an undistrubed Deciduous Forested Wetland to the east. Through a field review of remaining stumps and stump sprouts and interpretation of old aerial photographs made available by the S.C.S. in Haddam, it appears that this area was similar to and an extension of the Deciduous Forested Wetland which bordered it on the east, prior to its tree cover being clear cut. Area #2 presently exists as a shrub wetland, a result of the presence of an understory which was not cut and the regrowth of stump sprouts. Although the tree cover has been removed, this area still functions as a wetland due to residual wetland attributes

(W) = Wetland Indicator - Nieiring & Goodwin, Inland Wetland Plants of Connecticut, Connecticut Arboretum

which will improve with time and it should recover with a minimal amount of restoration. Other encroachments in this area include minor earthwork (uprooting and some stockpiling of stumps), deposition of spoil along the rerouted stream creating a man-made dike, and leachate springs emanating from materials placed in the filled wetland to the north.

Existing vegetation includes Red Maple (W), Tulip Tree, Black Willow (W) and Yellow Birch saplings, Speckled Alder (W), Spicebush (W), Broadleaved Cattails (W), Skunk Cabbage (W), Tussock Sedge (W), Soft Rush (W), and Sensitive Fern (W) (see Table 2). It is felt that this area historically (prior to recent filling) extended 320± ft to the west, bordering the buried stream and was defined by the limits of poorly drained soils and wetland vegetation (see Figure 6).

Wetland #3 comprises the downstream eastern segment of the site. This wetland is presently undisturbed and is characterized as a Deciduous Forested Wetland (wooded swamp). Dominant species which are present are listed in Table 3 and include Red Maple, Green Ash, Tulip Tree, Yellow Birch, Highbush Blueberry, Jack-in-the-Pulpit, Skunk Cabbage, and Sensitive Fern.

To summarize existing habitat conditions in wetlands, it is felt that prior to development, approximately 3.0± acres of the site were probably wetlands habitat as defined by vegetation (watercourse wetland under P.A. 155). Of that total area approximately 1.6± acres have been filled, and 1.0± acres have been disturbed but still exist as wetlands to varying degrees. Some 0.4± acres of wetland remain in a natural condition.

VI. WILDLIFE HABITAT

A. Existing Conditions

Presently, the lower area of the Crele Construction Co. site in and along Bible Rock Brook, contains a particular wetland ecosystem which supports various forms of wildlife requiring the habitat characteristics found there.

Although the wetlands analysis for the City of Middletown does not indicate that this wetland is considered an outstanding wetland of the City, there are numerous wetland characteristics present along Bible Rock Brook on this site that can be evaluated and ranked to give the wetland a comparative value rating to compare it with other wetlands. In this study, the Golet & Larson Habitat Evaluation Methodology was used in conjunction with the method utilized throughout the City of Middletown Wetland Analysis. Table 1 indicates rankings which were designated for various wetland characteristics for existing conditions.

While the total score for this particular wetland is 55.5, it is especially important to note the Wetland Class Richness (WCR) and Sub-Class Richness (SCR) as depicted in the table.

As previously stated in Section V - Wetlands, the existing wetland is comprised of at least three classes and perhaps as many as nine or more recognizable sub-classes of habitat. The existence of more than one type of habitat form increases the wildlife potential for this ecosystem. This is especially true when there are abundant low shrubs, tall slender shrubs,

TABLE 1

Habitat Evaluation for the Existing and Previous Wetland

	Assigned Value	Existing Ranking	Previous Ranking
Wetland Class Richness (WCR)	2.0	10.0	7.5
Dominant Wetland Class (DWC)	2.0	10.0	10.0
Size (< 10 ac.)	1.0	5.0	5.0
Sub-class Richness (SCR)	2.5	10.0	8.0
Site Type (SIT)	3.0	12.0	12.0
Surrounding Habitat Type (SUR)	1.0	4.0	4.0
Cover Type (COV)	1.5	4.5	4.5
Total Ranking		55.5	51.0

vines and berry shrubs which provide food, cover and nesting material for wildlife (see Wetland Plant List in Appendix).

Site observations indicated that Bible Rock Brook supports abundant Brook Trout at the site. Trout 6" and 8" in length were observed in deeper pools in the brook traveling in upstream and downstream directions.

Relocation of Bible Rock Brook has resulted in the creation of small waterfalls (see Figure 6). Because of a difference in elevation of 5.0± ft. the falls may act as an obstruction to trout swimming upstream.

B. Previous Conditions

There are several lines of evidence indicating that the previous wetland consisted of a wooded swamp alongside of Bible Rock Brook. Aerial photographs, field investigations of forest stumps in the wetland area, and existing undisturbed wetlands upstream and downstream of the site indicate that the previous wetland did not have the habitat diversity that is present today on the site. However, one must not lose sight of the overall decrease in size by 1.6± ac. from the previous wetland to the existing wetland. Table 1 also indicates a ranked habitat evaluation for the previous wetland on the site.

VII. AESTHETIC APPEARANCE

The single most noticeable change from the previous conditions at the site is its aesthetic appearance. The lower portion of the Crele Consutrction Co. site has undergone a distinct change from prior conditions, while the upper portion of the site has undergone minimal negative aesthetic changes.

Because the site occupies a low area between Connecticut Route 9 and Saybrook Road, it is easily viewed in its entirety, and consequently, subject to the critical eye of the observer.

Prior to alterations at the site, the wetland served as a very effective visual buffer between the highway and the garage area of the site. This natural wooded buffer zone has been removed by clear cutting, thus providing a clear view to activities occurring on the site.

Subsequently, 3.1±acres of the lower portion of the site adjacent to the wetland has been filled leaving 90% of this area as bare exposed soil. Additionally, peripheral edges of this fill are littered with unsuitable and unsightly fill such as demolition materials, 55 gal. drums, tires, etc. Site aesthetics are further aggravated by the new use of the land which allows stockpiling of large timber in three large piles and numerous loads of clean fill. All of these changes in the previous character of the land and wetland have degraded the appearance of the site.

VIII. BRIEF SUMMARY OF CHANGES WHICH HAVE OCCURRED AT THE CRELE CONSTRUCTION CO. SITE

Site work and office analysis of existing conditions for the Crele Construction Co. site clearly indicate that numerous changes have taken place from previous site conditions.

Basically, exposed bedrock (ledge) outcropping at higher elevations on the site near the existing garages has been blasted and excavated to allow a firm and even grade for parking construction equipment. Freshly broken rock and soil was deposited as fill at lower elevations on the site. The entire area of fill depicted on Figure 6 extends from the old dirt road in a southwest direction to the Bible Rock Brook. Thickness of the fill ranges between 2-3 ft. for most of the central portion of the filled area. However, larger thicknesses of fill on the order of a 5 ft. average thickness and ranging up to 10-12 ft. thick exist along the southern limit of fill adjacent to the wetland area.

While the 2-3 ft. thick central area of filled land is comprised of clean compacted sand and gravel, cobbles and boulders, the southern and northern perimeter of the fill contains appreciable amounts of unsuitable materials and/or demolition debris.

At the present time, the newly graded filled area is used as a storage area for sawmill ready logs and numerous piles of clean fill of different types which are used as needed by Crele Construction Co. projects.

Prior to filling and grading of the area along Bible Rock Brook, the flow of the brook was diverted to an existing western branch, as the eastern branch of Bible Rock Brook was filled over. Additionally, the bed of the western branch was deepened and straightened by blasting and excavating bedrock and soil in the brook.

Site investigations and aerial photographs indicate that the entire previous wetland along Bible Rock Brook existed as a wooded deciduous forested wetland. At the present time, the wetland exists as a shrub swamp, having numerous closely spaced tree stumps from a previous wooded cover which was clear cut prior to filling. Approximately 1.6± ac. of the previous wetland are now overlain by fill on the order of 12,400 c.y.

Finally, while 1.6± ac. of wetlands have been filled, the remaining wetland area appears to have a slightly higher habitat diversity. Abundant shrubs, vines, grasses and berry producing plants, in combination with a surrounding wooded cover and the presence of the brook, all provide a rich mixture of life forms which are especially attractive to wildlife in the area.

All of the above forementioned alterations, which have occurred at the site, have given the area a negative overall aesthetic appearance. Large areas of exposed soils having a peripheral edge of unsuitable material and demolition debris, tires, 55 gal. drums, etc. have detracted from the previously wooded buffer that existed between Connecticut Route 9 and the Crele Construction Co. site.

IX. IMPACTS RESULTING FROM ALTERATIONS OCCURRING AT THE SITE

There are essentially three distinct areas where significant impacts have resulted from alteration of the Crele Construction Co. site along Bible Rock Brook. Substantial impacts have arisen to the previous stream belt wetland along Bible Rock Brook at the site. Not only has a previous wooded cover been clear cut and destroyed, but approximately 1.6± ac. of the original wetland has been filled over. In doing this, the eastern drainageway of the brook has been diverted and filled over, while the western channel was deepened by blasting activities to accommodate the added flow. One unanticipated plus from this alteration is the increased habitat diversity of the remaining portion of the wetland at the site.

Additional impacts may result to the existing trout fisheries present in Bible Rock Brook from alteration of the wetland area. Construction activities have resulted in the placement of a 600± ft. continuous edge of exposed sand and gravel at the edge of the wetland and stream channel. During high storm runoff periods, sizeable amounts of this material has been eroded from the exposed fill and subsequently deposited in the form of sand and gravel bars which extend 1-2 ft. above the bed of the brook at times when water flowing in the brook is 4-6" deep. As a result, the sediment accumulations cause an unnatural obstruction to fisheries at low flow periods.

Additionally, blasting activities in the bed of the brook have created low falls of about 5 ft. for a distance of 20 ft. At the present time, it remains questionable as to whether existing trout are able to pass around this unnatural obstruction at periods of low flow in the brook.

Finally, the most noticeable and disturbing impact to the lower portion of the site is its relatively poor aesthetic quality. The zones of unsuitable material and demolition debris do not substitute for the naturally wooded buffer which originally existed.

At the present time, all of the above changes which have taken place at the site have resulted in the following:

Destruction of wetland vegetation by clear cutting the previous forested cover.

Filling 1.6± ac. of wetland area with 12,000± c.y. fill, and destruction of 1.6± ac. of wetland habitat.

Degrading the overall aesthetic appearance which the site previously had.

Creation of obstruction in the brook which might affect existing Trout fisheries at low flow periods.

X. PRACTICAL AND REASONABLE MITIGATIVE MEASURES TO MINIMIZE IMPACTS

From the above discussion, it would appear that actual impacts to Bible Rock Brook and adjacent stream belt wetland look much worse than they really are.

Destruction of the previously forested wetland vegetation while permanently altering the wetland has actually increased the wildlife habitat to some extent. It must be remembered that while the habitat diversity may have changed for the better, approximately 1.6± ac. of the pre-existing wetland has been permanently filled over, with a loss of wetland vegetation.

It is our professional opinion that while resurrecting the original wetland might cause more damage than that which already has taken place at the site, the remaining wetland area should be protected from further encroachment.

Remaining impacts to fisheries and aesthetics can and should be mitigated by implementation of various measures listed below.

1. Removal of all unsuitable and demolition materials from the lower portion of the site.

2. Allow minimal excavation in bed of Bible Rock Brook to remove excessive sedimentation and remove obstructions to existing fisheries.

3. Design and plant the outer perimeter of the exposed fill to provide slope stabilization and a natural buffer between the brook and activities on the lower portion of the site.

4. Implement and maintain an erosion and sedimentation control plan until such time the buffer zone becomes vegetated.

APPENDIX

TABLE 1

Vegetative Species Found to Occur Within the Disturbed Streambelt Wetlands which are Present on the Crete Site, Middletown, Connecticut, May, 1983

Common Name	Scientific Name	Relative Abundance
*Red Maple (Sapling)	Acer rubrum	P
Quaking Aspen (Sapling)	Populus tremuloides	P
*Speckled Alder	Alnus rugosa	M
*Skunk Cabbage	Symplocarpus foetidus	P
Grasses	Graminae spp.	A
*Sensitive Fern	Onoclea sensibilis	M

A = Abundant
M = Moderate
P = Paucity

*Wetland Indicator, Niering & Goodwin, Inland-Wetland Plants of Connecticut, Connecticut Aboretum, 1972

TABLE 2

Vegetative Species Found to Occur Within the Cleared Deciduous Forested Wetland/Shrub Wetland (Area #2) which is Present on the Crete Site, Middletown, Connecticut, May, 1983

Common Name	Scientific Name	Relative Abundance
*Red Maple (Sapling)	Acer rubrum	A
Tuliptree	Liriodendron tulipifera	M
*Black Willow (Sapling)	Salix nigra	M
Yellow Birch (Sapling & Stumps)	Betula lutea	P
White Pine (Sapling)	Pinus strobus	P
*Speckled Alder	Alnus rugosa	A
*Spicebush	Lindera benzoin	M
Grape sp.	Vitis sp.	M
Multiflora Rose	Rosa multiflora	P
Red Raspberry	Rubus idaeus	P
Black Raspberry	R. occidentalis	M
*Broadleaved Cattail	Typha latifolia	P
*Skunk Cabbage	Symplocarpus foetidus	A
*Soft Rush	Juncus effusus	M
*Larger Blue Flag Iris	Iris versicolor	P
Purple Trillium	Trillium erectum	P
Canadian Mayflower	Maianthemum canadense	A
*Tussock Sedge	Carex stricta	M
*False Hellebore	Veratrum viride	M
Tall Meadow Rue	Thalictrum polyganum	P
*Cinnamon Fern	Osmunda cinnamomea	M
*Sensitive Fern	Onoclea sensibilis	M

A = Abundant
M = Moderate
P = Paucity

*Wetland Indicator

TABLE 3

Vegetative Species Found to Occur Within the Deciduous Forested Wetlands (Area #3) which are Present on the Crete Site, Middletown, Connecticut, May, 1983

Common Name	Scientific Name	Relative Abundance
*Red Maple	Acer rubrum	A
*Green Ash	Fraxinus pennsylvanica	M
Tuliptree	Liriodendron tulipifera	M
Yellow Birch	Betula lutea	M
Black Birch	B. lenta	P
White Oak	Quercus alba	P
White Pine	Pinus strobus	P
*Hemlock	Tsuga canadensis	P
*Speckled Alder	Alnus rugosa	P
Highbush Blueberry	Vaccinium corymbosum	M
Spicebush	Lindera benzoin	P
Grape sp.	Vitis sp.	P
Skunk Cabbage	Symplocarpus foetidus	M
Tussock Sedge	Carex stricta	M
Jack-in-the-Pulpit	Arisaema triphyllum	M
Purple Trillium	Trillium erectum	P
Canadian Mayflower	Maianthemum canadense	A
False Hellebore	Veratrum viride	P
Jewelweed	Impatience capensis	M
*Cinnamon Fern	Osmunda cinnamomea	M
*Sensitive Fern	Onoclea sensibilis	M

A = Abundant
M = Moderate
P = Paucity

*Wetland Indicator

Environmental Testing Laboratory, Inc.
170 Montgomery St.
P.O. Box 429
Chicopee, Mass. 01021
(413) 592-2500

Sample Source Baystate Environmental Consultants
Sample Description C 4658 - D5
Sample Description C
Sample Description C
Sample Description C

Lab Number		C 4658	C	G	C
Collector		Client			
Date Analyzed		5-16-83			
Total Solids	mg/l	65			
Turbidity	N.T.U.	0.82			
Color	Units	20			
Conductance	Micromhos	100			
Suspended Solids	mg/l	1			
Volatile	mg/l	0			
Fixed	mg/l	0			
Phosphorous @ P	mg/l	0.00			
Iron	mg/l	0.11			
Copper	mg/l	0.00			
Chromium	mg/l	0.00			
Chloride	mg/l	14.5			
Hardness	mg/l	246			
Phenol	mg/l	0.05			
Ammonia @ N	mg/l	0.16			
Nitrate @ N	mg/l	0.00			
Sulfate	mg/l	1.6			

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Sample Source Baystate Environmental Consultants

Sample Description C 4301 - WQ 1
Sample Description C 4302 - WQ 2
Sample Description C 4303 - WQ 3
Sample Description C 4304 - WQ 4

Lab Number		C 4301	C 4302	C 4303	C 4304
Collector		Client	Client	Client	Client
Date Analyzed		4-12-83	4-12-83	4-12-83	4-12-83
Total Solids	mg/l	95	84	100	651
Turbidity	N.T.U.	0.77	0.72	1.4	200
Color	Units	20	20	20	300
Conductance	Micromhos	80	90	95	460
Suspended Solids	mg/l	2	0	10	319
Volatile	mg/l	2	0	10	46
Fixed	mg/l	0	0	0	273
Phosphorous @ P	mg/l	0.04	0.01	0.01	0.20
Iron	mg/l	0.05	0.08	0.11	14.0
Copper	mg/l	0.01	0.00	0.01	0.00
Chromium	mg/l	0.00	0.00	0.00	0.00
Chlorides	mg/l	12.5	15.5	17.0	38.0
Hardness	mg/l	22	22	24	194
Phenols	mg/l	0.00	0.00	0.00	0.00
Ammonia	mg/l	0.04	0.05	0.04	0.07
Nitrate	mg/l	0.36	0.51	0.44	0.73

James W McLaren