THE ENVIRONMENTAL GEOLOGY OF PROPOSED I 69

From Existing I 96 to Existing US 27
Watertown and Dewitt Townships
Clinton County
Control Section 19043

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MICHIGAN HIGHWAY RESEARCH LABORATORY SECTION

MICHIGAN DEPARTMENT OF STATE HIGHWAYS

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From Existing I 96 to Existing US 27
Watertown and Dewitt Townships
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G. R. Foster

Testing and Research Division
Research Project 71 TI-48
Research Report No. R-820

Michigan State Highway Commission
Charles H. Hewitt, Chairman; Louis A. Fisher, Vice-Chairman
Claude J. Tobin; E. V. Erickson; Henrik E. Stafseth, Director
Lansing, July 1972

A geologic and hydrogeologic study of the alternate routes A, B, and B-1 of Proposed I 69 Interstate roadway, between existing I 96 and existing US 27 (Fig. 1) was requested by J. H. Raad, Supervisor, Environmental Liaison Unit, Transportation Planning Division. This report presents those factors having impact upon, or influencing, the geologic and hydrogeologic clime of the affected area.

Acknowledgments for maps, charts, and well logs used for this study are as follows:

1) Topography and surface drainage patterns; U.S.G.S. quadrangle maps,

2) Soil types and boundaries; U.S.D.A. soil map,

3) Bedrock and ground water determinations; Michigan Department of Natural Resources water well logs and related information.

The above-mentioned source material was supplemented with an in-the-field investigation.

Glacial activity is directly responsible for nearly all of the land forms of Michigan's lower peninsula. Glacial ice eroded the country across which it moved, transporting the accumulated soil and rock debris, and eventually depositing its load either directly, by accretion beneath the ice, by melting, and "breaking off" or indirectly, by glacial meltwaters. Most of the material transported by the ice is carried in suspension, with the majority of the debris carried near the base of the ice.

Glacial deposits, in general, are of two basic types:

1) Till, an unsorted and unstratified heterogeneous mixture of sands, gravels, boulders, clay, and silt; and is deposited directly by the ice, and 2) Outwash, or well-sorted stratified materials, sands and gravels, which are deposited by meltwaters draining from the ice. Till, the unstratified glacial drift, being deposited directly by the ice, occurs chiefly as morainic deposits. Moraines are best developed at the glacier front when equilibrium has been established; i.e., the rate of movement or ice flow equals the rate of melting. The ice front remains essentially fixed in position for long periods of time.

In general, the load carried by the ice is released to form "hummocky" topography, such as ridges and hills. Because the ice fluctuates with mild climatic changes, a series of morainic ridges may develop. Moraines that mark stages of halt as the glacier recedes are called terminal or recessional moraines.

Some till is deposited beneath the ice and is overriden by it, or may be scattered over a glaciated area by melting out of the englacial (ice enclosed) material as the ice recedes. This irregularly scattered till, called ground moraine, is not concentrated into definite ridges as the recessional or terminal moraines, but is usually deposited in lower lying hills and depressions, and is basically a "heavy" or clayey deposit.

Outwash deposits, in turn, are generally more granular or sandy. Outwash deposits are formed when water issuing from a melting glacier breaks through low points in a recessional or terminal moraine and carries away sediments which are deposited on the surrounding country. At these points of emergence or break-through, much of the material is laid down in the form of "fans," which merge to form a broad outwash plain.

The proposed roadway alternates occupy a position immediately between two recessional moraines, the Ionia moraine to the north and the Grand Ledge Moraine to the south, and lie almost entirely on soils associated with ground moraines (Fig. 2). Ground moraines being composed principally of tight, cohesive or clayey soils allow only minimal downward percolation of surface waters, with no appreciable ground water recharge. Most precipitation is subject to run-off. Clay soils are not subject to wind erosion but when "fresh faces," those lacking appreciable vegetation, are exposed to water action channeling or gullying of back slopes can occur.

Granular cohesive soils, or soils not clayey enough to exhibit properties defining clay nor sufficiently sandy to be classified as sand, are traversed in part by all the roadway alternates. Layering of sandy clays and clayey sands of this soil lends itself to poor entrance characteristics relative to ground water recharge. The ability to hold, and later release entrapped waters from the sandy soil layers make them conducive to local seepage. These generally layered soils are highly susceptible to surface water erosion.

Granular soils, for the purpose of this report, are soils composed primarily of sands and gravels. Because of the looseness or noncohesive nature of the particulate material, downward infiltration of surface water readily takes place. These soils serve as ground water recharge zones. Where topsoil is removed for prolonged periods, wind erosion does occur.

Organic soils are mixtures of moisture, fine sands, microscopic organisms, and submerged plants, that decompose to form peat and/or muck.

Surface depressions serve as the basins for the formations of these organic deposits. These swamps or bogs reflect near-surface waters and, in many instances, define stream flood plain limits. The granular characteristics of organic soils makes them capable of encapturing surface waters. Ground water recharge can occur through these deposits. (See Figure 3 for soils texture distribution map.)

The Looking Glass River, flowing from east to west, meanders adjacent to the north of the study area, and ultimately accepts all the surface and precipitated waters, either directly, through tributary creeks and drainage ways, and/or indirectly through "storage systems" associated with the granular deposits flanking it (Fig. 4). Intermittent streams form a dendritic surface pattern, and mark the direct water entry points originating from surface waters.

Only one "live" stream, entering the Looking Glass River, the Summers Drain, would be interrupted by all the roadway alternates. Naturally occurring lakes, conspicuous by their absence, will not be directly influenced by surface run-off.

Bedrock of the Saginaw Formation underlies nearly all the glacial deposits of the studied area. The depth to bedrock varies from approximately 25 or 30 ft to over 100 ft. The Saginaw Formation, Pennsylvanian Period, is composed principally of sandstone and shale, but includes some thin beds of coal and limestone. The sandstones of the Saginaw Formation underlying the study area serve as the prime freshwater aquifer. Drift water wells are virtually nonexistent.

Gravel mining operations are located about the periphery of the studied area, but only one active operation would be directly affected by the crossing of the suggested roadway alternates; that operation being in the southwest quarter of Section 16, Dewitt Township.

None of the alternate routes should cause significant mineral depletion or any rare fossil extinction.

Roadway construction techniques have evolved to an extent that environment is minimally affected. Where organic sediments are encountered, sand, which encaptures and transmits water more readily than the organic soils, is used to replace displaced organic (swamp) deposits allowing surface run-off and precipitated waters to continue through their natural drainage courses. Roadway cut-section back slopes are treated with sod or seed and mulch soon after their exposure, thus inhibiting soil migration and eventual stream siltation.

Proposed alternate roadways A, B, and B-1 are weighed on impactual geologic and hydrogeologic factors created from construction, and will be presented in descending order of impact severity.

Alternate A would, because of proximity to the Looking Glass River, afford the greatest potential for ground and surface water disruption. This route would cross granular and organic deposits directly associated with the flood plains of the Looking Glass River. This would minimize the entrance and storage area for ground and precipital waters essential to maintaining the river's stable seasonal flows. Surficial pollutants, derived from seasonal deicing programs and/or spillages from commercial carriers of various liquids, would enter the stream less diluted.

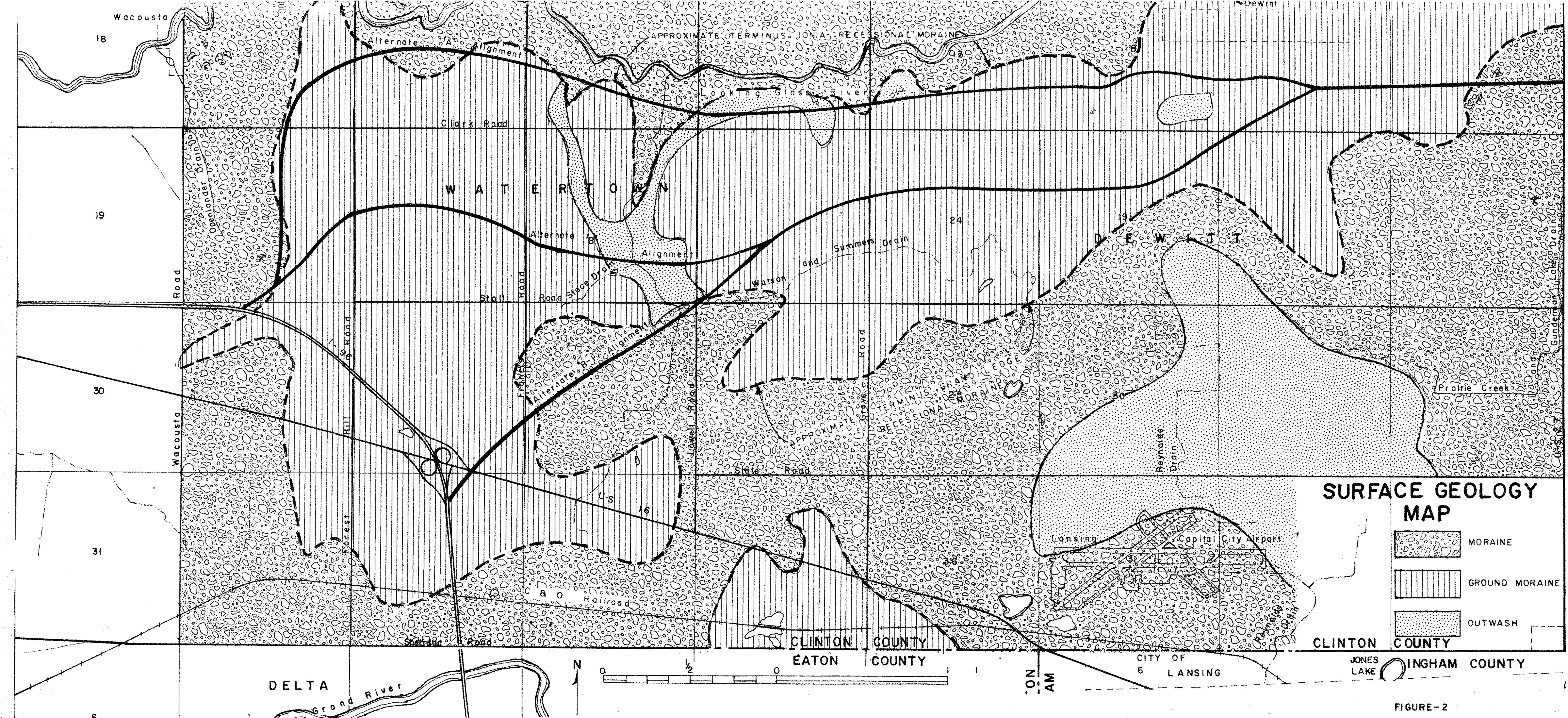
Stream crossing during construction would cause the releasing of a more direct sediment load.

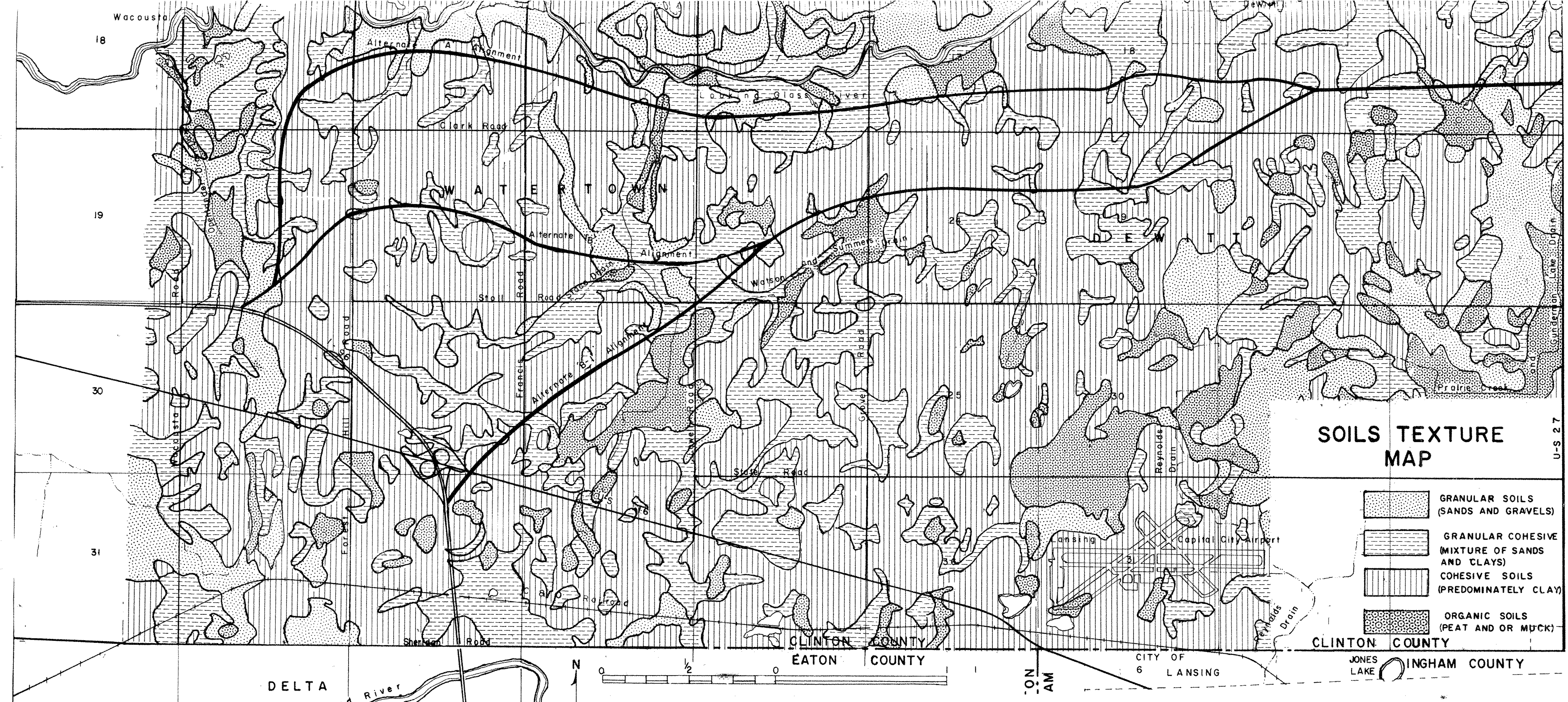
Alternate Routes B and B-1 have essentially the same impact factors, with only minor concern involving the Summers Drain crossing. Stream siltation and interruption would be minimal. Only minor encounters with granular soil deposits, associated with surface and ground water movements, would occur along either route.

In conclusion, as previously stated, Route A, because of its proximity to the Looking Glass River, exhibits the greatest potential for disrupting the geologic and/or hydrogeologic setting. Routes B and B-1 would contribute essentially the same influences. B-1, however, by virtue of its directness, would contribute the least impairment of all routes.

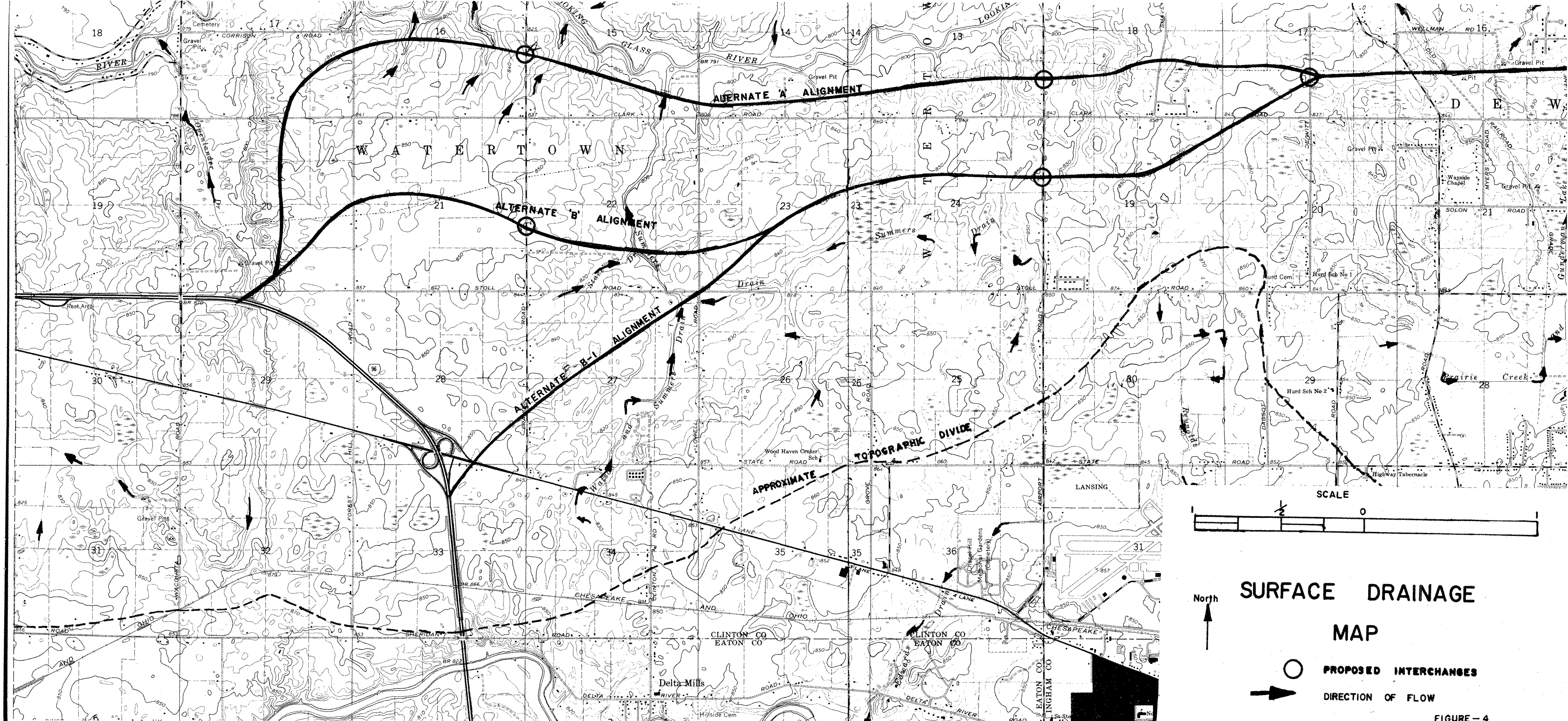
WACOUSTA
LAKE GENEVA
WEBB RD.
HERBISON RD.
CORRISON RD.
LOOKING GLASS RIVER
ALTERNATE 'A' ALIGNMENT
ALTERNATE 'B' ALIGNMENT
ALTERNATE 'B-1' ALIGNMENT
SCHAVEY RD.
GUNNISONVILLE
CLARK RD.
WATERTOWN
DEWITT
BAUER
HILL
STOLL
DE WITT
MYERS
SOLON
BOICHOT RD.
GRAND RIVER AVENUE
FRANCIS
LOWELL
STATE
GROVE
ABRAMS AIRPORT
CAPITAL CITY AIRPORT
SCALE 1 0 1 2 3 MILES
GENERAL LOCATION MAP
N
GRAVEL PITS

FIGURE – 1


SURFACE GEOLOGY MAP
MORAINE
GROUND MORAINE
OUTWASH
APPROXIMATE TERMINUS IONIA RECESSIONAL MORAINE
APPROXIMATE TERMINUS GRAND LEDGE RECESSIONAL MORAINE
WATERTOWN
DEWITT
Alternate A Alignment
Alternate B Alignment
Alternate B-1 Alignment
Looking Glass River
Clark Road
Stoll Road
State Road
Sheridan Road
Wacousta Road
Forest Hill Road
Francis Road
Lowell Road
Watson and Summers Drain
Reynolds Drain
Prairie Creek
Capital City Airport
Lansing
Railroad
U.S. 16
CLINTON COUNTY
EATON COUNTY
INGHAM COUNTY
CITY OF LANSING
JONES LAKE
DELTA
Grand River
Wacousta
DeWitt
N
FIGURE-2


SOILS TEXTURE
MAP
GRANULAR SOILS
(SANDS AND GRAVELS)
GRANULAR COHESIVE
(MIXTURE OF SANDS
AND CLAYS)
COHESIVE SOILS
(PREDOMINATELY CLAY)
ORGANIC SOILS
(PEAT AND OR MUCK)
Wacousta
WATERTOWN
DEWITT
Alternate 'A' Alignment
Alternate 'B' Alignment
Alternate 'B-1' Alignment
Looking Glass River
Clark Road
Stoll Road
State Road
Sheridan Road
Francis Road
Forest Hill Road
Wacousta Road
Grove Road
Watson and Summers Drain
Reynolds Drain
Prairie Creek
Gunderman Lake Drain
Capital City Airport
Lansing
Railroad
U-S 27
CLINTON COUNTY
EATON COUNTY
INGHAM COUNTY
CITY OF LANSING
JONES LAKE
DELTA
Grand River
18
19
30
31
24
25
36

FIGURE—3



SURFACE DRAINAGE MAP

FIGURE – 4