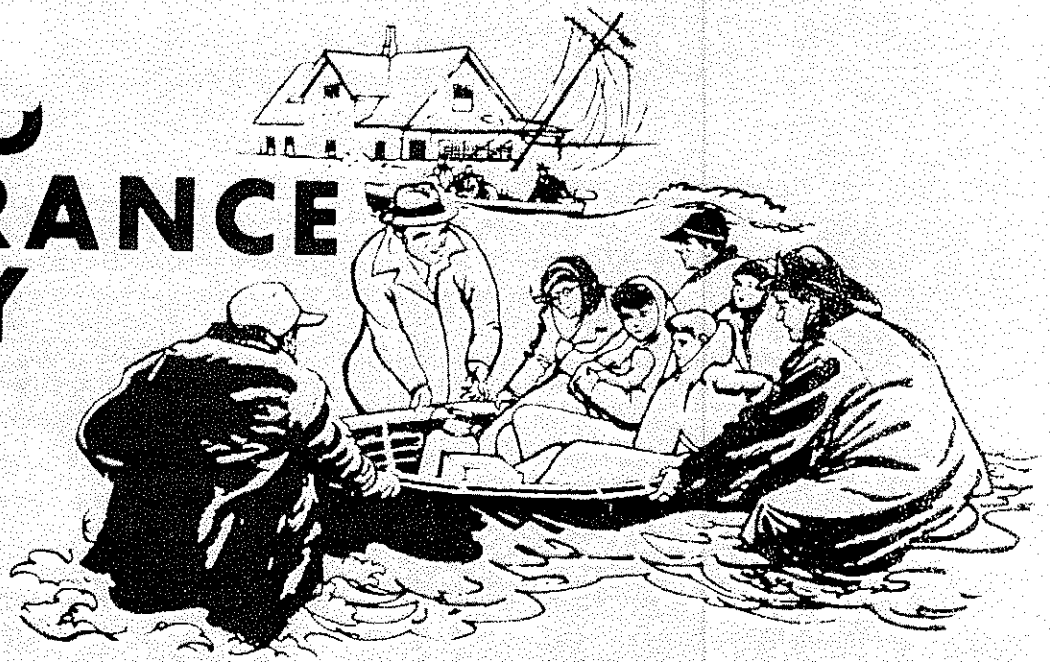
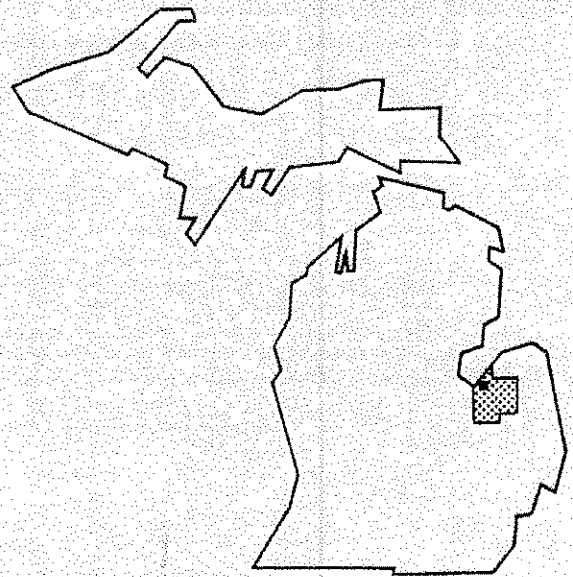


FLOOD INSURANCE STUDY



TOWNSHIP OF WISNER,
MICHIGAN
TUSCOLA COUNTY



UNIVERSITY OF MINNESOTA
LIBRARIES
MAR 16 1978
GOVERNMENT PUBLICATIONS DIVISION
U.S. DEPARTMENT OF COMMERCE

NOVEMBER 1977

U.S. DEPARTMENT of HOUSING & URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

TABLE OF CONTENTS

| | Page |
|--|------|
| 1.0 <u>INTRODUCTION</u> | 1 |
| 1.1 Purpose of Study..... | 1 |
| 1.2 Coordination..... | 1 |
| 1.3 Authority and Acknowledgments..... | 2 |
| 2.0 <u>AREA STUDIED</u> | 2 |
| 2.1 Scope of Study..... | 2 |
| 2.2 Community Description..... | 2 |
| 2.3 Principal Flood Problems..... | 4 |
| 2.4 Flood Protection Measures..... | 5 |
| 3.0 <u>ENGINEERING METHODS</u> | 5 |
| 3.1 Hydrologic Analyses..... | 5 |
| 3.2 Hydraulic Analyses..... | 7 |
| 4.0 <u>FLOOD PLAIN MANAGEMENT APPLICATIONS</u> | 8 |
| 4.1 Flood Boundaries..... | 8 |
| 5.0 <u>INSURANCE APPLICATION</u> | 8 |
| 5.1 Reach Determinations..... | 9 |
| 5.2 Flood Hazard Factors..... | 9 |
| 5.3 Flood Insurance Zones..... | 9 |
| 5.4 Flood Insurance Rate Map Description..... | 10 |
| 6.0 <u>OTHER STUDIES</u> | 10 |
| 7.0 <u>LOCATION OF DATA</u> | 12 |
| 8.0 <u>BIBLIOGRAPHY AND REFERENCES</u> | 12 |

TABLE OF CONTENTS (Cont'd)

Page

FIGURES

Figure 1 - Vicinity Map..... 3

TABLES

Table 1 - Summary of Elevations..... 6
Table 2 - Flood Insurance Zone Data..... 11

EXHIBITS

Exhibit 1 - Flood Insurance Rate Map Index
 Flood Insurance Rate Map Panels 260209 0001B-0002B

FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Township of Wisner, Tuscola County, Michigan, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Wisner to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

The initial community coordination meeting, attended by the Federal Insurance Administration's Consultation Coordination Officer, Township Supervisor, Township Treasurer, and a member of the Board of Review, was held during January 1976.

Agencies contacted for technical information include the U.S. Army Corps of Engineers, U.S. Geological Survey, and the National Oceanic and Atmospheric Administration.

Analysis of coastal flooding was done in coordination with the Michigan Department of Natural Resources, Bureau of Water Management, Hydrological Survey Division.

Other agencies contacted include the Tuscola County Road Commission, the Tuscola County Drain Commission, and the Tuscola County Field Office of the Michigan Department of Natural Resources.

The engineering firm of Bolt, McLeod and Johnson, Inc. was contacted for information pertaining to county drain improvement projects, done by them in the Township of Wisner.

On March 9, 1977, the final coordination meeting was held in the Wisner Township Hall. Those present included the Township Supervisor and Clerk, the Federal Insurance Administration's Community Coordination Officer, and a representative from Johnson & Anderson, Inc. Several other residents of the Township of Wisner were also present.

During this meeting, it was pointed out that mapping of the flood outlines along the Quanicassee River would be reviewed due to the influence of existing berms in the area. As a result, the flood-prone area adjacent to the Quanicassee River was reclassified from Zone A3 to Zone A0.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by Johnson & Anderson, Inc., for the Federal Insurance Administration, under Contract No. H-3816. This work, which was completed in June 1977, covered all significant flooding sources affecting the Township of Wisner, Michigan.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated area of the Township of Wisner, Tuscola County, Michigan. The area of study is shown on the Vicinity Map (Figure 1).

Included in the study is a detailed analysis of coastal flooding along Saginaw Bay and an analysis, by approximate methods, of the Gager Drain along Quanicassee Road, the Wisner Drain along Bradford Road, Outlet No. 3 of the Northwest Drain along Garner Road, and the Quanicassee River, which flows across the southwest corner of the township. These areas were studied by approximate methods due to the small size of, and lack of development along, their flood plains.

Areas of detailed study were chosen with consideration given to all proposed construction and forecasted development through 1980.

Areas excluded from the study include Vanderbilt County Park, Fish Point State Game Area, and Quanicassee State Game Area.

2.2 Community Description

The Township of Wisner, located in the northwestern corner of Tuscola County, is situated on the southern tip of Saginaw Bay, in Michigan's Lower Peninsula. The township is bordered on the east by the Township of Akron, on the south by the Township of Gilford, and on the west by the Township of Hampton. Primarily a farming community, with no large urban centers, Wisner's heaviest concentration of homes and small retail establishments is centered in the flood plain of the Quanicassee River and along State Highway 25.

According to the 1975-1976 Tuscola County Directory of Officials, the total population of Wisner is 928 (Reference 1).



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWNSHIP OF WISNER, MI
[TUSCOLA CO.]

FIGURE 1

APPROXIMATE SCALE



VICINITY MAP

Although Wisner is a rural community, residents have easy access to the facilities and conveniences of urban and metropolitan areas, as Wisner is located less than 15 miles from Bay City.

Much of the Saginaw Bay shoreline in Wisner has been designated as state game and wildlife areas by the Michigan Department of Natural Resources for the purpose of providing a wildlife habitat and public hunting lands.

Vanderbilt County Park, located just east of the Quanicassee River on Saginaw Bay, provides facilities for family outings.

The terrain of Wisner slopes uniformly to the northwest toward Saginaw Bay. Overland flow is intercepted by a network of manmade drains, which outlet either west into the Quanicassee River or north into Saginaw Bay. Numerous subsurface agricultural drainage systems have been installed by local farmers.

Ground elevations vary from a minimum of approximately 580 feet to a maximum of approximately 605 feet in the extreme southeast corner.

Wisner's climate is best described as a modified continental climate due to the effects of Saginaw Bay, Lake Huron, and the other Great Lakes. In general, the large bodies of water tend to reduce extreme variations in temperature. They range from the low twenties to the low eighties. Rainfall and snowfall average approximately 28 inches and 30 inches, respectively.

Although Wisner's economy is based, to a large extent, on the sale of agricultural products, oilfields in the southeastern corner of the community are also a contributing factor to the township's economy.

2.3 Principal Flood Problems

The principal flood problems in the Township of Wisner can be associated with storm surges of Saginaw Bay, which are caused by high northeasterly winds. Repeated damages have occurred as water from Saginaw Bay has been forced south onto the low areas adjacent to the Quanicassee River and over coastal regions.

A severe storm, which occurred on March 17, 1973, left Wisner and other communities located on the southerly portion of Saginaw Bay with extensive damage from high water caused by northeasterly winds. The small village of Quanicassee was isolated, and many homeowners living near the mouth of the Quanicassee River were forced to evacuate.

Tuscola and several adjacent counties were declared disaster areas. The damages in Tuscola County as a result of this storm were initially estimated by authorities to approach \$2.8 million. Damages throughout the affected region were estimated to be as high as \$12 million.

This flood is thought to be the maximum flood of record, with an estimated recurrence interval of 90 to 95 years.

Similar flooding occurred during the previous November, although total damages resulting from this storm were substantially lower.

In April 1976, a strong northeasterly wind once again caused flooding along the Saginaw Bay shoreline, Quanicassee River, and its tributaries. The damages sustained were considerably below those reported during the March 1973 flood.

2.4 Flood Protection Measures

The U.S. Army Corps of Engineers has installed culverts and flap gates on several drains that outlet into Saginaw Bay and the Quanicassee River. Also, a few hundred feet of small dikes have been constructed in an area just east of the Quanicassee River and north of State Highway 25. These flood protection measures were installed as part of Operation Foresight and are, in general, intended to be only temporary in nature.

Portions of the farmland adjacent to the Quanicassee River in both Wisner and the adjacent Township of Merritt have been diked by individual landowners, with little uniformity in construction. Only portions of the dikes have been deemed substantial enough to provide adequate protection against a 100-year flood.

3.0 ENGINEERING METHODS

For flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10, 50, 100, and 500 years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here reflect current conditions of the flooding sources in the community.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

The predicted flood elevations along Saginaw Bay were developed by analyzing historical gaging records at Essexville (References 2 and 3). Records covering a period of 23 years were obtained through the National Oceanic and Atmospheric Administration Lake Survey Center. Both long-term and short-term lake level fluctuations were considered in arriving at the final elevations.

The long-term lake level fluctuations were obtained from monthly gaging records representing Lake Huron. Monthly mean levels were adjusted for present diversion and inlet conditions affecting the Great Lakes system. These adjusted levels were then extended to the Essexville gage through a linear regression analysis.

Maximum monthly lake level records were used to establish the short-term cycles for Lake Huron. The influence of seiching, wind tides, and storm surges were accounted for in the short-term cycles.

By combining both the long-term and short-term components, the elevations for the 10-, 50-, 100-, and 500-year events were determined.

Elevations at the mouth of Saginaw Bay were obtained from the U.S. Army Corps of Engineers' Open-Coast Flood Levels Report (Reference 4). The mouth of Saginaw Bay is approximately 36 miles from the Essexville gage.

Saginaw Bay elevations for the Township of Wisner were determined by linear interpolation between the Essexville gage and the mouth of Saginaw Bay for 10-, 50-, 100-, and 500-year events. A summary of elevations for Saginaw Bay is shown in Table 1.

Table 1. Summary of Elevations

| Flooding Source and Location | Elevation Above NGVD of 1929* | | | |
|---|-------------------------------|---------|----------|----------|
| | 10-Year | 50-Year | 100-Year | 500-Year |
| Saginaw Bay Township of Wisner, Michigan Still Water | 583.5 | 584.6 | 584.8 | 585.6 |

*National Geodetic Vertical Datum of 1929

Additional flood hazards may be delineated for coastal areas in the future as methodology regarding waves becomes standardized. Until further study is accomplished, an estimated allowance of up to 3 feet may be added to elevations in this report for uniformly sloped beaches that are subject to direct wave attack from the north-northeast to take into account the additional hazard due to wave runoff. Factors such as location and shoreline configurations could alter the estimated wave runoff values mentioned above.

Hydrologic analysis for Outlet No. 3 of the Northwest Drain was completed by utilizing a procedure for estimating storm potential, which is outlined in Design of Small Dams by the U.S. Bureau of Reclamation (Reference 5).

The procedure consisted basically of determining a precipitation value through interpolation of generalized probable maximum precipitation charts for the Eastern United States, with adjustments obtained from appropriate depth-area-duration relationships.

A reduction factor for low-hazard areas was applied to the probable maximum precipitation value, which generated a new precipitation value having approximately a 1 percent chance of occurrence annually.

The corresponding approximate 100-year runoff was determined after applying suitable adjustments to the precipitation value based on soil characteristics that were available from the U.S. Soil Conservation Service for nearby communities with similar soils.

Flows for the Wisner Drain were determined by proportioning flow in the Northwest Drain in accordance with the ratio of the drainage areas of the two watercourses.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the community are carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in detail.

Hydraulic analysis of all drains included in this study was done by approximate methods. Backwater from Saginaw Bay is the controlling factor for the Quanicassee River.

Construction plans and design data used by Boldt, McLeod, and Johnson, Inc., Engineers, for improvements to the Northwest Drain and Wisner Drain were reviewed and carried out. The design flows were judged to be less than those occurring during a 100-year storm.

Estimated channel capacities of the Northwest Drain Outlet No. 3 and the Wisner Drain were computed using Manning's equation for open channel flow and assumed roughness coefficients. The roughness coefficient for channel flow for both drains was 0.035.

Flood-Prone Area Maps prepared by the U.S. Geological Survey were used to investigate flooding along the Gager Drain (Reference 6).

It should be noted that the flood outlines presented in the report could vary depending on the extent of ice or debris that may accumulate and restrict flow channels and drainage structures. The hydraulic analysis for this study is based only on the effects of flow unobstructed by ice or debris.

All elevations are referenced to the National Geodetic Vertical Datum of 1929. Elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For shoreline flooding studied in detail, the boundaries of the 100- and 500-year floods have been delineated using photogrammetric methods. Aerial photographs at a scale of 1:12,000, taken during April 1976 (Reference 7), were used for this delineation. In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

The approximate flood boundary of the Northwest Drain Outlet No. 3 was delineated on the basis of the estimated extent of flooding for the 100-year event. Flood outlines were delineated by interpolation from U.S. Geological Survey Topographic Maps at a scale of 1:24,000, with a contour interval of 5 feet (Reference 8).

Flood-Prone Area Maps (Reference 6) were used to determine the approximate flood boundaries for the Wisner Drain, Gager Drain, and Quanicassee River. The maps gave no indication of flooding, except in the low-lying areas adjacent to Saginaw Bay. Mapping of the flood outlines in these areas was done by photogrammetric methods (Reference 7).

Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

Flood boundaries are indicated on the Flood Insurance Rate Map (Exhibit 1). On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zone A3) and the 500-year flood boundary corresponds to the boundary of areas of moderate flood hazards (Zone B).

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the

engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the Township of Wisner.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

| <u>Average Difference Between</u> <u>10- and 100-year Floods</u> | <u>Variation</u> |
|---|------------------|
| Less than 2 feet | 0.5 foot |

Using the above criterion, it was determined that only one reach, for Saginaw Bay, exists in the Township of Wisner.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHF's from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire incorporated area of the Township of Wisner was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or Flood Hazard Factors determined.

- Zone A3: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.
- Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot. Zone B is not subdivided.
- Zone C: Areas of minimal flooding.

Table 2, "Flood Insurance Zone Data," summarizes the flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for the flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Township of Wisner is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevations show the expected whole-foot water-surface elevation of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

The U.S. Geological Survey prepared Flood-Prone Area Maps in 1974 (Reference 6) that designate areas subject to flooding in portions of the Townships of Wisner, Merritt, and Hampton, and other nearby communities. These maps were prepared for the Federal Insurance Administration to meet provisions of the National Flood Insurance Act of 1968.

Johnson & Anderson, Inc., is currently working on Flood Insurance Studies for the adjacent communities of Hampton and Merritt as well as several other communities in Bay County. Saginaw Bay flood elevations and flood plain mapping are being coordinated for each of the affected communities.

This study is authoritative for purposes of the National Flood Insurance Program, and data presented herein either supersede or are compatible with all previous determinations.

| FLOODING SOURCE | PANEL ¹ | ELEVATION DIFFERENCE ² BETWEEN 1% (100-YEAR) FLOOD AND | | | FLOOD HAZARD FACTOR | ZONE | BASE FLOOD ELEVATION (FEET NGVD) ³ |
|-----------------|--------------------|--|--------------|-----------------|---------------------|------|---|
| | | 10% (10-YEAR) | 2% (50-YEAR) | 0.2% (500-YEAR) | | | |
| Saginaw Bay | 0001,0002 | -1.5 | -0.4 | 0.7 | 015 | A3 | 585 |

¹Flood Insurance Rate Map Panel ²Weighted Average ³Rounded to Nearest Foot

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
TOWNSHIP OF WISNER, MI
(TUSCOLA CO.)

FLOOD INSURANCE ZONE DATA
SAGINAW BAY

TABLE 2

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, 300 South Wacker Drive, Chicago, Illinois 60606.

8.0 BIBLIOGRAPHY AND REFERENCES

1. County of Tuscola, Michigan, Tuscola County Directory of Officials, 1975-1976
2. National Oceanic and Atmospheric Administration, National Ocean Survey, Lake Survey Center, Great Lakes Water Levels, Years of Record, 1860-1970, Detroit, Michigan, 1971
3. -----, Great Lakes Water Levels, Years of Record, 1970, 1971, 1972, 1973, 1974, Detroit, Michigan
4. U.S. Army Corps of Engineers, Great Lakes Open-Coast Flood Levels, Preliminary Report, Detroit, Michigan, December 1976
5. U.S. Department of Interior, Bureau of Reclamation, Design of Small Dams, 1960
6. U.S. Geological Survey, Flood-Prone Area Maps, Scale 1:24,000, Contour Interval 5 feet: Bay City, Michigan Quadrangle (1974); Essexville, Michigan Quadrangle (1974); Quanicassee, Michigan Quadrangle (1974)
7. Abrams Aerial Survey, Inc., Aerial Photographs of Wisner Township Shoreline, Scale 1:12,000, April 4, 1976
8. U.S. Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 feet: Fairgrove Quadrangle, Michigan (1973)

Federal Insurance Administration, Flood Hazard Boundary Maps, Scale 1:12,000, Township of Wisner, Michigan (July 1976)

Great Lakes Basin Commission, Great Lakes Basin Framework Study, Appendix 14, 1975

Herrin, Gary D., "Review of Approach for Predicting Flood Levels on the Great Lakes," (Unpublished report for Johnson & Anderson, Inc.), Ann Arbor, Michigan, University of Michigan, 1976

Michigan Department of Natural Resources, Water Development Services Division, Flooding Problems Associated with Current High Levels of the Great Lakes, December 1973

Rockford Map Publishers, Inc., Tuscola County, Michigan Atlas and Plat Book, 1975

U.S. Army Corps of Engineers, Detroit District, Personal Communication with Leonard Schutze, Subject: Regulation of Great Lakes Water Levels, 1975 and 1976

U.S. Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 feet: Fish Point, Quanicassee, and Reese Quadrangles, Michigan (1973)

-----, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet: Caro and Gilford Quadrangles, Michigan (1963)

U.S. Soil Conservation Service, Engineering Field Manual, 1969

UNIVERSITY OF MINNESOTA



3 1951 D03 465230 X