U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FLOOD CONTROL

EAST GRAND FORKS, MINNESOTA
GRAND FORKS, NORTH DAKOTA

This document is an evaluation of the environmental effects of the proposed implementation of flood damage reduction activities in the communities of East Grand Forks, Minnesota and Grand Forks, North Dakota. After an evaluation of alternatives, a plan was selected which would provide flood damage reduction through the construction of levees within the communities. The selection of the levee alignments was based primarily on soil stability. The area along the river between the levees will be allowed to revert to natural vegetation. This will result in the formation of a riparian corridor, or greenway, of approximately 2000 acres.

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Final Environmental Impact Statement
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1.0 INTRODUCTION AND SUMMARY

1.1 SUMMARY

The flooding that occurred in the spring of 1997 caused heavy damage and dislocation in the cities of Grand Forks, North Dakota and East Grand Forks, Minnesota. This study is an evaluation of plans formulated to prevent a repetition of flood damages of the magnitude that occurred in 1997.

A flood control feasibility study was completed for the city of East Grand Forks in 1986. The study was suspended prior to construction. A reconnaissance report was completed for flood control for the city of Grand Forks in 1991. A flood control feasibility study for the city of Grand Forks was in progress when the 1997 flood occurred.

Due to the urgency of the situation, the East Grand Forks project was activated as the East Grand Forks General Reevaluation Report (GRR). Because it was recognized that neither city could be protected independently, flood protection for the city of Grand Forks was added to the GRR.

The two cities have been dependent on the construction of emergency levees for flood protection. Various non-structural measures were evaluated including floodproofing and floodplain evacuation/relocation. Basin-wide and upstream flood control solutions were evaluated as well as channel modifications, different levels of levee protection and alternative alignments for a diversion.

An array of alternatives was screened for their capability to meet project objectives, environmental effects, and economic feasibility, among others. Two plans were evaluated in detail, a diversion in North Dakota with levees in the two communities, and a levees-only plan, which is the proposed plan. The diversion plan would not reduce the footprint of required levees. In addition, it would not be economically feasible and would have considerable adverse environmental effects.

The selected plan would include removal of the existing emergency levees and the construction of levees and floodwalls in both communities along with associated features and would provide protection from a flood equivalent to that of 1997. The area between the proposed levees would become an urban greenway twice the size of the existing area. Included in the overall plan for the multiple-use area would be the development of natural vegetation in the riparian corridor. This would result in a three-fold increase in habitat value along the riparian corridor and would offset any adverse effects to natural resources associated with construction activities.

There are several areas of controversy. Levee foundation stability was the primary criteria for the selection of the levee alignments. The alignments would require the removal or relocation of structures including some which are historic and/or not substantially damaged by flooding.

There is additional controversy regarding the selection of project limits. Some homeowners close to, but outside, the project alignment, feel that they have been unfairly excluded and could be subject to additional damages. However, the project was designed to exclude damages from areas upstream and downstream of the project limits.

Compensation would be provided for property obtained for the project and for the relocation of property owners. Under the proposed Programmatic Agreement, adverse effects on historic and cultural resources sites would be offset by specific mitigation measures.

1.2 MAJOR FINDINGS AND CONCLUSIONS

The construction of levees with a sufficient setback to accommodate the local soil stability would provide protection from floods equal to the flood of 1997. A levee project would have positive economic feasibility. It would provide public health and safety and contribute to community stability and growth.

1.3 AREAS OF CONTROVERSY

1.3.1 General

There is controversy regarding the removal of homes to accommodate the levees. The substantial levee setback distances required for safety would impact many homes. Some individuals do not agree with soil stability assumptions, made in the plan formulation, that dictated levee alignments. Some have proposed that soil stability measures be employed to move levees closer to the river. Although this proposal is under study, some think that it should be resolved before the General Reevaluation Report/Environmental Impact Statement is completed.

Some have commented that implementation of basin-wide water management and upstream water storage should reduce flooding enough to allow the relocation of levee alignments closer to the river, but this was not found to be feasible. The Corps will continue to participate in basin-wide studies. Changes in upper-basin storage may increase the factor of safety of the flood control project.

There is also controversy regarding the limits of the project; some area residents feel that the project should be extended to protect some homes which will be outside the present line of protection. These residents state that being close to, but outside, the levee would reduce their property values. Contrary to the understanding of some, the protection would be in the form of a road raise (2.5-2.7 feet) and would be set back approximately one-half mile from the residences. The project would not directly damage these properties since it would not raise flood levels. According to some residents, their properties suffered limited damage during the flood of 1997. These facts when combined with the amenities of the neighborhood led to the determination that the effect of the project on property values for those areas not protected by the levee would be minimal.

1.3.2 Reeves Drive Historic Houses

Construction of a levee at Reeves Drive will directly impact six residences which have been determined eligible for listing on the National Register of Historic Places either individually or as a contributing member to the East Side Residential Historic District. The houses date from 1883 to 1924. Construction of a floodwall at this location would move the line of flood protection closer to the Red River channel, but would still adversely affect five of these historic houses. There is the potential to move most of these houses to the front of their lots versus having to relocate them to another part of the city. This would at least retain some of the historic character of the neighborhood. However, they would have a floodwall in their immediate backyard. In addition to the houses on Reeves Drive, seven historic houses (1925-1947) along the adjacent Reeves Court and River Street will have to be relocated or torn down regardless of whether the levee or floodwall option is chosen.

1.3.3 Removal of Northern Pacific Railroad Swing Bridge (Pedestrian Bridge)

The City of Grand Forks acquired this railroad bridge from the Burlington Northern Railroad and converted it to a pedestrian bridge in 1983. Part of its pivoting mechanism has been removed. The piers and the original Howe timber truss bridge date to 1887. The timber superstructure was replaced with a steel truss bridge in 1902. This railroad bridge was designed to swing open on a center pivot to allow steam boats passage on the Red River. It is one of only two such bridges in North Dakota, the other being in Fargo. Both the North Dakota State Historic Preservation Office and the Grand Forks Historic Preservation Commission would prefer that the bridge remain where it is. Removal of this National Register of Historic Places eligible bridge is proposed in order to reduce the obstructions to flow in the Red River. Removal of the bridge means that the water in the Red River upstream of its location would be up to 6 inches lower than with the bridge present. This in turn means that the proposed levees upstream do not have to be built as high as if the bridge remains.

Both the Minnesota State Historic Preservation Office and the North Dakota State Historic Preservation Office state that, if the bridge has to be removed, it should receive an appropriate level of Historic American Engineering Record documentation prior to removal. In addition, the North Dakota State Historic Preservation Office and the Grand Forks Historic Preservation Commission recommend that the superstructure be reused somewhere in the proposed greenway for a coulee crossing along one of its trails. They also recommend that whatever remains of the pivot mechanism and the top several courses of stone from the bridge’s center pier be salvaged and made into an interpretative exhibit somewhere in the greenway.

1.4 UNRESOLVED ISSUES

There are no unresolved issues relating to the environmental effects of the proposed project. However, there is controversy regarding the resolution of some issues (Section 1.2).

1.5 RELATIONSHIP TO ENVIRONMENTAL REQUIREMENTS

This EIS was prepared in compliance with Federal environmental laws, executive orders, and policies, and with State and local laws and policies as shown below including: the Clean Air Act, as amended; the Clean Water Act of 1977; the Endangered Species Act of 1973, as amended; the National Historic Preservation Act of 1966, as amended; the Land and Water Conservation Fund Act of 1965, as amended; the National Environmental Policy Act of 1969, as amended; the Fish and Wildlife Coordination Act of 1958, as amended; the Farmland Protection Policy Act; Executive Order 11990, Protection of Wetlands; Executive Order 11988, Floodplain Management; and Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.

Table 1. Relationship of the Proposed Project to Environmental Laws and Regulations

Federal Statutes	Current Compliance Status
Archaeological and Historic Preservation Act	Full
Clean Air Act of 1977, as amended	Full
Clean Water Act of 1977, as amended	Full
Coastal Zone Management Act	N/A
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended	Full
Endangered Species Act of 1973, as amended	Full
Estuary Protection Act	N/A
Farmland Protection Policy Act	Full
Federal Water Project Recreation Act, as amended	Full
Fish and Wildlife Coordination Act, as amended	Full
Land and Water Conservation Fund Act, as amended	Full
Marine Protection, Research and Sanctuaries Act, as amended	N/A
National Environmental Policy Act of 1969, as amended	Full
National Historic Preservation Act of 1966, as amended	Full
River and Harbor Acts	Full
Watershed Protection and Flood Prevention Act, as amended	Full
Wild and Scenic Rivers Act, as amended	Full

Executive Orders, Memoranda, etc.	
Floodplain Management (E.O. 11988)	Full
Protection of Wetlands (E.O. 11990)	Full
Environmental Effects Abroad of Major Federal Actions (E.O.12114)	Full
Protection and Enhancement of Environmental Quality (E.O.11514, as amended by E.O. 11991)	Full
Protection and Enhancement of the Cultural Environment (E.O.11593)	Full
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (E.O. 12898)	Full

All applicable laws and regulations will be fully complied with upon completion of the environmental review process and before the project begins.

1.6 POTENTIAL EFFECTS OF ALTERNATIVES

The array of project alternatives was evaluated for the potential effects on attributes of the natural and human environment. The analysis is summarized in Table 2.

Table 2. Comparative Effects of Alternatives

Resources	Alternatives				
					SELECTED PLAN
	No Action	Diversion with Levees	Levee Plan 50 Year	Levee Plan 100 Year	Levee Plan 210 Year
Water Quality	No Effect	Degradation from exposure of saline groundwater	No Effect	No Effect	No Effect
Air Quality	No Effect	Degradation from extensive and lengthy construction	No Effect	No Effect	No Effect
Wetlands	No Effect	Severe impact to 649 acres from lowering of groundwater elevation	No Effect	No Effect	No Effect
Riparian Habitat	Minor increase in habitat valueover time in area limited to 1000 acres by emergency levees	Three-fold increase in habitat value for 2000 ac. greenway less 2 acres at river connections	Three-fold increase in habitat value for 2000 acre greenway	Three-fold increase in habitat value for 2000 acre greenway	Three-fold increase in habitat value for 2000 acre greenway

Resources	Alternatives				
					SELECTED PLAN
	No Action	Diversion with Levees	Levee Plan 50 Year	Levee Plan 100 Year	Levee Plan 210 Year
Fishery	No Effect	Loss of 1/4 acre habitat with large closure structure in river	No Effect	No Effect	No Effect
Upland Habitat	No Effect	Excavation of 7,332 acres for channel	Conversion of 240 acres agricultural or vacant land for borrow (may be converted to stormwater treatment and/or wetlands)	Conversion of 240 acres agricultural or vacant land for borrow (may be converted to stormwater treatment and/or wetlands)	Conversion of 240 acres agricultural or vacant land for borrow (may be converted to stormwater treatment and/or wetlands)
Public Health/Safety	Protection limited to existing levels	Protected by flood control project	Protected by flood control project	Protected by flood control project	Protected by flood control project
Community Cohesion	Potential conflict over protection strategies without project	Divides an area in two	Some loss of neighborhood identity offset by stable community	Some loss of neighborhood identity offset by stable community	Some loss of neighborhood identity offset by stable community
Community Growth	Potential growth limitation with only emergency protection	Increased community growth from stability of flood protection	Increased community growth from stability of flood protection	Increased community growth from stability of flood protection	Increased community growth from stability of flood protection
Relocations	No additional relocations required	190 homes, 13 businesses, acreage, and 5 farmsteads	186 homes, 8 businesses, and acreage	186 homes, 8 businesses, and acreage	252 homes, 16 businesses and acreage
Controversy	Potential controversy over strategies without formal protection project	Significant area affected is not benefited	Loss of some lightly damaged homes Excludes some out of city	Loss of some lightly damaged homes Excludes some out of city	Loss of some lightly damaged homes Excludes some out of city
Property Values	Reduced by uncertain protection	Reduced by loss of farm size	Increase in community property values	Increase in community property values	Increase in community property values
Public Facilities & Services	Interuption of services by large flood events	Disruption of transportation by channel	Protection of infrastructure and from interruption of service	Protection of infrastructure and from interruption of service	Protection of infrastructure and from interruption of service
Farmland & Food Supply	No Effect	Ssignificant agricultural acreage loss	No Effect	No Effect	No Effect
Flooding Effects	Continued potential for damage from large floods	Protection from 210 Year Event	Protection from 50 Year Event	Protection from 100 Year Event	Protection from 210 Year Event

Resources	Alternatives				
					SELECTED PLAN
	No Action	Diversion with Levees	Levee Plan 50 Year	Levee Plan 100 Year	Levee Plan 210 Year
Historic Architectural Values	Continued potential for damage from large floods	Protection from 210 Year Event Relocation or demolition outside levees	Protection from 50 Year Event Relocation or demolition outside levees	Protection from 100 Year Event Relocation or demolition outside levees	Protection from 210 Year Event Relocation or demolition outside levees
Archeological	No Effect	Potential for impacts along diversion channel Potential impacts original townsite, English Coulee crossing and within 100 meters of river banks	Potential impacts original townsite, English Coulee crossing and within 100 meters of river banks	Potential impacts original townsite, English Coulee crossing and within 100 meters of river banks	Potential impacts original townsite, English Coulee crossing and within 100 meters of river banks

1.7 FURTHER STUDIES

The location and environmental evaluation of project features is discussed in this document but the specific designs of some features have not be completed. These will be completed during feature design studies. The environmental studies have included these features. Further review would be done during the design phase. If additional environmental effects are identified, a supplement to the EIS may be prepared.

1.8 MITIGATION

Mitigation is the means by which significant adverse effects are alleviated. If the adverse effect cannot be avoided by changes in the proposed plan, then specific measures would be needed to offset the impact.

To mitigate the effect of property acquisition, compensation would be provided for the fair-market value of the property and for the relocation of property owners (Section 5.3.1).

Specific mitigation measures would be utilized, under the proposed Programmatic Agreement, to offset adverse effects on historic and cultural resources sites (Exhibit D).

There would be only limited adverse effects of the project on natural resources. Removal of the existing emergency levees and construction of the new levees would result in the establishment of an urban greenway. The U.S. Fish and Wildlife Service’s 1980 version of Habitat Evaluation Procedures (HEP-80) was used to quantify and evaluate the potential

effects of the proposed project. The results indicate that project construction would result in a two-fold increase in riparian habitat area and three-fold increase in average annual habitat units (Exhibit B). Therefore, no separable mitigation is proposed for the natural resources effects of the project.

2.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

The metropolitan area of Grand Forks, North Dakota and East Grand Forks, Minnesota was flooded in April, 1997. Flood levels surpassed community efforts to provide emergency flood protection. Flooding in the communities was extensive and nearly all residents were affected because most public utilities were put out of service by high water.

2.1 PROJECT BACKGROUND

Flood control planning was accelerated following the 1997 flooding in the Red River Valley. Studies, both completed and in progress, identified levees as a likely alternative to provide cost-effective flood control in the two cities. However, public comment identified a need to evaluate other alternatives as well. This document analyzes the potential environmental effects of the construction of flood control levees in Grand Forks, North Dakota and East Grand Forks, Minnesota. This EIS also provides a review of the potential environmental effects of the construction of a diversion channel west of Grand Forks. This alternative would include levees similar to those in the selected plan but with protection at a lesser elevation, the remaining water being carried by the diversion. Since the diversion had not been studied previously, there is only a reconnaissance level examination in this report. If the alternative is selected for further study, a Supplement EIS would be prepared to analyze the potential effects of a diversion and levee alternative.

As river cities, Grand Forks and East Grand Forks have always been threatened by flooding. The Red River flows to the north, and spring snowmelt in the south is trapped as water attempts to move to the north through a still-frozen area. Floodwaters escape from the river and spread over a wide geographic area because the Red River Valley is a glacier plain that is nearly flat.

Approximately one-fourth of the Grand Forks-East Grand Forks area is in the 100-year floodplain under its present delineation. The cities are periodically threatened by high waters on the Red; but both have constructed local levees that proved successful in flood fights until 1997. In recent decades the only previous flooding of large scale was in 1979 in Grand Forks; but this was an internal drainage problem in which English Coulee escaped from its banks and caused over $7 million in damages.

Corps studies of the feasibility of more adequate protection systems for the two cities extend back many decades. A cost-effective plan was designed for East Grand Forks that was authorized by Congress but declined by the city because of the large number of structures that would be affected. Grand Forks was under study with a designed but Congressionally unauthorized plan when the flood of 1997 hit.

The winter of 1996-1997 in the Red River basin was unusual. There were eight blizzards producing accumulated snows of nearly 100 inches. As the snow began to melt rapidly in early April, upstream communities to the south along the river were flooded or threatened. By the middle of the month, the Red had reached its highest level in a century, and Grand Forks and East Grand Forks were rapidly preparing their lines of defense based on a National Weather Service prediction of a flood crest of 49 feet.

The flood crest ultimately reached 54 feet. Although emergency preparations were accelerated as the water rose in the vicinity of the cities and predictions of flood crests were adjusted upwards, the flood fighting effort reached the upper limits of its capacity when the river reached 52 feet on Friday, April 19th. By Saturday, the water had overtopped the levees and was spreading rapidly through both cities as residents evacuated. In the midst of all the water, a fire consumed buildings in the downtown area of Grand Forks.

In spite of the expenditure of large sums of money in the flood fighting effort, almost all of East Grand Forks and about 75 percent of the land area of Grand Forks were flooded, including most of the densely settled areas. Water entered 11,000 businesses and homes in Grand Forks, and only 27 single-family residences were spared in East Grand Forks. Fifty thousand people fled their homes, power and water were lost, and the cities were cut off from each other. Over $1 billion in damages were sustained.

2.2 PROJECT AUTHORITY

The proposed action is authorized by the Flood Control Acts of 30 June 1948, 17 May 1950, and 31 December 1970.

2.3 PURPOSE AND NEED FOR THE PROJECT

The objective of the implementation of flood protection for Grand Forks and East Grand Forks is to provide protection from a flood of magnitude equal to that of the 1997 flood.

Previous investigations demonstrated that a complex project would be required to meet the flood control needs of the two communities. The extensive flooding in 1997 affected significant community resources. There were differing opinions in the communities as to the most appropriate method and extent of future flood control. Finally, it was evident that a substantial project would be required to provide protection from a flood equivalent to that of 1997. For these reasons it was determined that the preparation of an Environmental Assessment would be unnecessary. The NEPA evaluation would proceed directly to the preparation of an EIS to be followed by the signing of a Record of Decision (ROD).

Emergency levees have not provided sufficient protection from flooding of the Red River of the North and the Red Lake River. A permanent solution is required to prevent the recurrence of flooding and its attendant effects on the economy and public health and safety.

2.4 CONTENT AND SCOPE OF THE EIS

The EIS is divided into ten chapters which include: summary, need for the project, description of alternatives, affected environment, environmental effects, public involvement, mailing list, list of preparers, references, and index. Several appendices include: 404(b)(1) water quality evaluation, scoping, correspondence, and cultural resources.

A Notice of Intent to Publish a Draft EIS was published in the Federal Register on December 15, 1997. The scope of the EIS was determined by soliciting public and agency comment on the preliminary scope which was sent to state, federal, and local agencies as well as to over 1,100 newsletter recipients. The comments received were incorporated into a draft scoping document which was announced in the newsletter, provided to city halls and libraries and mailed to agencies and commentors. The comments received on the draft scoping document were utilized in the preparation of the DEIS.

3.0 ALTERNATIVES

3.1 ALTERNATIVES ELIMINATED FROM CONSIDERATION

An array of alternatives to provide flood protection for the two communities was examined through the course of the East Grand Forks and Grand Forks Flood Control Studies that preceded this evaluation. Some alternatives were eliminated from further consideration when it was determined that they would not be feasible. That is, when it was clear that a proposed alternative would not provide the desired level of protection, or that it could not demonstrate economic feasibility, it was not considered any further as a component of the East Grand Forks and Grand Forks Flood Control Studies.

3.1.1 No-Action Alternative

Taking no action would not provide any permanent protection from flooding. The communities would continue to depend on emergency measures for flood protection. Existing levees, originally constructed under emergency conditions, may not be reliable. The communities will likely improve such levees but would probably find it difficult to create an integrated flood control plan from diverse elements. Emergency protection would require the commitment of community resources and volunteer assistance each time substantial flooding would be expected. As experienced in 1997, outside circumstances may hinder or prevent a successful flood fight.

About 15,000 homes would remain in the flood plain. When damaged more than 50% by flooding, homes would be demolished or relocated leaving gaps in the neighborhoods which would begin to degrade from lack of incentive to repair and upgrade.

3.1.2 Non-structural Measures

The non-structural approach to flood control is limited by the flat topography and the extreme flood levels experienced in the area. Typical non-structural measures would include such things as flood proofing, flood warning and temporary evacuation, and permanent evacuation. As shown in 1997, without structural flood protection, the entire communities can flood. Flood proofing of individual buildings is not sufficient protection when access to the building is blocked and utility services are interrupted. Flood warning and emergency levee construction and temporary evacuation has been used in the communities, but as seen in 1997, this has not proved to be effective. Permanent evacuation of the flood plain would not provide sufficient flood protection for the entire communities. However, the most flood prone areas have been evacuated in part through the demolition of severely flood-damaged homes. Levee construction will require the removal of additional structures, many of which are flood-damaged.

3.1.3 Basin-wide Flood Control

Basin-wide flood reduction measures such as upstream storage impoundments/reservoirs were also considered as a primary flood reduction strategy for Grand Forks and East Grand Forks. However, upstream storage features would not provide protection from a 210-year flood and were eliminated from detailed consideration early in the screening process. An evaluation of the “waffle” plan is contained in the main report and summarized below. The effect of multiple upstream impoundments on flood flows is also discussed after the discussion of the “waffle” plan.

The “waffle plan” would store water on farmland (not flooded in 1997) behind section line roads. The water depth would be 3 feet and the sections of land would have gated outlets and overflow sections. A plan which would protect the cities from a flood equal to that of 1997, without the requirement for levees, would require 1.4 million acres, or 2,150 sections of land. The plan would benefit other communities in addition to the two cities but would leave water on some properties longer than at present. If levees were constructed in the two cities to flood stage 49.0, only half as much land would be required but this would still amount to 1,120 sections of land.

The July, 1996, EIS of Flood Control Impoundments in Northwestern Minnesota (Corps of Engineers and Minnesota Department of Natural Resources), summarizes the possible impacts of flood control reservoirs on flood peaks. The Hydrology Evaluation shows that the 20 Minnesota "reasonably foreseeable projects" upstream of East Grand Forks and Grand Forks would reduce the 100-yr peak discharge 1.12% and the peak stage 0.11 ft. From Table 1 of that report, those 20 projects would have a total flood pool volume of about 51,000 acre-feet. This is 1% of the 1997 volume (4,900,000 ac-ft) at EGF/GF. It is reasonable to assume these 20 proposed reservoirs would not reduce the 1997 flood discharge more than about 1% and would not be an effective alternative for EGF/GF.

3.1.4 50 or 100-Year Levees

The construction of levees to a 50 year level of protection with no freeboard would provide a low-cost project with moderate benefits. A greater level of protection (100 year) with freeboard would provide less protection than that of the 1997 flood but was considered in the hope that levee alignments could be placed more riverward than those for the 1997 level of flood protection. The alignments turned out to be quite similar and the lower level of protection was not justified given the minor decrease in properties affected. The plan would be economically feasible.

3.1.5 Separable Reach Levee Plan

This plan consists of separate levee plans for Riverside, Downtown, Lincoln Park which would provide approximately 50 year flood protection. The plans varied in the level of feasibility but when combined formed a single flood control project which had good economic feasibility.

3.1.6 Minnesota Diversion Plan

The construction of a diversion of the Red Lake River to the Red River of the North, east of the city of East Grand Forks, was evaluated. The alternative was not economically feasible. Based on a review of natural resources and coordination with state agencies, it was concluded that it was unlikely that it would be environmentally acceptable. This would be primarily because of construction in, and effects on, the Red Lake River and potential damage to aquatic habitat from reduction in base flow in the Grand Marais Coulee . Based on a request from the local sponsors, it was removed from further consideration.

3.1.7 In-Town Channel Modifications

The construction of a wider river channel to provide greater capacity was evaluated. Several sizes were analyzed but only minor effects on river stage would be realized at substantial cost and adverse environmental effects. This project was not economically feasible.

3.1.8 Downstream Channel Modifications

Downstream channel enlargements of 900, 1200, or 1500 feet would reduce stages within the city by 1 to 2 feet. The cost of this alternative was high which made it economically infeasible. Channel modifications would not be environmentally acceptable because of the extensive excavation of aquatic habitat that provides spawning, rearing, and feeding habitat for fish.

3.2 ALTERNATIVES CONSIDERED IN DETAIL

Two alternatives were evaluated in detail. The diversion plan was formulated to reduce the impact of levees on the community by conveying flood waters around the city of Grand Forks. The levee plan was formulated to provide economical flood protection. The projects were presented to the officials of the two communities and the general public. The diversion plan was not economically feasible and would have required the communities to provide the difference in cost from a feasible federal project. The levee plan was economically feasible and was selected for further study.

3.2.1 Diversion and Levee Plan

The diversion plan was formulated by the firm of Short Elliot Hendrickson under the direction of the Corps of Engineers. It would consist of a diversion channel from the Red River of the North upstream of the City of Grand Forks. A diversion structure would be placed in the river to divert a portion of the river flow into the channel which would be 23 miles long, one-half mile wide, and 30 feet deep. Another structure would control the

release of the water into the Red River of the North. A seven mile tieback levee would be constructed on the Minnesota side of the Red River. Levees equivalent to a 100-year level of protection would be required within the communities. The area outside the line of protection would be allowed to revert to natural conditions, once the homes were removed. This would provide a “greenway” of up to 2000 acres.

An environmental evaluation showed that the plan had the potential to cause significant adverse effects on natural resources. The diversion channel would consume acres of land and directly eliminate wetlands and other natural habitat. It would damage wetlands outside the alignment by lowering the elevation of the groundwater. It would destroy riparian habitat at the mouth and outlet of the diversion channel and destroy fish habitat with the construction of a large diversion structure in the Red River of the North. The project right-of-way would eliminate many acres of farmland and many farmsteads.

The levees that would be required for the diversion plan would have nearly the same alignment as that of the levees-only plan and would not reduce the need for relocation of houses. Further, the plan did not demonstrate economic feasibility.

3.2.2 Levee Plan

The plan for flood protection using levees would provide a level of protection from a flood equivalent to the one which occurred in 1997. It would include levees, floodwalls, and mechanically stabilized levees. It would be possible to raise these levees to protect against even higher flood levels. Diversions of English Coulee in North Dakota and Heartsville (sometimes referred to as Hartsville) Coulee in Minnesota would operate only during the period of flooding. Erosion protection would be placed in several locations. A substantial portion of the area outside the line of protection would be allowed to revert to natural conditions, once the homes were removed. This would provide a “greenway” of up to 2000 acres. The project was designed to not raise water levels and induce damages upstream or downstream of the project.

The proposed project was divided into reaches:
Grand Forks:

1. Downstream end to Highway 2
2. Highway 2 to Water Treatment Plant
3. Water Treatment Plant to Belmont Coulee
4. Belmont Coulee to upstream end of project and the associated tieback levees

East Grand Forks (north of Red Lake River):

1. Downstream end to Downtown
2. Downtown to upstream end of Red Lake River Levees
3. All the associated tieback levees

East Grand Forks (Point Area; south of Red Lake River):

1. Red River of the North and Red Lake River levees
2. All the associated tieback levees

4.0 AFFECTED ENVIRONMENT

4.1 NATURAL RESOURCES

Grand Forks and East Grand Forks are located at the border of North Dakota and Minnesota in the valley of the Red River of the North (Plate 1). Much of the basin lies within the former bed of glacial Lake Agassiz, which covered northwestern Minnesota and eastern North Dakota 12,000 bp (before present), creating the broad, flat, plain of the Red River Valley. The lake formed as the last of the glaciers began to melt. As the glacier receded, the lake grew in size until it was drained into the Mississippi River by the Glacial River Warren. As the last of the ice disappeared, the lake began to drain towards Hudson's Bay through what eventually became the Red River of the North (RRN). The remnant lake bed is extremely flat and drainage is not well defined.

The Red River basin in the United States encompasses 30,100 mi^2 at Grand Forks and East Grand Forks. The river drops 200 ft. in elevation with an average gradient of only 0.5 ft/mi from its source at Wahpeton, North Dakota, to the Canadian border. The mean annual flow of the Red River is 554 cfs at Wahpeton and 4390 cfs at the border near Emerson, Manitoba. The majority of flow received by the Red River is from eastern (Minnesota) tributaries, with about 33% of discharge at the Canadian border contributed by the Red Lake River. The region is prone to both flooding and drought, and many of the small tributaries in North Dakota have low or no flow during late summer.

4.1.1 Climate

Its location at the geographical center of the North American continent makes North Dakota and western Minnesota climate an excellent example of the continental climatic type. The climate is characterized by large annual, daily, and day-to-day temperature changes, and light-to-moderate precipitation that is highly seasonal, yet irregular within season in time and coverage. Humidity is relatively low, sunshine is plentiful, and air movement is nearly continuous.

The short 110-to-130 day freeze-free period, relatively low growing season temperatures of 54° to 62°F. and extremely low winter temperatures preclude the production of many crops grown elsewhere in the United States. These factors also limit the state's faunal and floral diversity.

About 75% of North Dakota's and western Minnesota's rather scant precipitation (mean 13-20 inches annually) falls during the period April through September. Were the precipitation more evenly distributed, very little agriculture would be possible. Most of the summer precipitation occurs during periods of thunderstorm activity. During winter, snowfalls are usually less than 1 inch at a time and total snowfall averages less than 3 feet annually. This poses serious problems for control of soil erosion during the fall, winter, and spring.

North Dakota is a windy state with an average wind velocity of almost 11 miles per hour. Peak winds occur in late winter and early spring, which further aggravates the problem of soil erosion.

4.1.2 Upland Habitat

Eastern North Dakota and western Minnesota are part of the prairie ecosystem close to its eastern edge. The ecosystem is characterized by prairies vegetated with grasses and forbs. Wetlands, described as prairie potholes, occur throughout the area but are subject to extensive agricultural drainage.

The tallgrass prairie community occupied most of the Red River Valley and areas of rich moist soils further west such as are found along river valleys and around wetlands. Dominant plants in this community were about 3-6 feet tall. These were tall perennial grasses such as big bluestem, porcupine grass, prairie cordgrass, and indiangrass. Common large mammals included the bison, elk, and pronghorn. Common birds were the western meadowlark, Savannah sparrow, and bobolink.

The majority of land in the two states is now used to produce annual crops of various grains, sunflowers, potatoes, soybeans, and sugar beets. Few resident animals have adapted well to the habitats created by the production of annual crops. However, many migrant and wintering birds make extensive use of crop fields, especially those where crop residue is present. Intensive farming has created large, monotypic areas of cropland with the result that many grassland birds have been forced to nest in the few remaining areas that contain perennial vegetation. These are mostly narrow idle strips between fields and along roads where the birds suffer very low nest success in these areas, primarily because of excessive rates of predation of nesting birds and their eggs.

Smaller amounts of land are used to raise perennial forage crops such as alfalfa, clover, and bromegrass. Forage crops are usually mowed twice during the growing season. Several species of birds nest in these habitats, but production is usually low due to high rates of mechanical nest destruction. Pocket gophers, ground squirrels, and badgers are considered nuisance animals in these fields.

About 6 million acres of North Dakota remain in native grassland. This is about 15% of the original acreage. Nearly all of this land is grazed by cattle and by lesser numbers of sheep and horses. Most of the native grasslands are now found in the western half of the state on land too rocky, hilly, or droughty to plow. Plants and animals naturally adapted to heavily grazed conditions still can be found in large numbers on larger native pastures, but other species have undergone significant reductions in population and distribution within the state and withing Minnesota as well.

Most losses of woodlands are due to agricultural clearing and inundation by reservoirs. Well over half of the woodlands in North Dakota are grazed, much of them to the point where tree reproduction has ceased. There has, of course, been a proportional loss of the woodland fauna. Most plant and animal species whose breeding distribution within the state is severely limited by a lack of suitable habitat or by climate are found in woodlands.

4.1.3 Wetland Habitat

Wetlands once occupied an estimated 5 million acres, or 11%, of what now is North Dakota. Palustrine wetlands were most numerous. These are relatively shallow wetlands dominated by persistent emergent plants. In North Dakota and western Minnesota, palustrine wetlands occupied the millions of shallow basins that resulted from glacial scouring and the melting of buried blocks of glacial ice. Nearly all of the palustrine wetlands were found in that portion of the state lying within the Prairie Pothole Region. This region is vitally important to waterfowl as it occupies only about 10% of their breeding range, yet produces about 50% of the birds.

Lacustrine wetlands are generally large areas of open water with active, wave-formed shorelines and no persistent emergent vegetation in the central or deepest zones. Permanent fresh wetlands are numerous in a small area in northern North Dakota called the Turtle Mountains, but uncommon throughout the rest of the Prairie Pothole Region. Many of these wetlands contain water of sufficient depth to maintain fish populations. The bottoms of these wetlands may be unvegetated or support stands of various deepwater pondweeds. Freshwater amphipods, decapods, reptiles, and amphibians are common. These wetlands are heavily used by migrant waterfowl and breeding gulls, cormorants, pelicans, and grebes. Subsaline and saline permanent wetlands cannot support fish populations. The principal salts in these wetlands are sulfates and chlorides of sodium and magnesium. Conductivities may be in excess of 100,000 micromhos. Permanent saline wetlands have no overflow outlets. The bottoms may be unvegetated or support stands of widgeongrass attractive to migrant waterfowl. Certain copepods, ostracods, and anostracans adapted to the highly saline water may also be abundant, which makes these wetlands highly attractive to migrant waterbirds.

Alkali wetlands are lacustrine wetlands characterized by the intermittent occurrence of shallow saline water. These wetlands average over 100 acres in area and, like permanent saline wetlands, may contain water with specific conductance in excess of 100,000 micromhos. No emergent plants grow in the central zone of these wetlands, but salt water widgeongrass and certain algae are often found in abundance. Principal invertebrates are anostracans and ostracods. These wetlands provide the primary habitat for several species of migrant shorebirds and are also heavily used by migrant waterfowl. Common breeding species on these wetlands are the avocet, piping plover, and Wilson's phalarope.

Riverine wetlands include those with periodically or continuously moving water contained within a channel. Only three rivers in North Dakota, the Missouri, Yellowstone, and Red, are considered permanent riverine wetlands. The Red Lake River in Minnesota would also qualify. Permanent riverine wetlands support species such as sturgeon and paddlefish which are not found in intermittent riverine wetlands. The intermittent types are most productive of small fish such as minnows and suckers, and are heavily used by mink, muskrat, and beaver.

Precipitation and groundwater flow patterns are the principal factors affecting the hydrology and limnology of prairie wetlands. Secondary influences are grazing and fire. All prairie wetlands except the permanently-flooded lacustrine and riverine types undergo irregular drying and oxidation of their bottom soils. This release of nutrients is the main reason why prairie wetlands are so biologically productive.

Wetland ecosystems have suffered greatly due to agricultural development. Natural palustrine, lacustrine, and riverine wetlands now total an estimated 2.2 million acres or 56% of their original area. Palustrine wetlands have been extensively drained for crop production, especially in the glaciated plains and Agassiz lake plain. Drainage usually creates the need for more drainage and larger ditches, the result being that all the wetlands are lost over many square miles. Well over half of the undrained palustrine wetlands are cultivated for crop production whenever they are dry. Others are grazed by livestock, mowed for hay, or left idle. Populations of most marsh and aquatic birds and mammals have suffered drastic declines due to wetland drainage and changes in land use in North Dakota and western Minnesota. During the early 1960's, great international concern for the well-being of the economically important waterfowl group prompted the United States Government to launch a program to protect palustrine wetland habitat in the Prairie Pothole Region. In North Dakota, about a quarter million wetland acres have been purchased, and three-quarters of a million wetland acres have been protected by easements.

4.1.4 Riparian Habitat

Riparian habitat is the zone along a body of water which is influenced by the presence of water. Along rivers and streams, the overflow caused by flooding also affects the composition of the habitat. Riparian habitat may be recognized in the prairie by the presence of trees which are scarce elsewhere in the area.

Wise management of remaining riparian ecosystems or replacement of these communities is extremely important because of their high value as fish and wildlife habitat. Riparian ecosystems generally are characterized by increased structural diversity of vegetation compared to surrounding plant communities and an increased edge effect for area occupied. Riparian areas provide food, water, shade, and cover for fish and wildlife, and forage for both wild and domestic grazing animals, as well as provide recreational areas.

Fish and Aquatic Invertebrates

The riparian zone influences several elements of fish habitat, including temperature, cover, and food. Loss of vegetative cover and undercut banks can decrease the amount of suitable habitat, thereby reducing stream productivity and fish carrying capacity. Streambank vegetation also can be an important source of fish food. Small fish use slower water along margins of larger streams and depend on terrestrial organisms from streamside vegetation for food because most aquatic drift organisms escape them.

Water velocity, water depth, and cover are important factors regulating stream fish populations . In general, cover increases habitat complexity, which can lead to a richer species complex. Cover provides hiding places for both adults and fry to escape predation. Its slowing effect on water velocity provides a metabolic resting place and, under some circumstances, cover provides increased substrate for food items and for egg attachment.

Birds and Mammals

Riparian ecosystems generally are more structurally diverse and more productive in terms of plant and animal biomass than surrounding areas. High vegetation density and diversity are factors that attract the greatest number and kinds of birds. Riparian ecosystems not only supply breeding and foraging habitats for resident birds, but also provide productive habitats for migrants. If the habitat meets a migrant bird’s physiological needs, a greater percentage of the bird's total energy may be channeled into reproduction. Deer and small mammals also make use of riparian ecosystems. Continuity of habitat provides a corridor for animal movement when it is not broken into clumps of dissimilar habitat types.

Riparian ecosystems generally occupy relatively small areas, and their occurrence along waterways makes them vulnerable to severe alteration caused by a variety of development activities.

4.1.5 Aquatic Habitat-Red River of the North

The Red River basin in the United States encompasses 36,400 mi^2 in North Dakota, Minnesota, and South Dakota. The river drops 200 ft. in elevation with an average gradient of only 0.5 ft/mi from its source at Wahpeton, North Dakota, to the Canadian border.

Fishery

From surveys made in streams in the Red River basin from 1892-1994, 84 fish species in 20 families were reported; 77 species are now considered native, and 7 are known

introductions. The introduced species are rainbow trout, brown trout, brook trout, muskellunge, white bass, common carp, and flathead chub. Of these, only the white bass and common carp have been able to maintain populations though natural reproduction.

Fishes found in the Red River that may be classified as game species include northern pike, channel catfish, white bass, sauger and walleye. Channel catfish are the most common of the large species, with walleye and sauger next. Carp are the most abundant in fisheries survey catches, followed by goldeye and shorthead redhorse. Other large species that were caught included northern pike, quillback, white sucker, bigmouth buffalo, four species of redhorse, black bullhead, burbot, white bass, rock bass, green sunfish, black crappie, and freshwater drum among others.

Compared with other large streams in the region, diversity of fishes in the Red River basin is high, and most of its species are also found in streams of the Mississippi River drainage. The upper Mississippi River (above St. Anthony Falls in Minneapolis) has 69 fish species of which 62 species are shared with the Red River. The Minnesota River has 88 species of which 72 are shared. The Missouri River in North Dakota has 65 species of which 46 species are shared.

Several species are apparently restricted to specific habitats available in only some streams. Species typical of only eastern, clearwater tributaries of the Red River basin are: chestnut lamprey, silver lamprey, hornyhead chub, pugnose shiner, blackchin shiner, central mudminnow, and mottled sculpin. Species reported only from the Otter Tail and Pelican river drainages are: bowfin, northern hogsucker, central stoneroller, weed shiner, yellow bullhead, rainbow darter, and least darter. The largescale stoneroller has been reported only from the Forest River, and the orangespotted sunfish is most common in the Sheyenne River.

Water Quality and Stream Classification

The RRN is a turbid stream from scour of glacial sediments and high levels of dissolved salts as well. Water quality parameters are generally satisfactory although dissolved oxygen values may decline in the winter when ice is present.

The Minnesota Pollution Control Agency has classified the Red River of the North from Breckenridge to Canadian border as 1C, 2Bd, 3B. This water will meet drinking water standards with treatment, permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life and their habitats, and permit the use for general industrial purposes, except food processing with only a moderate degree of treatment.

4.1.6 Aquatic Habitat-Red Lake River

Fishery

The Red Lake River sub-basin occupies 5,970 square miles. It is the largest drainage area in northwest Minnesota and includes the Upper and Lower Red Lakes, and the Red Lake, Thief, Clearwater, and Poplar Rivers and numerous creeks and ditches. The Red Lakes are remnants of the glacial Lake Agassiz, and the watershed contains the typical glacial moraine, lake-washed till, beach ridges and glacial lake plain. Many impoundments, control structures, diversions, and channelization and ditching projects have occurred since the 1900's.

The Red Lake River originates from the west end of Lower Red Lake, at an elevation of 1,175 feet, and flows west and south 193 miles before entering the Red River of the North at East Grand Forks 384 feet lower.

There are 43 fish species recorded for the Red Lake River. The river is periodically sampled by the Minnesota Department of Natural Resources using various gear. In a 1994 survey in the reach from the mouth to Crookston, electrofishing captured 16 species. These included: bigmouth buffalo, common carp, channel catfish, chestnut lamprey, common shiner, freshwater drum, golden redhorse, mooneye, quillback, rock bass, sand shiner, spotfin shiner, shorthead redhorse, silver redhorse, smallmouth bass, and trout-perch. The most common species by weight and numbers were: bigmouth buffalo, common carp, freshwater drum, golden redhorse, and quillback.

Water Quality and Stream Classification

The Minnesota Pollution Control Agency has classified the Red Lake River from the outlet of Lower Red Lake to the mouth as 1C, 2Bd, 3B. This water will meet drinking water standards with treatment, permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life and their habitats, and permit the use for general industrial purposes, except food processing with only a moderate degree of treatment.

4.1.7 Air Quality

The city of East Grand Forks is in an air quality attainment area in Minnesota. The city of Grand Forks is in an air quality attainment area in North Dakota.

4.1.8 Hazardous, Toxic, and Radiological Waste (HTRW)

Phase I Environmental Site Assessments (ESAs) were completed along the levee and floodwall alignments in Grand Forks and East Grand Forks to identify sites with potential environmental concerns associated with the construction of the flood control project features (Appendix B). The Phase I ESAs were completed in accordance with ASTM

1527-97. The ESAs identified six sites in Grand Forks and two sites in East Grand Forks which have potential environmental concern. Of these eight sites, only one of the sites is considered to have the potential to encounter materials which meet the strict definition of HTRW materials, and only a small portion (10 percent, for estimating purposes) of that site is assumed to meet the strict definition of HTRW materials. While the remaining sites have been determined to have the potential to encounter contaminated materials, with little or no potential to encounter materials which meet the strict definition of HTRW materials, Phase II investigations are ongoing to verify the nature of the materials that may be encountered at the those sites. It is expected that these will be completed before the public review of the Final EIS.

4.1.9 Threatened and Endangered Species

Federally-listed species that may be found in the project area include: bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and gray wolf (*Canis lupus*).

The North Dakota Natural Heritage Inventory of ecologically significant species identified in the project area includes: rosyface shiner (*Notropis rubellus*), mourning warbler (*Oporonis philadelphia*), black sandshell mussel (*Ligumia recta*), Dutchman's breeches (*Dicentra cucullaria*), and purple cinquefoil (*Potentilla palustris*).

The Minnesota Natural Heritage Inventory of ecologically significant species or features identified in the project area includes: lake sturgeon (*Acipenser fulvescens*) and a colonial waterbird nesting site.

4.1.10 Prime and Unique Farmland

An evaluation of the effect of the proposed project on the conversion of farmland to non-agricultural uses was made according to guidelines in the Farmland Protection Policy Act.

4.2 CULTURAL RESOURCES

4.2.1 Historic Conditions

The following summary of the prehistory and history of the Grand Forks/East Grand Forks portion of the Red River Valley is based primarily on information in the Archeological and Architectural Resources technical appendix of the *Environmental Impact Study of Flood Control Impoundments in Northwestern Minnesota* (St. Paul District, U.S. Army Corps of Engineers and the Minnesota Department of Natural Resources, 1995). It in turn utilized the information provided specifically to the St. Paul District Corps for that EIS by two

contracted literature and records searches, one for the Minnesota portion of the Red River Basin (Dobbs et al. 1994) and the other for the North Dakota portion (Larson et al. 1994).

Paleo-Indian tradition cultures based on the hunting of large Late Pleistocene/early Holocene game animals date to 11,500 B.P. (years before present) and are the earliest documented cultures in North America. No early Paleo-Indian sites are expected in the Project area due to the presence of the Red River ice lobe to the north and glacial Lake Agassiz in what is now the Red River Valley. By 10,000 B.P., however, areas of tundra adjacent to the ice lobe, the boreal forest surrounding Lake Agassiz, and the lake's beaches would have become increasingly available for use by Paleo-Indian peoples.

Glacial Lake Agassiz had receded well north into Canada by 8,000 B.P. and the large Pleistocene mammals (mammoth, camel, horse, bison) hunted by the earlier Paleo-Indians had become extinct. The boreal forest of the Red River Valley was replaced by prairie grassland to the west of the Red River and first by pine and then mixed deciduous forests to the east of the Red. By 7,000 B.P., the climate had entered a long, dry period during which prairie grasslands spread eastwards as far as northeastern Minnesota. The prairie/forest border shifted several times through the subsequent years, but the Red River Valley remained prairie grasslands. The expansion of the prairie grassland eastward resulted in a change to more regionally oriented cultures that are part of the Archaic tradition (8,000-3,000 B.P.), which is based on gathering wild plants and hunting bison and smaller animals. Prairie Archaic cultures were adapted to the tall grass prairie of western Minnesota and Plains Archaic cultures were adapted to the mixed grass prairie of eastern North Dakota. Archaic sites have been found along small streams, at pothole lakes, on the beach ridges of glacial Lake Agassiz, and buried on the terraces and floodplain of the Red River and its tributaries.

The following Woodland tradition (3,000-900 B.P.) is characterized by the initial appearance and manufacture of grit-tempered pottery vessels and the use of earthen mounds for burial purposes. Bison hunting and plant gathering formed the basic Woodland economy. The bow and arrow with its small triangular points were introduced at this time. Woodland sites have been found near lakes and rivers and on the uplands overlooking river valleys. Late Prehistoric Period Woodland hunting and gathering cultures continued from 1,100 B.P. (A.D. 900) up to the time of contact (A.D. 1660 in Minnesota; A.D. 1738 in North Dakota) in all but the southernmost Red River Valley. Village sites of the Northeastern Plains Village complex occur on river terraces along the Sheyenne River, while Cambria complex village sites occur on river terraces in southwestern Minnesota. Both complexes are based on a dual corn horticulture and bison hunting-wild plant gathering economy.

Native American groups known to have lived in the Red River Valley include the Hidatsa, Arapaho/Atsina, Plains Ojibwe (Chippewa), Assiniboin, and Yanktonai Dakota. The Arapaho/Atsina are believed to have occupied the Red River Valley prior to and during

the early 1600s though no archeological sites found to date have been attributed to them. The village dwelling Hidatsa originated in southwestern Minnesota and migrated northwards down the west side of the Red River. Their home territory prior to A.D. 1650 centered on Devils Lake, but extended from the Red River west to the Souris River. They left the Red River-Devils Lake area for the Missouri River valley when the gun-equipped, bison-hunting Plains Ojibwe moved into northeastern North Dakota from northern Minnesota and southern Manitoba in the 1700s. The Plains Ojibwe occupied tipi camps from the Red River west to the Turtle Mountains and hunted bison out on the Plains even prior to their acquisition of the horse.

The Yankton and Yanktonai Dakota lived in central Minnesota in the mid-1600s where they practiced a hunting-gathering-gardening lifestyle. The Assiniboin, having gradually split off from the Dakota, occupied northwestern Minnesota and the Red River Valley in Canada at that time. The prehistoric and protohistoric Blackduck culture in northern Minnesota is considered ancestral to the Assiniboin. The encroachment of the Ojibwe from the north and east between A.D. 1679 and 1750 forced both the Dakota and Assiniboin westward. After 1750 the Yanktonai Dakota occupied the southeastern quarter of North Dakota east of the Missouri River. The Assiniboin moved to northwestern North Dakota and adjacent Canada west of the Souris River loop.

The fur trade flourished in the Red River Valley from 1738 to around 1860. French fur trade activities lasted from their initial contact with the Dakota in Minnesota in A.D. 1660 to their 1763 loss of the French and Indian War, and thereby Canada, to the British. From A.D. 1763 to 1803, the British controlled the fur trade in the Red River Basin. Posts were established at Pembina in 1797 by Chaboillez and by David Thompson and Alexander Henry for trade with the Plains Ojibwe in the Red River Valley. A North West Company fur trading post was established at Grand Forks/East Grand Forks in the early 1800s. In 1811, the Scottish Earl of Selkirk with a land grant from the Hudson's Bay Company, started an agricultural colony at the confluence of the Red and Assiniboine rivers in Manitoba. In 1816 the colony was attacked by the large Metis population of the area. Subsequent to this, Lord Selkirk purchased from the Ojibwe and Cree a strip of land extending from the mouth of the Red River upstream to where Grand Forks is now located, with the main settlement at the 49th parallel in the Pembina area.

The development of the Red River oxcart trails was a direct result of the fur trade and the need for transporting goods between settlers in the Red River region and St. Paul, Minnesota. These cart trails were used from the 1830s to 1871 when the railroads replaced them. The Red River Trail followed the east side of that river from Lake Traverse to Pembina. The North Dakota Trail ran north-south to the west of and roughly paralleling the Red River. A branch of the Red River Trail crossed that river near its confluence with the Red Lake River.

A land cession treaty between the United States government and the Ojibwe in 1863 resulted in the Ojibwe giving up most of their land and mineral rights in northern Minnesota and the Red River Valley in North Dakota. The Dakota ceded most of their lands in southwestern Minnesota and the Red River Basin in North Dakota in 1872.

Minnesota was organized as a territory in 1849 and the Dakota Territory was organized in 1861. Minnesota statehood came in 1858. North and South Dakota became states in 1889. Grand Forks became the second permanent settlement in what would be North Dakota. Pembina was first in about 1813. Although the French explorers and fur traders and the Hudson's Bay Company traders had used the area at the confluence of the Red and Red Lake Rivers for trading outposts in the late 1700s and early 1800s, it was not until 1865 that a handful of Euro-American settlers moved into the area. Ten years later riverboat Captain Alexander Griggs filed a plat for the original Grand Forks townsite on 90 acres of land he claimed via squatter's rights, having been there since 1871. Grand Forks acquired a post office in 1870, became the Grand Forks County seat in 1873, was incorporated as a village in 1884, and as a city in 1887 (Williams 1966:119). East Grand Forks was incorporated as a city in Polk County in 1887 (Upham 1969:423).

Settlement of western Minnesota and the Dakotas was directly tied to the arrival of the Northern Pacific Railroad in Moorhead in 1872 and the St. Paul, Minneapolis and Manitoba (Great Northern) Railroad in Grand Forks in 1880. The 1878-1887 influx of settlers from Germany, Scandinavia, Great Britain, Ireland, and the Great Lakes region into the Red River Valley was the direct result of the chance for free land under the Homestead Act of 1862 and the active promotions of the railroads. A second influx of settlers occurred from the late 1890s to 1920 and involved eastern, central, and southern Europeans. Improvements to highways and country roads occurred after 1910 with the increasingly common use of the automobile. The drought and depression of the late 1920s and 1930s resulted in the loss of many farms in the Red River Valley due to an inability to pay mortgages and/or taxes because of successive crop failures.

4.2.2 Previous Cultural Resources Investigations

Prior to 1980, the only cultural resources fieldwork in the Project area and near vicinity involved the complete excavation in 1888 of a single burial mound (site lead 32GFx235) west of Reeves Drive in Grand Forks by Montgomery (1906) and the recordation of another lone mound (site 21PL12) in the Point area of East Grand Forks by Lewis in 1886 (Winchell 1911:362) and Wilford in 1939 and 1945.

Approximately 10 percent of the Project area has been previously surveyed for cultural resources between 1980 and June 1998. A total of 37.5 miles of levee, floodwall, tieback levee, road raise, and coulee diversion alignments and 1310 acres of the proposed Greenway area, including 30.8 miles of riverbank, still need an archeological survey as of July 1, 1998, as do Project-related borrow areas when they are selected. There have been six previous archeological surveys and three architectural inventories on the Grand Forks

side of the Red River and four archeological surveys and one architectural inventory on the East Grand Forks side. About 90 percent of the buildings and structures to be acquired as part of the Project area have had their National Register eligibility evaluated as of June 1998. Only one of the ten recorded historic and/or prehistoric archeological sites has been evaluated.

Past archeological surveys in Grand Forks include a 1980 pedestrian survey of English Coulee from Interstate 29 to just east of State Mill Road (Hudak 1981); a survey of the banks of the Red River from the old to the new Riverside Dam locations (Haury 1987); limited testing at historic archeological site 32GF116 and a low-water cutbank survey along the Red River from the old Riverside Dam upstream to the south end of Central Park (Haury 1988); a survey of a proposed cable crossing of the Red River 0.7 miles downstream of the new Riverside Dam (Gregg and Picha 1989); and two surveys involving proposed in-town levee and floodwall alignments from 27th Avenue North to County Highway 19 on the south side of Grand Forks as well as a proposed English Coulee diversion as part of the St. Paul District Corps' feasibility study for flood protection for the City of Grand Forks (Hagglund and McCarthy 1995; Ketz and Dolence 1997). Nine prehistoric and/or historic archeological sites were located as a result of these surveys. All are within one-quarter mile of the Red River. Testing at historic archeological site 32GF116 in the Riverside Dam area resulted in the determination that this site was not eligible to the National Register.

Geomorphological investigations during the 1996 survey (Ketz and Dolence 1997) evaluated the potential for buried archeological sites along the proposed levee corridor. Deep coring (up to 4.5 meters/15 feet) revealed multiple buried Holocene-age paleosols with archeological site potential in the Lincoln Drive area and the areas riverward of Olson Drive, Elmwood Drive, and the Northridge Hills Court to Sloping Hills Cove vicinity. Deep coring along the remaining levee and floodwall segments revealed a late glacial surface where any archeological sites present should be found at or near the surface. Recent/historic age alluvial deposits overlay the Holocene aged soils and become thicker the closer one is to the Red River.

Past archeological surveys in East Grand Forks include a 1980 windshield reconnaissance survey of two proposed levee alternative alignments (Hudak 1981); a survey of two proposed bank unloading areas, in the Forrest Court and North 4th Street vicinity and between the railroad tracks and the Red Lake River east of the Murray Bridge and west of the old City Water Plant (Artz 1984); a survey of the 1000 foot section of Red River bank between the old and the new Riverside Dam locations (Haury 1987); and a proposed cable crossing of the Red River 0.7 miles downstream of the new Riverside Dam (Gregg and Picha 1989). Archeological site 21PL17, consisting of the remains of the Grand Forks Lumber Company sawmill site, a few prehistoric artifacts, and a twentieth century landfill, were found in the second bank unloading area east of the Murray Bridge (Artz 1984).

In addition to National Register eligibility evaluations of various individual buildings and structures, there have been three larger scale, strictly architectural inventories and evaluations in Grand Forks and one such study in East Grand Forks. In 1981, the area of Grand Forks bounded by Highway 2 on the north, Washington Avenue on the west, 8th Avenue South on the south, and the Red River on the east was inventoried for National Register of Historic Places eligible buildings (Roberts 1981). As a result of this inventory, 32 individually nominated historic properties comprising the Downtown Grand Forks Multiple Resource Area (DGFMRA) were listed on the National Register in October 1982. The North Dakota SHPO considers this architectural inventory to be outdated and recommends that those properties not previously considered eligible to the National Register have their eligibility reevaluated.

In 1992, Mr. Steven Hoffbeck of the Grand Forks Historic Preservation Commission conducted a reconnaissance inventory of the Riverside Park area of Grand Forks (Hoffbeck 1992). Mr. Hoffbeck recommended that the residences at 1518, 1648, and 1635 Riverside Drive; 1412 and 1418 Lewis Boulevard; and the Bathhouse and Pool in Riverside Park are eligible to the National Register on their individual architectural and historical merits. Other residences he believed might be eligible to the National Register included those at 29 Conklin Avenue; 24 Fenton Avenue; 1422, 1618, 1623 and 1628 Lewis Boulevard; and 1605, 1621 and 1717 Riverside Drive. No formal determinations of the National Register eligibility of these standing structures either on an individual basis or as part of a potential Riverside Park Historic District were made at that time, however.

The Archaeology and Historic Preservation Division of the State Historical Society of North Dakota in Bismarck has a “Master List: Addresses, SITS Numbers, and Eligibility Assessments for surveyed properties in Grand Forks” for an area bounded by 1st Avenue South and Division Avenue on the north, South 9th Street on the west, 13th Avenue South and Lincoln Drive on the south, and the Red River on the east. Of the 1657 residences and other buildings evaluated as part of this 1991-1993 study, 10 were already listed on the National Register, 67 were determined to be individually eligible to the National Register, 438 were determined eligible as contributing members within the East Side Residential Historic District (ESRHD), 196 were both individually eligible and eligible as a contributing member of the ESRHD, 226 were noncontributing members within the ESRHD, and 720 were outside the ESRHD’s boundaries and were determined to be not eligible to the National Register. The eligibility of 81 other buildings and structures in the inventory area remains undetermined pending further information.

In June 1997, immediately after the flood, staff from the State Historic Preservation Office of the Minnesota Historical Society evaluated the National Register eligibility of 470 buildings , both residential and commercial, in East Grand Forks. Of these, 448 buildings were determined to be not eligible to the National Register in the field. An additional 22 buildings required further archival work to complete their evaluations, but were eventually all determined to be not eligible as well. Information on this architectural evaluation work is available at the State Historic Preservation Office in St. Paul.

4.2.3 Known Cultural Resources Sites

Archeological sites recorded to date in the Grand Forks portion of the Project area include three historic cultural material scatter sites (32GF116, 32GF134, 32GF135), one prehistoric cultural material scatter site (32GF130), riverboat dock remains (32GF133) opposite St. Anne's, and the remains of two small boat docks (32GF131, 32GF132) and two patio/chimneys (32GF126, 32GF2087) along the Red River at Riverside Drive. Except for historic site 32GF116, which was determined not eligible to the National Register, none of these archeological sites have had their National Register eligibility determined. A multi-component historic sawmill/landfill/prehistoric lithic scatter site (21PL17) is the only archeological site recorded for the East Grand Forks portion of the Project area. Its National Register eligibility also is undetermined.

Besides these recorded sites, there are also unverified leads to a second set of steamboat docks (32GFx33/32GFx42), three steamboat wrecks (32GFx233, no #, no #), and a former "Indian cemetery" (32GFx235) for Grand Forks and a trading post (21PLf) and early settler's cabin site (BC8.1 W956) for East Grand Forks. Archeological inventories of the Project area are not complete so the final total of prehistoric and historic archeological sites is not known. Phase I cultural resources investigations to inventory the remainder of the Project area are scheduled for 1999, as is testing and archival research to determine the National Register eligibility of archeological sites in the Project's construction areas.

Architectural inventories are complete for the in-town portions of the Project area for both Grand Forks and East Grand Forks. A total of 600 buildings and structures in Grand Forks and 494 buildings and structures in East Grand Forks were within the Project area prior to the start of the Cities' respective 1997 flood voluntary buy out programs. The National Register eligibility evaluations of these properties are over 90 percent complete. A Phase II evaluation contract will complete the remaining evaluations during the summer and fall of 1998. Buildings and standing structures along the tieback levees and road raises and in the borrow areas will be inventoried as part of the Phase I cultural resources investigation mentioned above.

There are three reported burial locations in the Project vicinity: one (21PL12) on the Minnesota side of the Red River and two (32GFx234, 32GFx235) on the North Dakota side. Single mound site 21PL12 was originally reported by Lewis in 1886 in the Point area of East Grand Forks. Wilford reports in 1939 that the mound was located on the section line between Sections 7 and 18, Township 151 North, Range 49 West. In 1945, Wilford reported that a section line road had been constructed over the mound. No trace of

the mound was observed during a 1978 field check by Minnesota SHPO staff. This mound location is landward of the proposed Point area levee alignment and will not be affected.

In 1906, Montgomery reported the former presence of a single mound (32GFx235) which he excavated in 1888 prior to the landowner using its soil to landscape his lawn. It was located between Reeves Drive and Belmont Road, which places its location landward of the floodwall currently proposed for the east side of Reeves Drive. This mound location will therefore not be affected by the Project.

The James Turner papers at the Myra Museum in Grand Forks mention an "old Indian cemetary" located on the east side of North 3rd Street opposite approximately 307 North 3rd Street. Turner wrote his reminiscences in about 1965. He indicates that the "bodies were dug up and buried elsewhere." It is not known if this cemetery was a burial mound or a formal interment. In addition, no burial discovery or relocation dates are given, nor are the number of burials involved or the reburial location mentioned. Construction of the proposed floodwall adjacent to the east side of North 3rd Street in this area might cross over/through this unverified former burial location or it may have been located farther riverward, in which case it would not be impacted by the proposed floodwall construction.

4.2.4 1997 Flood Voluntary Acquisition Programs

Both the City of Grand Forks and the City of East Grand Forks established voluntary acquisition programs after the flood of 1997. Offers were made by the respective city to property owners whose residence or commercial building had received 50 percent or greater structural damage as a result of the flood. The City of Grand Forks' voluntary acquisition program used Hazard Mitigation Program funds from FEMA and Community Development Block Grant funds from HUD. The City of East Grand Forks' voluntary acquisition program used State of Minnesota, Department of Economic Trade and Development funds, which ultimately came from HUD. Acquisition of buildings and structures under either of these cities' programs is not considered part of the Project because these flood-damaged properties would have been bought out by the cities whether the proposed flood protection Project is built or not.

The relocation or demolition of the historic properties acquired by the City of Grand Forks'voluntary acquisition program using FEMA and HUD funds are covered under a Programmatic Agreements between FEMA or HUD and the North Dakota State Historic Preservation Officer, the Advisory Council on Historic Preservation, and the City of Grand Forks to cover their Section 106 responsibilities. The Minnesota State Historic Preservation Officer has determined that none of the buildings and structures acquired by the City of East Grand Forks'voluntary acquisition program are eligible for listing on the National Register, so their resultant relocation or demolition thereby has no effect on historic properties.

4.2.5 National Register of Historic Places Listed or Eligible Sites and Districts

As of June 1998, there are 49 properties individually listed on the National Register of Historic Places in the City of Grand Forks and one in the City of East Grand Forks. Within the Project area itself, there is a total of seven listed, 91 eligible, and 52 undetermined eligibility properties in the Grand Forks portion and zero listed, two eligible, and 28 undetermined eligibility properties in the East Grand Forks portion. Parts of the Downtown Grand Forks Multiple Resource Area and the proposed but not formally nominated Riverside Park and East Side Residential Historic Districts are also located within the Project area for Grand Forks.

Four of the 32 individually listed properties which comprise the Downtown Grand Forks Multiple Resource Area are within the Project area. These are Boom Town Store #1 at 201 South 3rd Street, the Red River Valley Brick Co. building at 215 South 3rd Street, the Viet's Hotel at 309-311 South 3rd Street, and the Viet's Hotel Annex at 317 South 3rd Street. The City of Grand Forks acquired the Viet's Hotel under its 1997 flood voluntary acquisition program.

The 1993 proposed East Side Residential Historic District (ESRHD) is located just south of downtown Grand Forks. It is roughly bounded by 1st Avenue South on the north, South 3rd Street on the northeast, Reeves Drive on the east, 13th Avenue South on the south, and Cherry and Cottonwood Streets on the west. There are seven individually eligible and contributing (IC) properties and 17 contributing properties of the ESRHD within the Project area. One IC and nine contributing properties have been acquired by the City of Grand Forks through its 1997 flood voluntary acquisition program.

The 1992 proposed Riverside Park Historic District (RPHD) is an irregularly shaped area roughly bounded by the Red River at Riverside Drive on the east, Park Avenue on the north, North 2nd Street on the west, and Gateway Drive (Highway 2) on the south. There are one listed, 36 individually eligible and contributing (IC), and 42 contributing properties in the RPHD. Thirty of these properties (one listed, 18 IC, 11 contributing) are within the Project area. Of these, the City of Grand Forks has acquired the listed property (residence at 1648 Riverside Drive), 10 IC properties, and 10 contributing properties under its 1997 flood voluntary acquisition program.

National Register listed properties located in the Project area in Grand Forks, but not within the multiple resource area or either of the two historic districts, include St. Anne's Guest Home at 813 Lewis Boulevard, the Thomas D. Campbell House at 2405 Belmont Road, and portions of the R. S. Blome Granitoid Pavement along Lewis Boulevard, South 4th Street, Elm Avenue, and 4th Avenue South.

Not counting the historic properties in the above two historic districts, 38 buildings and structures located in the Project area in Grand Forks have been determined eligible to the National Register, including two bridges. These same two bridges, the Northern Pacific Railroad Bridge and the Sorlie Memorial Bridge which span the Red River north of and at DeMers Avenue, are the only National Register eligible properties in the Project area in East Grand Forks. Additional eligible buildings and structures may be expected when the 52 buildings and structures of undetermined eligibility in Grand Forks and the 28 buildings and structures of undetermined eligibility in East Grand Forks have their National Register status evaluated.

Nine of the 10 recorded prehistoric or historic archeological sites in Grand Forks and East Grand Forks have not had their National Register eligibility evaluated. The tenth site (32GF116) has been determined not eligible for inclusion on the National Register. Additional archeological sites may be expected when the Phase I cultural resources investigation is conducted in 1999. Evaluation of archeological sites will also be conducted in 1999.

4.3 SOCIOECONOMIC RESOURCES

4.3.1 General

The city of Grand Forks is located on the eastern border of northeastern North Dakota, 75 miles north of Fargo, North Dakota, and 150 miles south of Winnipeg, Manitoba, Canada. Grand Forks is one of the four largest communities in North Dakota. East Grand Forks, a city in northwestern Minnesota, is directly across the Red River from Grand Forks. East Grand Forks is situated at the junction of the Red and Red Lake Rivers.

The agricultural land in and around these cities is comprised of the rich, fertile land of the Red River Valley of western Minnesota and eastern North Dakota and is one of the most fertile farming areas of the world. Principal cash crops of the region include potatoes, sugar beets, sunflowers, and wheat. Many of the area's major employers are manufacturers or processors of agricultural products.

Grand Forks/East Grand Forks is a health, educational, cultural, and commercial center serving seven counties in northwest Minnesota and ten counties in North Dakota with a population of approximately 220,000.

4.3.2 Development

The Grand Forks-East Grand Forks area entered history as a trading post for the North West Fur company in the early 1800s. Permanent settlement began in the 1870s, which was accelerated by steamboat traffic on the Red River between Fargo and Winnipeg. Railroads reached the area in 1881. Grand Forks was incorporated in 1881, and East

Grand Forks was incorporated in 1887.

The towns are located immediately across the river from each other and are joined by bridges. The relationship between the two towns is close, with many residents of East Grand Forks working in Grand Forks. Although East Grand Forks has maintained its integrity as an independent entity, at a present population of 9,000 it is overshadowed by the much larger Grand Forks at a present population of 52,500.

The cities have traditionally served as agribusiness and agricultural service centers for a large rural region. Population in the region has been declining in keeping with the general trend toward larger farms. Grand Forks has been experiencing moderate population increases, but East Grand Forks has been growing very slowly. Both cities have been experiencing out-migration. Although both cities have large agribusinesses, Grand Forks has the advantage of the Air Force Base, a regional hospital, and the University of North Dakota.

Both cities are ethnically homogeneous. About 95 percent of the population of Grand Forks and about 90 percent of the population of East Grand Forks was non-Hispanic white in 1990. About 0.7 percent of each was black and 2.0 percent was American Indian. The Asian population was 1.2 percent in Grand Forks and 0.5 percent in East Grand Forks. Grand Forks was 1.2 percent Hispanic, and East Grand Forks was 5.9 percent Hispanic. Much of the ethnic population is associated with the university and the Air Force Base. Hispanics have come to East Grand Forks to seize opportunities afforded to agricultural field laborers.

East Grand Forks is physically divided by the Red Lake River. The city has been developing slowly to the south and east. Grand Forks has been developing more quickly, but through a dispersed pattern based on amenities. Both cities have experienced declines in their central business districts, and both have developed downtown revitalization plans. These plans have attempted to refocus development toward traditional orientations on the river, with parks and open spaces reinforcing the riverfront focus. These efforts have been consolidated through the development of a joint River Forks Plan.

4.3.3 Flood Characteristics

As river cities, Grand Forks and East Grand Forks have always been threatened by flooding. The Red River flows to the north, and spring snowmelt in the south is trapped as water attempts to move to the north through a still-frozen area. Floodwaters escape from the river and spread over a wide geographic area because the Red River Valley is a glacier plain that is nearly flat.

Approximately one-fourth of the Grand Forks-East Grand Forks area is in the 100-year floodplain under its present delineation. The cities are periodically threatened by high

waters on the Red; but both have constructed local levees that proved successful in flood fights until 1997. In recent decades the only previous flooding of large scale was in 1979 in Grand Forks; but this was an internal drainage problem in which English Coulee escaped from its banks and caused over $7 million in damages.

Corps studies of the feasibility of more adequate protection systems for the two cities extend back many decades. A cost-effective plan was designed for East Grand Forks that was authorized by Congress but declined by the city because of the large number of structures that would be affected. Grand Forks was under study with a designed but Congressionally unauthorized plan when the flood of 1997 hit.

The winter of 1996-1997 in the Red River basin was unusual. There were eight blizzards producing accumulated snows of nearly 100 inches. As the snow began to melt rapidly in early April, upstream communities to the south along the river were flooded or threatened. By the middle of the month, the Red had reached its highest level in a century, and Grand Forks and East Grand Forks were rapidly preparing their lines of defense based on a National Weather Service prediction of a flood crest of 49 feet.

The flood crest ultimately reached 54 feet. Although emergency preparations were accelerated as the water rose in the vicinity of the cities and predictions of flood crests were adjusted upwards, the flood fighting effort reached the upper limits of its capacity when the river reached 52 feet on Friday, April 19th. By Saturday, the water had overtopped the levees and was spreading rapidly through both cities as residents evacuated. In the midst of all the water, a fire consumed buildings in the downtown area of Grand Forks.

In spite of the expenditure of large sums of money in the flood fighting effort, almost all of East Grand Forks and about 75 percent of the land area of Grand Forks were flooded, including most of the densely settled areas. Water entered 11,000 businesses and homes in Grand Forks, and only 27 single-family residences were spared in East Grand Forks. Fifty thousand people fled their homes, power and water were lost, and the cities were cut off from each other. Over $1 billion in damages were sustained.

4.3.4 Economy

In Grand Forks/East Grand Forks, the economy depends on the level of agricultural, industrial, commercial, business trade and service activity. Because Grand Forks/East Grand Forks is a trade center for a large area consisting of northeast North Dakota, northwest Minnesota, and southern Manitoba, the local economy cannot be understood without considering its relationship with the surrounding area. Other indicators affecting the viability of the local economy are employment levels, the volume of wholesale and retail trade, and the amount of industrial activity present in the area.

The Greater Grand Forks Economic Trade Area consists of seven counties in northwest Minnesota, ten counties in North Dakota, and a portion of southern Manitoba. Three North Dakota counties -- Griggs, Steele, and Traill -- have their population centers located in the northern part of the counties and are closer to Greater Grand Forks than to Fargo, and they may reasonably be considered within the Greater Grand Forks Economic Trade Area. Since these counties are located between Grand Forks/Polk Counties and Cass/Clay Counties, there is some overlap between the Greater Grand Forks Economic Trade Area and the Fargo-Moorhead Economic Trade Area. Although it is not possible to determine the economic impact of the Canadian influence on Grand Forks/East Grand Forks in terms of area served, it is assumed to include that area of southern Manitoba as far north as Winnipeg.

The area is highly specialized in agriculture and depends upon agriculture as its basic industry. A variety of crops are grown, including wheat, potatoes, flax, sugar beets, barley, dry edible beans, sunflowers, and other small grains. While agriculture is the area's most important industry, it must be noted that agricultural employment has been declining and income growth has been slow.

The dominance of agriculture upon the trade area economy, as well as the location of Grand Forks/East Grand Forks at such a distance from other manufacturing areas, has greatly influenced the nature of industry in the area. Industrial activity in the Grand Forks/East Grand Forks area focuses on the processing and distribution of agriculturally related products. The leading industrial activity is food processing; notably, potato processing and sugar beet refining. Related industrial activities include seed processing and grain milling, potato warehousing, the processing of dairy products, soft drink bottling, and the production of chemicals and fertilizers.

In addition to the impact of agriculture and trade, the level of activity at the Grand Forks Air Force Base, the University of North Dakota, and other public institutions, notably all government levels, also has a major impact on the local economy.

With nearly 7,000 people on base, and another 3,000 officers, enlisted and family members living off base, the Grand Forks Air Force Base basically is a city unto itself. And while many goods and services are provided for base personnel, they do contribute to the Grand Forks/East Grand Forks economy. In 1997, the payroll on the base was $68.8 million.

Another major influence on the local economy is the University of North Dakota. During the fall and spring semesters, about 10,000 students are enrolled at UND. And year-round, more than 1,500 faculty and staff make Grand Forks/East Grand Forks and the region their home. Beyond Grand Forks, Northwest Technical College in East Grand Forks and the University of Minnesota-Crookston also contribute to the local economy.

Being the region's economic center, Grand Forks also serves as the region's health center, a function filled primarily by Altru Health System. In addition to its 3,200 employees, Altru brings numerous people from outside the region to Grand Forks/East Grand Forks.

Some smaller industrial activities include concrete products, printing and publishing, farm equipment manufacturing, and other machinery and machine works. Sand and gravel are the only natural resources that are extracted in the area.

The Flood of 1997 devastated the local business community. Grand Forks had approximately 88 commercial properties destroyed or probably destroyed and another 675 damaged. Most of the destroyed properties were in the downtown area. Many have already been demolished. Buildings were destroyed, not only by flood, but also by fire in downtown Grand Forks, and numerous days of business have been lost. City government and other agencies are putting a high priority on helping businesses get up and running and rehabilitating damaged properties. Of particular emphasis is accelerating a downtown redevelopment program that was under way even before the flood. East Grand Forks had about 10 commercial structures bought out because of flood damage. Another 15 were targeted to be acquired and demolished as part of the that city's downtown redevelopment program. All of these structures are also on the "wet" side of the proposed levee alignment and would be removed if the levees are built. After floodwaters receded, many of the nearly 2,500 businesses in Grand Forks/East Grand Forks would not reopen for weeks or months. Some never did.

Those that could reopen found fewer workers. Many of their original employees had found new, higher-paying jobs in the construction trades. Wages peaked throughout the two communities as employers were forced to compete for workers. With the shortage, many of the late-night restaurants and stores were forced to shorten hours, which led to more lost business.

After more than a decade of decline, downtown Grand Forks/East Grand Forks had been starting to make a rebound in the mid-90s. After the flood, however, the downtowns didn't exist. They had started coming back to life, but many of the businesses based in downtown have moved to other parts of the cities.

When relocated businesses did try to find new space, they found higher prices instead. Properties on the south end of Grand Forks now demanded a premium price, and to keep open, many businesses were forced to pay the higher rents.

Like other communities, though, after a natural disaster, Grand Forks/East Grand Forks is in the middle of a building boom. Many experts think this trend will continue for the next three to five years. The demand for skilled workers will continue, and the wages should continue to climb.

With record low unemployment, Grand Forks success at attracting workers to the area will help determine the height of its rebound. The ensuing construction boom and demand for skilled labor has left smaller, lower-paying employers short of adequate help.

After the flood, the Grand Forks Region Economic Development Corporation (EDC) took on a new role. Instead of luring new businesses and jobs to the region, it tried to help keep the ones they had. The short-term priority is on maintaining the economic base that existed prior to the flood. In the near future, though, EDC will pursue economic development again.

A key factor in attracting companies is a skilled work force. Work force training has become a serious concern for economic developers. But with unemployment so low, companies are reluctant to come to the area unless they know a skilled work force exists. As EDC recruits prospective companies, their focus is on procuring quality jobs for the area. Little benefit is attained by bringing in more part-time and low-paying jobs. What the local economy needs are high-paying, long-term jobs that can help entice some of the 2,000 annual UND graduates to stay in the area. So matching the needs of companies with skills of the labor force is a challenge for economic developers. In order to thrive in the new economy, Grand Forks and the region must attract companies, and employees, to the region.

4.3.5 Physical Characteristics

The area in and around Grand Forks is comprised of the former lake bed that was once covered by ancient glacial Lake Agassiz. This glacial lake extended as far south as the North Dakota-South Dakota border and hundreds of miles north into Manitoba and Saskatchewan, Canada. As Lake Agassiz receded, it left behind a lake bed that is now the Red River Valley. When the lake drained, it left behind numerous rivers, coulees, lakes and streams and tributaries; also remaining were many underground aquifers that supply areas surrounding Grand Forks/East Grand Forks with their water supplies. However, Grand Forks/East Grand Forks and the surrounding areas receive the majority of their water supply from the Red and Red Lake Rivers. This water supply is purified and made potable in water treatment plants in both Grand Forks and East Grand Forks.

Along the Red River lies some of the richest agricultural farmland in the world. Unfortunately, this farmland is subject to frequent flooding, usually during the spring each year.

The mineral resources in the Grand Forks/East Grand Forks area consist primarily of sand and gravel extractions. These deposits are used in the building and maintenance of roads and general building construction. Although this area contains a great deal of sand and gravel deposits, they are used only locally. In the late 1970's, seven exploratory oil wells were drilled in Grand Forks County, but results were negative.

The climate of Grand Forks/East Grand Forks is characterized by a wide variation in temperature, caused by nearly continuous air movement, and light to moderate precipitation. Weather patterns consisting of cold, dry, polar air and warm, moist, tropical air move quickly into the area, resulting in the characteristic temperature variations. Temperatures drop to 0 degrees Fahrenheit or below on an average of 60 days each year. Spring is the time of great changes in temperature and precipitation. April is when the most rapid warming occurs in the springtime, with an average monthly temperature 18 degrees Fahrenheit higher than that of March. The average last day of frost is May 16, but freezing temperatures have been recorded as late as June.

Summer months are characterized by nearly continuous weather patterns that are dominated by regions from the arid south. The summers are warm but not hot; a maximum temperature of 90 degrees Fahrenheit or more occurs on an average of only 12 days a year. The highest temperature of record was 109 degrees Fahrenheit on July 13, 1936.

The first fall frost usually occurs in mid to late September, signaling the end of the growing season and indicating that about two months remain until winter. Average frost depth is 4.5 feet, but the frost has been known to go as deep as 7 feet.

The temperature changes that accompany the rapidly moving winter weather systems may, at times, become extreme and be accompanied by blizzard conditions. The lowest temperature on record at the Grand Forks weather station was minus 44 degrees Fahrenheit on February 1, 1893. The mean annual precipitation of 20 inches is distributed in the form of rain or snow. Average rainfall is approximately 17 inches per year, the balance being snow or sleet (approximately 36 inches annually).

4.3.6 Population

The 1990 census shows Grand Forks had a population of 49,425 people (see Table 3). This is an increase of 5,660 persons or 12.9 percent from the 1980 census population of 43,765. From 1960 through 1990, the city of Grand Forks had an average annual growth rate of 1.25 percent or 12.5 percent every decade.

Table 3. Number of Residents - Grand Forks, North Dakota 1890 - 1990

Year	Population	Increase	Percent Change
1890	4,979	- -	- -
1900	7,652	2,673	53.7%
1910	12,478	4,826	63.1%
1920	14,010	1,532	12.3%
1930	17,112	3,102	22.1%
1940	20,228	3,116	18.2%

			Percent
Year	Population	Increase	Change
1950	26,836	6,608	32.7%
1960	34,451	7,615	28.4%
1970	39,008	4,557	13.2%
1980	43,765	4,757	12.2%
1990	49,425	5,660	12.9%
Source: Census of Population, 1890-1990			

Between 1980 and 1990, the State of North Dakota experienced a population decline of nearly 14,000 people. During the same decade, the cities of Fargo, Grand Forks, Bismarck, and Minot all had significant increases in population. Grand Forks is ranked as the second largest city in North Dakota according to the 1990 census information. Most of the growth of the larger cities in the State can be attributed to economic expansion opportunities. Agriculture has become increasingly efficient since the turn of the century, reducing the need for a large population base in the rural areas of the State. Many people from the surrounding areas have moved to Grand Forks seeking jobs.

The 1990 census shows East Grand Forks has a population of 8,658 people (see Table 4). This is an increase of 121 persons or 1.4 percent from the 1980 census population of 8,537. From 1960 through 1990, the city of East Grand Forks had an average annual growth rate of 0.8 percent.

Table 4. Number of Residents - East Grand Forks, North Dakota 1890 - 1990			
			Percent
Year	Population	Increase	Change
1890	795	- -	- -
1900	2,077	1,282	161.3%
1910	2,533	456	22.0%
1920	2,490	(43)	-1.7%
1930	2,922	432	17.3%
1940	3,511	589	20.2%
1950	5,049	1,538	43.8%
1960	6,998	1,949	38.6%
1970	7,607	609	8.7%
1980	8,537	930	12.2%
1990	8,658	121	1.4%

			Percent
Year	Population	Increase	Change
Source: Census of Population, 1890-1990			

During the 1980's, Polk County in Minnesota experienced a population decline of 2,346 people. During the same time, no other city in Polk County gained in population. East Grand Forks became the largest city in the county, surpassing Crookston, the county seat, located 22 miles to the east.

Estimates of the most probable future growth for Grand Forks and East Grand Forks are based primarily on growth patterns for a small metropolitan area. Population growth due to natural increase and the expansion of employment opportunities are the primary factors responsible for growth (see Tables 5 and 6). The cities are classified as part of a metropolitan service center because the community provides goods and services to a 17-county region with a population of approximately 220,000 people. Population forecasts are based on expectations that the local economy will continue to expand, primarily due to the continuing growth of Greater Grand Forks as a metropolitan service and trade center. Recent developments reflecting this growth include improved and expanded medical facilities and the expansion of major retail facilities in Grand Forks and an increase in housing starts and new residential developments being platted in East Grand Forks.

Table 5. Population Projections - Grand Forks, N.D. 1990 - 2020			Table 6. Population Projections - East Grand Forks, MN. 1990 - 2020	
Year	Population		Year	Population
*1990	49,425		*1990	8,658
2000	53,873		2000	9,350
2010	58,722		2010	10,100
2020	64,007		2020	11,000
* Census of Population and Housing 1990			* Census of Population and Housing 1990	
Source: Grand Forks Planning Office, 1993			Source: Grand Forks/East Grand Forks	
			Metropolitan Planning Organization, 1992	

The relationship between the economy and population growth is reciprocal in effect. Population growth will stimulate the economy and economic growth will attract more people. Industrial growth has a similar effect, but introductions of new industries into the local economy are not anticipated at this time.

In summary, continued economic growth and employment opportunities in Greater Grand Forks will continue to foster population growth. Economic indicators such as new housing will probably exceed the rate of population growth in the future because household size is decreasing.

4.3.7 Education

Grand Forks (Forks Facts compiled December 1996) schools consisted of thirteen elementary schools with enrollment of 5,179 students, four middle schools with 1,686 students, three high schools with 2,884 students, one vocational technical institute with 1,108 students, one business college with 110 students, and the University of North Dakota with 11,000 students.

The North Dakota School for the Blind is also located in Grand Forks as well as seven parochial and private schools.

The University of North Dakota (UND), with over 11,000 students, 800 faculty and researchers, 570 acres of campus and an annual budget exceeding $200 million, is the largest institution of higher education in the Dakotas, Montana, and western Minnesota. Academic programs are offered in more than 100 fields, and the curriculum spans arts and sciences, aviation, business, fine arts, engineering, human resources, education, nursing, law, medicine, and graduate studies, plus a division of continuing education. The aerospace and the business programs are the most popular. Many UND workers also are affiliated with the nearby U.S. Department of Agriculture's Human Nutrition Research Center, which is recovering from multi-million dollar flood losses.

UND's school of medicine is recognized as a national leader in training rural health care providers. UND is ranked #1 in the Nation in training physicians who go on to practice in rural areas. In recent years, two world-class facilities have developed at opposite sides of the campus. The Energy and Environmental Research Center, which has undertaken numerous government and industry projects and is closely tied to the School of Engineering and Mines, is located on the east end and the Center for Aerospace Sciences is located on the west end.

East Grand Forks (Community Profile compiled April 1991) schools consisted of three elementary schools with enrollment of 1,029 students, one junior high school with 446 students, one high school with 485 students, and one vocational technical institute specializing in general construction and super insulation techniques. Three private and parochial schools are also located in East Grand Forks.

Education incurred staggering losses from the flood. School replacement costs alone are estimated at $41 million in East Grand Forks and $22 million in Grand Forks. And millions more have been and will be spent on cleanup and rebuilding. More than $5 million will be spent just to bring the lower level of Central High School back on line.

In response to the flood catastrophe, though, new construction, which will be covered largely by disaster payments and insurance policies, will result in state-of-the-art learning environments. Students will get facilities that might otherwise have taken years to develop through normal budgeting, and they will in many cases have roomier classrooms, more modern support services, better access for the handicapped and more green space.

In Grand Forks, the school district lost South Middle School, which is being sold for a private apartment project. It will build a new middle school three miles farther south next to the softball complex at Ulland Park. Grand Forks also lost Lincoln and Belmont elementary schools, and will rebuild one new school for the children of those two neighborhoods on the near south side. The new school will be at the former site of Belmont, and represents a successful campaign last summer to keep a small neighborhood school alive near downtown and the river front.

Not far from Belmont, a non-profit organization has bought a flood-damaged historic church from a Presbyterian congregation to build a family oriented Dakota Science Center, with hands-on exhibits and a nationally funded computer outreach program for North Dakota. Dakota Science is locally renowned for its Brainy Bunch program for after-school science learning among older elementary children.

East Grand Forks lost the use of three of its former public schools and its Catholic elementary and high school, as well. They are temporarily operating from metal buildings. Sacred Heart has a plan to rebuild at its former site near the church at the edge of downtown. The public school system is building a south-side middle school and elementary school on 100 acres of former wheat fields on the edge of the city, and is building a new elementary school on the north side. In the meantime, East Grand Forks plans to close Valley Elementary in the heavily damaged central part of town, and divide its reduced student population next year between the new north-end and south-end schools.

UND, after nearly $40 million in flood damage, is largely recovered from its worst disaster and has continued with new projects, including two new skywalks and the renovation of its chemistry facilities. The campus is reviewing its tuition plans with an eye to attracting more non-traditional students, and is pushing ahead with strategies for integrating technology into more programs and beefing up its computer system. North Dakota State University in Fargo is gaining numbers while UND has slid. But the Grand Forks campus remains the largest institution in the 11-campus state system, and still is considered the flagship campus.

4.3.8 Housing

Prior to the flood of 1997 Grand Forks had an extensive housing stock. The type of housing varies from single- family detached homes to high-rise condominium units. In 1980, there were more than 17,000 housing units in Grand Forks, but 10 years later, in 1990, the number of housing units in Grand Forks had grown to almost 19,600 (Table 7), an increase of 12.4 percent.

Table 7. Housing Characteristics - Grand Forks, N.D. 1980 - 1990				
Units in Structure	1980 # of Units	1980 % of Units	1990 # of Units	1990 % of Units
* 1 unit	7,898	46.1%	9,172	46.8%
2 - 4 units	2,974	17.3%	2,257	11.5%
5 - 9 units	1,017	5.9%	990	5.1%
10 or > units	4,548	26.5%	6,144	31.4%
Mobile homes	727	4.2%	1,026	5.2%
TOTAL	17,164	100.0%	19,589	100.0%
* Note: Single units included both attached and detached housing units.				
Source: Census of Population, 1980 - 1990				

Single-unit housing is the largest category of housing type in Grand Forks. From 1980 to 1990, there was an increase of almost 1,300 single housing units in Grand Forks, but the increase was only 0.7 percent in the overall housing composition. Over 7,650 single housing units are owner-occupied with a median value of $64,700. The remaining 1,250 single housing units are renter-occupied with a median rent of $320 per month.

Grand Forks multi-family housing is a study of contrasts -- from the converted basement of a former single-family house to a new 24-unit apartment building. Multi-unit housing is an important part of Grand Forks' housing stock, because it fills the needs of highly mobile people, like college students and military personnel. From 1980 to 1990, there was an increase of about 860 multi-family housing units in Grand Forks. The number of mobile homes increased by almost 300 units from 1980 to 1990.

Prior to the flood of 1997 East Grand Forks had a stable housing stock. The type of housing varies from single-family detached houses to large apartment buildings. In East Grand Forks, there were 3,470 housing units in 1980. Ten years later, in 1990, the number of housing units in East Grand Forks had grown slightly to 3,500 (Table 8), an increase of 1.0 percent.

Table 8. Housing Characteristics - East Grand Forks, MN. 1980 - 1990				
Units in Structure	1980 # of Units	1980 % of Units	1990 # of Units	1990 % of Units
1 unit, detached or attached	1,938	55.8%	2,093	59.8%
2 - 4 units	391	11.3%	305	8.7%
5 - 9 units	191	5.5%	150	4.3%
10 or > units	762	22.0%	738	21.1%
Mobile homes	188	5.4%	189	5.4%
Other	NA	NA	25	0.7%
TOTAL	3,470	100.0%	3,500	100.0%
Source: Census of Population, 1980 - 1990				

Single-unit housing is the largest category of housing type. From 1980 to 1990, there was an increase of 155 single housing units in the city, an increase of 4.0 percent in the overall housing composition. Over 1,900 single housing units are owner-occupied. The median value of one-unit structures is $55,767.

East Grand Forks multi-family housing declined in numbers during the 1980s. Over one-half of the decrease occurred in the 2- to 4-unit type, possibly signifying the conversions of structures back to single-unit, owner-occupied homes. From 1980 to 1990, there was a decrease of around 150 multi-family housing units in East Grand Forks. The median rent in 1990 was $330 per month.

A major impact of the flood was the loss of a considerable percentage of the housing stock in the two cities. Seriously damaged properties in the floodplains of both cities are being bought out under FEMA regulations. Some homes with lesser damage but also in the floodplains are also being bought out. Grand Forks has targeted approximately 773 homes for buy out, East Grand Forks about 500. Some of the lesser damaged homes that are bought out may be relocated and rehabilitated. Some neighborhoods will almost completely disappear; others will be much diminished. New neighborhoods will grow as people move to new housing in areas farther away from the river. The City of Grand Forks bought land on the west side of the city, so they could build about 250 single-family homes. Persons whose homes were bought out because of flood damage have priority in purchasing these houses. East Grand Forks bought 39 acres south of town so the property can be annexed for new neighborhoods and has also hired a consulting group to help displaced residents find suitable replacement land and home plans.

Many of the homes which are not being bought out or relocated sustained varying amounts of damage. In East Grand Forks, only 27 of the approximately 2,800 homes in the City escaped damage. In Grand Forks, 8,459 of 10,885 homes were damaged and 1,163 apartments were damaged.

4.3.9 Health

Grand Forks and East Grand Forks serve as the regions health care center. Since the flood, United Hospital and the Grand Forks Clinic have been consolidated under the Altru Health System. Altru Health System, the entity with primary health care responsibility in the region, has numerous branches that provide a wide range of services to a population of 235,000. Outside Grand Forks, Northwood, Grand Forks Air Force Base and Crookston have hospitals of their own. Altru has affiliate clinics in 16 regional communities. Other Altru facilities include a 277-bed acute care hospital and a 50-bed rehabilitation center. Among Altru's 3,200 employees are 170 physicians who practice family medicine and more than 32 other specialties. The health system includes a health maintenance organization with more than 3,000 subscribers and plans for continued growth. Comprehensive services are provided in such areas as cardiology, oncology and diabetes. Home health services, medical equipment and supplies and congregate retirement living also are available through Altru as well as other area sources.

Area residents tend to be healthier than those in the general population, with lower incidences of most cancers and coronary heart disease. On the other hand, area diabetes rates are among the nations highest, especially among Native American residents. And the rates are rising sharply. Altru has established a center specializing in diabetes care to address that problem.

Mental health needs are met by specialists including at least six psychiatrists and dozens of psychologists.

Low-income working people without health insurance can be treated without charge through the Third Street Clinic, which screens patients and refers them to Altru physicians.

The flood forced United Hospital to evacuate all staff and patients, many by helicopter. The hospital and Grand Forks Clinic operated for several weeks at Grand Forks Air Force Base and from sites in surrounding communities. Other regional hospitals took in many patients. Elective surgeries were postponed. The flood also displaced residents of all Grand Forks and East Grand Forks nursing homes. Nine months after the flood, residents still were in other facilities while new facilities were being built.

The stress caused by the flood prompted a jump in alcohol abuse, domestic violence and mental health problems. Many employers provided professional counseling services for workers.

The flood also created concern that molds and other flood contamination could cause physical illnesses such as respiratory problems or allergic reactions. The extent of this problem is currently being researched.

4.3.10 Income

According to 1990 census figures the median family income was $32,417 for Grand Forks and $31,140 for East Grand Forks. Per capita income was $11,902 for Grand Forks and $10,588 for East Grand Forks.

4.3.11 Employment

The percentage of people working in Grand Forks has consistently increased since the 1960s. This reflects the large number of women who have entered the work force and the decrease in the birth rate over the past 30 years. According to 1990 census information, more than 60 percent of the local population was employed at the time of the survey. The percentage of people employed is projected to fall slightly over the next 30 years as people from the “Baby Boom” generation begin to retire (see Table 9).

Table 9. Employment - Grand Forks, N.D. 1960 - 2020			
			% Population
Year	Population	Employment	Employed
1960	34,451	11,620	33.7%
1970	39,008	16,356	41.9%
1976	42,581	22,356	52.6%
1980	43,765	22,933	52.4%
1985	46,222	24,159	52.3%
1990	49,425	30,497	61.7%
2000*	52,689	32,511	59.0%
2010*	58,722	34,059	58.0%
2020*	64,007	36,164	56.5%
* Projected Figures			
Source: Census of Population, 1960 - 1990			
Grand Forks Planning Department Population Projections, 9/01/93			

Employment in Grand Forks has increased from just over 27,000 jobs in 1987 to 31,600 jobs in 1993, an increase of 4,600 jobs, or 15 percent, in a 6-year time span (see Table9). Employment is classified into eight basic categories: construction, manufacturing, transportation-communications-public utilities, wholesale trade, retail trade, finance-insurance-real estate, services, and government.

Over three-quarters of the people employed in Grand Forks were employed in one of three sectors in 1993: retail (25%), service (25%), and government (28%) (see Table 10). Grand Forks is a regional trade center, which increases the amount of retail and service sector employment. Government is the largest sector due to the number of people employed at the University of North Dakota, the Grand Forks School District, and the Grand Forks Air Force Base. The University of North Dakota employed nearly 5,400 (full- and part-time) faculty and support staff in December 1991. The Grand Forks School Board employed 1,200 people in 1991. The Grand Forks Air Force Base employed over 550 people in full- and part-time civilian jobs in 1990.

Because of Grand Forks position as a retail and service center for the region, the local economy is heavily dependent on part-time employment. Grand Forks has the highest ratio of part-time workers in North Dakota. And by their nature, part-time jobs are among the lower-paying jobs available.

The remaining five categories of employment total almost 22 percent of total nonagricultural wage and salary employment: construction, 4.9 percent; manufacturing, 5.4 percent; transportation, communications, and public utilities, 4.9 percent; wholesale trade, 3.4 percent; and finance, insurance, and real estate, 3.3 percent.

Table 10. Historical Employment - Grand Forks, N.D. 1987 - 1993

	1987		1989		1991		1993	
Employment	#	%	#	%	#	%	#	%
Construction	1,632	6.0%	1,287	4.6%	1,253	4.1%	1,541	4.8%
Manufacturing	1,581	5.8%	1,529	5.5%	1,496	4.9%	1,701	5.4%
Transportation, Communications, & Public Utilities	1,462	5.4%	1,551	5.6%	1,495	4.9%	1,559	4.9%
Wholesale Trade	928	3.5%	1,022	3.7%	1,028	3.4%	1,071	3.4%
Retail Trade	6,646	24.6%	6,987	25.2%	7,850	25.7%	7,940	25.1%
Finance, Insurance, & Real Estate	1,014	3.8%	1,103	4.0%	1,106	3.6%	1,033	3.3%
Services	6,279	23.2%	6,366	23.0%	7,408	24.3%	8,015	25.4%
Government	7,496	27.7%	7,877	28.4%	8,871	29.1%	8,740	27.7%

	1987		1989		1991		1993	
Employment	#	%	#	%	#	%	#	%
TOTAL	27,038	100.0%	27,722	100.0%	30,507	100.0%	31,600	100.0%
Source: Employment Trends - Community Employment Survey, 1987, 1989, 1991, 1993								
North Dakota Employment Security Bureau								

Employment in East Grand Forks as of September 1991, was 3,600 persons. Between 1980 and 1990, the number of jobs grew by 18 percent, a total of 500 jobs (Table 11).

Table 11. Employment - East Grand Forks, MN. 1970 - 2010			
Year	Population	Employment	% Population Employed
1970	7,607	2,798	36.8%
1980	8,537	3,054	35.8%
1985	8,600	3,942	45.8%
1990	8,658	3,593	41.5%
2000*	9,350	4,885	52.2%
2010*	10,100	6,177	61.2%
* Projected Figures			
Source: Census of Population, 1970 - 1990; Metropolitan Planning Organization Projections, January 1990			

Services are the largest employment sector, accounting for almost 37 percent of all persons employed in East Grand Forks. The other major employment area is the wholesale and retail trade industry, representing 30 percent of the total employment in the city. The remaining total of nonagricultural wage and salary employment is comprised of: manufacturing, 9.6 percent; transportation, communications, and public utilities, 8.1 percent; construction, 5.3 percent; finance, insurance, and real estate, 5.5 percent; and government, 4.7 percent (Table 12).

Table 12. Historical Employment - East Grand Forks, MN.						
	1970		1980		1990	
Employment	#	%	#	%	#	%
Construction	158	5.6%	207	6.8%	191	5.3%
Manufacturing	310	11.1%	201	6.6%	345	9.6%

Transportation, Communications, & Public Utilities	311	11.1%	461	15.1%	292	8.1%
Wholesale/Retail Trade	905	32.4%	1,006	32.9%	1,084	30.2%
Finance, Insurance, & Real Estate	158	5.6%	129	4.2%	198	5.5%
Services	801	28.6%	864	28.3%	1,314	36.6%
Government	155	5.6%	186	6.1%	169	4.7%
TOTAL	2,798	100.0%	3,054	100.0%	3,593	100.0%
Source: U.S. Census of Population 1970, 1980, 1990						

Historically, the Red River Valley is known for its low unemployment. In November 1997, the rate in North Dakota was 1.9 percent, the lowest it's been in 40 years. But the low rate doesn't mean all workers enjoy good jobs. By some estimates, 49 percent of the region's work force is underemployed, working at low-paying jobs until something better comes along.

4.3.12 Land Use

In East Grand Forks, a land use inventory was compiled to determine the city's existing land usage. The actual land use data was obtained through a survey, conducted in the spring of 1993. Acreages were then calculated using computer generated maps of the city, supplied by the city's consulting engineering firm. The physical space classified within the city limits in the 1993 study is 2,807.9 acres. Land uses were evaluated according to broad categories, as follows: residential (single- or multi-family), 577.2 acres; industrial, 409.8 acres; commercial, 88.6 acres; right-of-way, 630.3 acres; public/semi-public, 271.0 acres; recreational, 360.2 acres; and vacant, 470.8 acres.

In Grand Forks, a land use inventory was completed in 1992. Existing residential land use accounts for 2,879 acres or 43.3 percent of the land within the present city limits. Over 70 percent of residential land is in single-family detached housing. Multiple-family is the next largest category of housing, making up almost 15 percent, or 403 acres, of residential land. The remaining categories of residential land use, single-family attached housing and mobile home parks, total over 12 percent of residential land.

Currently, there are 698 acres of commercially developed land within Grand Forks, or 10.5 percent of all developed land. The area zoned for commercial development inside the city limits totals 1,150 acres. Street rights-of-way and undeveloped property make up the difference between developed property and zoned property. There are six concentrations

of commercial development within the city: the Central Business District; South Washington Street; North Washington Street; Gateway Drive; South Columbia Road; and 32nd Avenue South. Grand Forks also has scattered commercial development on other minor arterial and collector streets.

The 1992 Land Use Inventory identified 519 acres of developed industrial land or 7.8 percent of land in Grand Forks. The city has 1,052 acres or 22.0 percent of the city zoned for industrial land use within the city limits. There are approximately 1,400 acres zoned industrial outside the city limits, but within the city's 2-mile extraterritorial zoning jurisdiction. Only a small percentage of industrial land outside the city is developed.

Government buildings, schools, lift stations, churches, hospitals, and cemeteries are all classified as public or semi-public land use. Land that was either dedicated for streets and utilities or purchased as right-of-way is excluded from this category. There are 1,175 acres of land devoted to public and semi-public purposes (17.6 percent of the total developed land within the city limits, not including the Airport Authority land).

There are approximately 550 acres of parks, open space and public recreational land in Grand Forks, or 8.3 percent of the total land within the existing city limits. An additional 400 acres of parks, open space, and recreational facilities outside the city limits are available to Grand Forks residents.

4.3.13 City Government

The organizational structure of the Grand Forks municipal government is mayor-council, with a strong mayor. The terms of office are 4 years. Grand Forks has a Home Rule Charter. The East Grand Forks political structure operates under a mayor-council form of government.

4.3.14 Public Services

Fire Protection	GF 3 Stations/64 employees
	EGF 2 Stations/14 regular employees and 16 volunteers
Police Protection	GF 1 Station/77 employees
	EGF 1 Station/22 employees
Airport	1
Television Stations	4
Radio Stations	8
Cable Service	Basic, expanded and premium services available

4.3.15 Recreational Opportunities

Grand Forks and East Grand Forks have over 34 parks, over 12.5 miles of bike/jogging lanes and paths, 5 golf courses, 6 ice arenas, 5 swimming pools, a water world with slides and miniature golf, 32 tennis courts, 5 indoor tennis courts, and 4 racquetball courts. The

two rivers that join East Grand Forks and Grand Forks offer fishing for the sports enthusiast. Winter months are perfect for snowmobiling, ice fishing and cross-country skiing.

4.3.16 Cultural Opportunities

The Grand Forks/East Grand Forks area offers a variety of theaters, art exhibits, and museums, including performances by the Greater Grand Forks Symphony Orchestra, Greater Grand Forks Master Chorale, North Dakota Ballet Company, Community Performing Arts Council, Burtness Theater, and Fire Hall Theater. The Chester Fritz Auditorium on the UND campus brings in national and international top-name performers. For those interested in history, the Grand Forks County Historical Society and Myra Museum, as well as the North Dakota Museum of Art and the Hughes Fine Arts Center on the UND campus, exhibit the area's rich cultural heritage.

4.3.17 Transportation

Grand Forks/East Grand Forks is serviced by an excellent system of transportation facilities. Interstate 29 passes through Grand Forks, and U.S. Highway 2 passes through both of the communities. Interstate 29 provides convenience to points south such as Fargo, Sioux Falls, Omaha and Kansas City, while terminating at the U.S.-Canada border en route to Winnipeg. U.S. Highway 2 provides east-west highway connection between Duluth, Minnesota, to the east and points west such as Minot and Williston, North Dakota. Efforts are being made to upgrade U.S. Highway 2 to a four-lane divided roadway from Duluth to Williston. Rail facilities link Grand Forks to the Great Lakes ports of Duluth and Superior; to Minneapolis and St. Paul; to Fargo; and to the Pacific Coast via Seattle, 1,400 miles to the west. There are also rail connections to Winnipeg, Manitoba. Grand Forks/East Grand Forks is served by fifteen motor freight carriers, intra-city and inter-city bus lines. The Grand Forks International Airport is served by Northwest Airlines and regional airlines; it also acts as a collection node for Federal Express in this region. There is extensive general aviation traffic in the region due, in large part, to the University of North Dakota Flight Training Center.

4.4 RECREATIONAL RESOURCES

4.4.1 Regional

Current studies reveal that the majority of people recreate within (±) ½ hour of their homes. Considering this, regional recreation resources for this study are commonly considered to be recreation sources that are within a 50 mile radius of the population center – Grand Forks, North Dakota and East Grand Forks, Minnesota.

There are few area-wide recreation contributors in the region. There are no region-wide recreation ties such as regional trails or large (National or State) parks or other attractions commonly associated with recreation or leisure (scenic, geological, biological, etc.). There are however 3 small State parks within the 50-mile radius.

Turtle River State Park is a small park in North Dakota, it is located 22 miles west of Grand Forks on Highway 2. It was established in 1934 by the State Historical Society because of its large number of pioneer (log and stone) structures. The Civilian Conservation Corps constructed the park. Woodland Lodge, constructed along the river in 1938, is still used for family gatherings and park events. In 1995 the number of visits to the park totaled 124,380. The entire park is a nature sanctuary. It contains a rich diversity of wetlands, mixed hardwood stands, floodplain forest, timbered uplands and prairie areas. The 784 acre park offers camping, picnicking, fishing, and a wide variety of trails including: guided interpretive, self-guided nature, bike, mountain bike, equestrian, snowmobile, and groomed trails for cross-country skiing. Sections of the river are stocked with rainbow trout in a cooperative effort with the North Dakota Game and Fish Department. Special Programs are featured at an outdoor amphitheater. Turtle River State Park has no ties with the project area.

In Minnesota, Old Mill State Park (300 acres) is approximately 40 miles northeast of East Grand Forks and the Old Treaty Crossing. Wayside Park is approximately 30 miles southeast on the Red Lake River. The Red Lake River is considered a recreational river for canoeing and boating.

4.4.2 Local: Grand Forks

Grand Forks public recreation facilities address a wide spectrum of user preferences, from art and history museums to a motor speedway. Outdoor recreation areas include 20 public parks and 4 golf courses. Of these, 5 parks and 1 golf course are located within the project boundaries; they are considered some of the more popular recreation areas in the city:

Sunbeam Park is located at the south (upstream) end of the city. It is a "strip park" (a long narrow strip of land) and follows the meandering course of the Red River. It features a paved multi-purpose trail that borders the mouth of Belmont Coulee, then turns south and follows the river for the length of the park. Of the 5 parks, this park serves more as a neighborhood park than a city-wide recreation resource.

Lincoln Park is a more traditional city park with a picnic area and shelter, horseshoe pits, play equipment, tennis courts, flower gardens, and restrooms. Lincoln Park Golf Course and club house are contiguous with the city park. Together they also feature cross-country skiing in the winter. This park serves as an attractive open green-space along Belmont Road. The 18-hole golf course, located within the residential setting, offers panoramic

views to adjacent residents and the users of Belmont Road. North Lincoln Park has a warming house, playground, and flower gardens adjacent to the golf course

Central Park is also a park in the traditional mold. Adjacent to the downtown area, it provides picnic facilities and a shelter, horseshoe pits, play equipment, tennis courts, flower gardens, and restrooms. There are skating and hockey rinks for winter use, an auto tour, and multi-purpose trail.

Kannowski Park is a small park located between the downtown area and the Red River. It is adjacent to the downtown business district and is linked to Central Park and Riverside Park by a multi-purpose trail that also connects to East Grand Forks via the historic Great Northern Railroad Bridge. The renovated railroad station in the center of the park serves as a tourist information center. This park and Central Park receive heavy use from the central business district on warm days.

Riverside Park is located at the north (downstream) end of the project. A traditional city park, it provides picnic facilities and a shelter, tennis and volleyball courts, play equipment, horseshoe pits, flower gardens, skating and hockey rinks, a swimming pool, playing fields, open space, and restrooms. Riverside Park is an attractive open green-space within a residential setting, offering panoramic views to surrounding homes. Park trails link to the Kannowski Park trail and the downtown business district via city tertiary streets.

The city owns the riverbank strip of land between the Kennedy Bridge and the Point Bridge (Minnesota Avenue). Situated between the river and the central business district, this small strip of green space provides about 50 acres of valuable open land for the city's trail system and urban greenspace.

4.4.3 Local: East Grand Forks.

East Grand Forks, located at the confluence of 2 rivers, is considerably smaller than Grand Forks. It is bisected by the Red Lake River from the east, with the Red River of the North bordering the west edge of the city. The city has 14 parks with over 200 acres combined; of these, 7 parks and 1 golf course are located within the flood control project boundaries along the south side of the Red Lake River and the east bank of the Red River.

East Grand Forks parks located on the Red Lake River:

Folson Park features a boat launch and trail with large open areas for passive and active recreation use.

O’Leary Park offers a trail with large open areas for passive recreation use.

Griggs Park features a small playground and skating area.

Red Lake River Golf Course.

Parks situated along the Red River of the North:

River Edge Park is adjacent to the central business district. It features a campground, a boat launch, and multi-purpose trail.

LaFave Park features river fishing and a multi-purpose trail.

Sherlock Park is a traditional city park. It has full facilities including a public swimming pool. Sherlock Park is an attractive open green-space within a residential setting, offering panoramic views to surrounding homes.

River Heights Park features picnic and playground facilities and a multi-purpose trail. This park serves as an attractive open green-space along River Road (North 4th St); the park offers panoramic views to adjacent residents and users of River Road.

Valley View Golf Course, located within a residential setting, offers panoramic views to adjacent residents and users of River Road.

4.5 AESTHETIC RESOURCES:

4.5.1 Regional

The project is located in the "Red River Valley" of the Red River of the North. The project location, shown on Plate 1, is centered on the border of North Dakota and Minnesota with the Red River defining the state boundaries.

The "Valley" is the dry lakebed of a prehistoric lake, Glacial Lake Agassiz. At the project latitude it is about 100 miles wide - east to west. As with most lakebeds, it is extremely flat, almost devoid of vertical relief. In this drainage basin, the ground slopes to the north, with the average slope measured in fractions of a percent. As a relatively young landscape (~ 12,000 years) there is virtually no topography except for the small valleys (a few hundred yards wide) along the rivers; and even smaller coulees carved by precipitation run-off and creeks. The last natural biota of the region was tall grass prairie; at present, land use is overwhelmingly agricultural.

Historically, this is the northeastern edge of the Great Plains of North America; a vast expanse of rolling, grass covered hills inhabited by semi-nomadic Native American tribes. Today the region is part of the mid-western farm belt, the "Bread Basket of America." It is

a sparsely populated area - a rural landscape that stretches across the center of the continent for hundreds of miles. 50-70 miles to the east of the project is the vegetative transition zone where the naturally occurring, rolling grassland changes to northern coniferous forest, dotted with thousands of lakes and streams.

This region comprises the eastern edge of the Northern Great Plains, and the native biota is both wet and dry prairie dwelling species. Historically, vegetation consisted of grasses, sedges and wildflowers on the vast level areas, and occasional patches of northern floodplain forest along the stream banks and in the gullies. As the prairies were periodically swept by tremendous fires, the only woody plants in the area were those that survived them. As a natural consequence, stands of native trees and brush were few and widely scattered, found only on the stream banks or in naturally protected areas.

4.5.2 Local

Today the region is part of a vast, rich agricultural network stretching from the Rocky Mountains to the lakes region of Minnesota.

Two rivers lie between the metropolitan areas of Grand Forks and East Grand Forks. The Red Lake River flows from the east (Minnesota) and south. The Red River of the North (the border of North Dakota and Minnesota) flows south to north. They are the major water features within the area of influence. Although neither river is very big, they both drain large areas of the northern plains and, due to a combination of physiography and climate, tend to flood frequently - sometimes drastically. As with most rivers of the plains, they lie low in the landscape and are not apparent until one crests the river valleys. Because of the relative youth of this landscape, the river valley bluffs rise only 25 feet above the river, as a result, scenic views and extended vistas are rare. In addition, both rivers suffer from poor water quality and are visually degraded by their heavy particulate load. Although water resources can be important contributors to the recreation and visual resources of a region; in this case, due to the circumstances described above, the rivers' contributions to recreation or visual quality are greatly reduced.

Grand Forks

Grand Forks has five parks located along the Red River of the North River. These parks are well maintained, having a variety of mature trees and shrubs to screen, shade and soften the river edge. The residential areas have a diverse mix of mature deciduous and coniferous overstory vegetation that provides a protective canopy. The clean, neat appearance of the downtown and residential areas indicates community pride. The historic neighborhood, close to downtown, shows a rich cultural character. A number of culturally significant historical architectural structures in this neighborhood have or are being nominated for the National Registry of Historic Places. The Lincoln Park Public Golf Course is a major amenity that serves as a large, open, green space within an urban context. The Golf Course serves as a prominent visual corridor along Belmont Road and to surrounding residents. The Myra museum complex has a pedestrian trail access that offers

panoramic views of the river. Residential areas to the south have distinct differences in development. Earlier housing developments have mid-growth to mature trees and shrubs, offering diversity and fall color. Newer developments do not have the scenic quality of larger trees, but they are clean and neat and have a character of their own. The Grand Forks neighborhoods have a high degree of pride, indicated by the extreme care and neat appearance. After the devastating flood of "97" several residential zones near the river are being relocated. Old levees will be removed and used for the new levee alignment. The new alignment moved further away from the river opening up the floodplain to an increase in habitat diversity. A wide expanse of land between the river and the flood control project will become a greenway. A greenway of trees, shrubs and grasses can improve air quality, reduce noise and add to the visual quality.

East Grand Forks

East Grand Forks is located at the confluence of two rivers, the Red Lake River from the east and the Red River of the North bordering the West Side. The city has three parks along the south side of the Red Lake River, with an industrial area and a golf course located on the north side. Along the east bank of the Red River are four parks and a golf course. Several parks along the river have little or no vegetation and vegetation along the shoreline is minimal, many trees are stressed and damaged due to recent floods. These areas have low visual quality and are very visible from the opposite riverbank. Views from this side of the river toward Grand Forks side are much more pleasing due to green turf and trees. Home values vary from low, to mid, to upscale. Most neighborhoods are clean and neat with diverse mature trees in older neighborhoods. Flooded homes that were abandoned after the "97" flood have been removed opening up large areas to floodplain habitat and green space. The Valley Golf Course, at the north end of the project, slopes to the river offering rolling terrain, excellent open green space, bountiful views and diverse vegetation. Presently views to the golf course are limited to those playing the game and to those residents who can view the course because they are located along the boundary. Mature woods habitat with sounds of nature is enjoyed by the residential neighborhood next to the golf course. The downtown business core is of low visual quality, dominated by hardspace. Industrial/commercial land use dominates the north side of the Red Lake River. Huntsville coulee is a natural corridor of wildlife habitat. Agricultural lands are being displaced by residential development.

5.0 ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

The proposed project was evaluated for compliance with environmental laws, regulations, and executive orders (Section 1.4). A comparitive summary of the potential impacts of the alternatives is shown in Section 1.5 (Table 2). As specified in Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611), potential project impacts on the parameters listed in Table 11 were considered in arriving at the final determination.

5.1 EFFECTS ON NATURAL RESOURCES

5.1.1 Upland Habitat

The principal features of the proposed project are earth levees or flood walls which would be set back a considerable distance from the riverbank. Most of the levee alignments utilize open land used for agriculture or rural residences, residential property or street right-of-way. The majority of the project alignment, except for small portions at upstream and downstream ends would be placed on land most recently part of the urban landscape.

The effects on natural resources of placing levees in residential neighborhoods would be minor. The areas have been occupied by residential and commercial users and include houses, garages, streets, sidewalks, patios, driveways, landscaping, parking lots, and commercial buildings. Some of the landscaping, especially trees and shrubs, may be providing some habitat for birds and small mammals, like squirrels, that are adapted to urban settings.

Vegetation directly in the alignment of the levees would be removed and would no longer provide any habitat. This loss would be offset by several project features. Existing emergency levees would be removed. Structures outside the levee alignment would be removed along with foundations but landscaping would remain if it would not interfere with project function. The area outside the levees would become an urban greenspace. The majority of this space would be allowed to revert to natural vegetation. This would substantially increase habitat and offset any losses caused by the levees.

Most borrow material would be obtained from the existing emergency levees. Additional borrow material would be obtained from sites to be selected during the preparation of plans and specifications. All borrow sites would be evaluated for geotechnical suitability, presence of HTRW, cultural resources, and potential natural resources impacts. If necessary, additional environmental analysis would be conducted and the appropriate NEPA documents prepared.

The habitat to be found along the project reaches is as follows:

Grand Forks:

1. Downstream end to Highway 2
The area is rural upland from I-29 to the river and upstream to English Coulee. From English Coulee to Highway 2 is industrial park, residential, and park.

2. Highway 2 to Water Treatment Plant
The area of the levee alignment is commercial, industrial, and residential.

3. Water Treatment Plant to Belmont Coulee
The levee alignment runs through residential area and park land in this reach.

4. Belmont Coulee to upstream end of project and the associated tieback levees
From Belmont Coulee to 55th Avenue South is residential area. From 55th Avenue to Merrifield Road and along Merrifield Road to I-29 is rural upland habitat.

5. Borrow areas include the existing emergency levees which are grassed, and upland sites which are either vacant open upland or in agricultural use.

East Grand Forks (north of Red Lake River):

1. Downstream end to Downtown
The Red River Levees run through park and residential area into the downtown commercial district.

2. Downtown to upstream end of Red Lake River Levees
The north Red Lake River levee runs through downtown commercial area, through residential area and through an industrial area.

3. All the associated tieback levees
One tieback levee runs east from the Red River through residential area and rural, open, upland. The second runs south through rural upland and commercial and industrial areas along Highway 2.

4. Borrow areas include the existing emergency levees which are grassed, and upland sites which are either vacant open upland or in agricultural use.

East Grand Forks (Point Area; south of Red Lake River):

1. Red River of the North and Red Lake River levees
The Red River and Red Lake River levees run through residential and rural upland areas.

2. All the associated tieback levees
Tieback levees run through rural upland and residential areas.

3. Borrow areas include the existing emergency levees which are grassed, and upland sites which are either vacant open upland or in agricultural use.

5.1.2 Borrow Areas

Borrow would be obtained primarily from the removal of the existing emergency levees. The majority of the suitable material would be reclycled into the new levees reducing the need for new borrow material and for disposal sites. Other sources, to the extent that material is suitable, would include the English and Heartsville Coulee extensions and the south-side storm drainage project in Grand Forks.

Approximately 220-240 acres of upland would be required to provide the balance of the necessary borrow material. The estimated cost of acquiring and hauling the material was included in the project cost estimate.

A number of potential borrow sites have been identified (Plate 166). Because of the accelerated time schedule, it was not possible to evaluate these sites for suitability in the EIS. The number of sites identified was in excess of the number required. The only sites that would be used for obtaining borrow material would be those that were examined for engineering feasibility, presence of hazardous, radioactive, and toxic wastes, and effects on environmental and cultural resources, and were deemed suitable. In this way, any site where adverse effects of disturbance would occur would be deleted from further consideration. It is intended that clean fill that requires disposal, such as soil that would not provide good levee material, would be disposed of in some of the borrow areas. In this way, no additional sites for disposal would be required. Where appropriate, borrow areas would be used for stormwater treatment and storage or for wetland development. The interior flood control design would be evaluated and designed during the next phase of the study.

5.1.3 Wetland Habitat

Other than riparian habitat discussed in the following paragraph, no wetlands would be affected by the proposed project. Levee alignments would be placed within the cities on high ground setback from the river's edge. Borrow material would be obtained from existing emergency levees scheduled for removal and upland sites with suitable soils for levee construction. Disposal areas would be upland sites developed specifically for disposal and would not affect wetlands either directly or indirectly.

5.1.4 Riparian Habitat

English Coulee and Heartsville Coulee are intermittent, runoff-dependent watercourses. Much of English Coulee exists as a drainage ditch adjacent to county roads and has an

existing diversion to carry water to a point further downstream along the natural watercourse. This diversion would be extended to carry more runoff along roadsides and around residential areas. Since this is an extension of an existing diversion, no adverse effects would be expected to natural resources. The existing conditions in the natural portions of English Coulee would not be altered by changes in flow or by construction.

The flow of Heartsville Coulee would be diverted at its upstream junction with the city of East Grand Forks. For the duration of significant floods the water would flow directly to the Red River, rather than into the Red Lake River. However, this diversion is not expected to adversely affect the habitat of the coulee. The habitat value is limited by the intermittent nature of the drainage. Operation would be short-term and infrequent. The removal of interior drainage would refresh the water in the closed portion of the channel. Fish would have access to the coulee through the diversion channel.

5.1.5 Aquatic Habitat-Red River of the North

No structures would be placed in the Red River of the North. Some rockfill (riprap) would be required to reduce erosion upstream and downstream of the Riverside Dam and at the confluence of the two rivers as well as at a bank reach, near Reeves Drive, considered to be unstable. This would be placed from the top of the primary bank, near the normal water line, and extend across the river to the opposite bank. It would be placed on granular bedding material or geotextile fabric to prevent washout. The areas would be limited to reach lengths necessary to accomplish erosion protection. Vegetation clearing would be limited to that required for rock placement. Rock would be placed in areas with minimal vegetation. The rock would reduce bank erosion and sedimentation in the river and provide increased habitat diversity for aquatic invertebrates. The rock fill sections would be limited in thickness to avoid affecting water surface elevations. Investigations during the design of the erosion protection will focus on ways to reduce the overall amount required and will explore the use of alternative means of protection.

5.1.6 Aquatic Habitat-Red Lake River

No structures would be placed in the Red Lake River. Some rockfill (riprap) would be required to reduce erosion at the confluence of the two rivers. This would be placed from the top of the primary bank, near the normal water line, and extend across the river to the opposite bank. It would be placed on granular bedding material or geotextile fabric to prevent washout. The areas would be limited to reach lengths necessary to accomplish erosion protection. Vegetation clearing would be limited to that required for rock placement. Rock would be placed in areas with minimal vegetation. The rock would reduce bank erosion and sedimentation in the river and provide increased habitat diversity for aquatic invertebrates. The rock fill sections would be limited in thickness to avoid affecting water surface elevations.

5.1.7 Threatened and Endangered Species

In accordance with Section 7 of the Endangered Species Act, Federally-listed species that may be found in the project's area of influence include: bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and the gray wolf (*Canis lupus*). These species often use water courses and river valleys as migration routes and temporary feeding sites. Project construction would move the levees away from the river and allow the riparian area to revert to more natural habitat. This would enhance the riparian habitat and associated species and provide improved feeding opportunities for both species of birds. The gray wolf would be unlikely to use such an urbanized area. Although there would be a more developed habitat corridor in the greenway after project construction, it is doubtful that wolves would find it to be suitable habitat. Based on this evaluation, it is determined that the proposed project would have no adverse effect on the listed species.

The transmittal letter for the Final Coordination Act Report (dated 6 October 1998) states that the U.S. Fish and Wildlife Service concurred with the determination, presented in the Draft EIS, of no effect on endangered and threatened species and therefore, further consultation under Section 7 is not necessary.

The North Dakota Natural Heritage Inventory of ecologically significant species identified in the project area includes: rosyface shiner (*Notropis rubellus*), mourning warbler (*Oporonis philadelphia*), black sandshell mussel (*Ligumia recta*), Dutchman's breeches (*Dicentra cucullaria*), and purple cinquefoil (*Potentilla palustris*). The rosyface shiner would not be affected by the project since it was reported from an area downstream of the limits of riprap placement and levee construction would not affect aquatic habitat. The mourning warbler was reported from an area outside the project limits so it would not be affected by project construction or operation. Dutchman's breeches was found within the city limits but not in an area slated for any construction. No effect on this species is anticipated. Purple cinquefoil was reported from an area which would be outside the project limits at the confluence of English Coulee and the Red River of the North. Therefore, no effect would be expected.

The Minnesota Natural Heritage Inventory of ecologically significant species or features identified in the project area includes: lake sturgeon (*Acipenser fulvescens*) and a colonial waterbird nesting site. The lake sturgeon has not been reported in the Minnesota portion of the watershed since the 1950's. Project construction would not change fish passage and erosion protection, especially at the Riverside Dam, could provide spawning habitat should fish be present. The colonial waterbird nesting site is located downstream of the limits of the project and would not be affected by project construction or operation.

5.1.8 Air Quality Effects

There would be numerous construction machines operating during the construction of the proposed project but adverse effects on air quality would be expected to be minimal. All internal combustion engines would be required to be operating according to specifications

and have all required pollution control equipment installed. Machinery would be excavating, hauling, and placing material, so for the most part there would be no concentrations of equipment, nor would equipment be stationary for long periods while operating. The open area and the frequent windy conditions would dissipate the additional emissions.

Since both Grand Forks and East Grand Forks are not located in non-attainment areas, as defined in the Clean Air Act, the project would be in complete compliance with the Clean Air Act.

5.1.9 Hazardous, Toxic, and Radiological Waste (HTRW)

To assess the study area for potential hazardous, toxic, or radioactive waste (HTRW) materials, and for other contaminated materials which may not meet the strict definition of HTRW materials, an Environmental Site History was completed for Grand Forks and Phase I Environmental Site Assessments (ESAs) were completed for both Grand Forks and East Grand Forks. The Phase I ESAs were completed in accordance with ASTM 1527-97. The ESAs identified six sites in Grand Forks and two sites in East Grand Forks which have potential environmental concern. Of these eight sites, only one of the sites is considered to have the potential to encounter materials which meet the strict definition of HTRW materials, and only a small portion (10 percent, for estimating purposes) of that site is assumed to meet the strict definition of HTRW materials. While the remaining sites have been determined to have the potential to encounter contaminated materials, with little or no potential to encounter materials which meet the strict definition of HTRW materials, Phase II investigations are ongoing to verify the nature of the materials that may be encountered at the those sites. These investigations will be completed before the public review of the Final EIS.

Any cleanup of contaminated sites would be required to be completed by the local sponsor prior to construction. All applicable environmental laws and regulations would be followed so potential adverse environmental effects would be minimized during cleanup and construction. The removal of sub-surface contaminants could have beneficial effects including improving the quality of groundwater.

5.1.10 Prime and Unique Farmland

An evaluation of the effect of the proposed project on the conversion of farmland to non-agricultural uses was made according to guidelines in the Farmland Protection Policy Act. The rating system, contained in the guidelines, considers the proximity of the land to the urban area, relationship to average size, the effect on farm support services, the percent of sites being actively farmed and so forth. The score must reach a certain minimum value

before further action under the Act is mandated. The proposed project was evaluated using criteria for corridor-type projects (i.e, levees). All assumptions were made in favor of farmland rather than the project. The result of the evaluation was a score below the level requiring further action. Therefore, according to the Farmland Protection Policy Act, the proposed project would not result in the conversion of significant areas of farmland to non-agricultural use. No further action would be required.

5.1.11 Irreversible and Irretrievable Commitments of Resources

Aside from fuel used for construction machinery, the project would not cause any substantial commitment of resources that could not be reclaimed or reused in the future. The levees would be constructed of earth recycled from existing emergency levees. Some additional material would be required from stockpiles or borrow sites but this material could be reused in the future in a way similar to the reuse of levee material for this project. Some concrete and steel would be required for various structural purposes. This material could be separated in the future and processed for reuse. Riprap could be reused at another site.

5.1.12 Mitigation Measures

Mitigation is required to offset adverse effects of the project. Mitigation can be achieved in several different ways. First, the levee alignments avoided structures and streets to the maximum extent possible. Where conflicts still occurred, modifications in the type of protection were made to minimize adverse effects to the community. In some cases, it was not possible to avoid or minimize adverse effects. In those situations, mitigation would be provided by P.L. 91-646, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Under the proposed Programmatic Agreement, adverse effects on historic and cultural resources sites would be offset by specific mitigation measures (Exhibit D).

No separable mitigation is proposed for the natural resources effects of the project. Removal of the emergency levees and construction of the new levees would result in the establishment of an urban greenway. U.S. Fish and Wildlife Service's 1980 version of Habitat Evaluation Procedures (HEP-80) was used to quantify and evaluate the potential effects of the proposed project. The results indicate that project construction would result in a two-fold increase in riparian habitat area and three-fold increase in annual average habitat units (Exhibit B).

5.1.13 Cumulative Impacts on Natural Resources

The effects of the construction of the project on natural resources are minimal and would not contribute to an accumulation of impacts in the watershed. The effects of the operation

of the project are also minor and would be confined to the immediate area of the two cities. As such, the cumulative effects of the project would occur only during flooding and only in the project area and would not be additive with other effects in the region.

The conversion of portions of the city to floodway or open greenspace would have a beneficial effect on natural resources. Similar actions may be expected to occur elsewhere in the Red River Valley because of the need to avoid future flood damage in many communities and especially in view of the actions taken at East Grand Forks and Grand Forks.

5.2 EFFECTS ON CULTURAL RESOURCES

5.2.1 Future Studies:Actions Being Treated Programmatically in This EIS

A Programmatic Agreement has been negotiated per 36 CFR Section 800.13 (Protection of Historic and Cultural Properties) between the St. Paul District, U.S. Army Corps of Engineers, the Advisory Council on Historic Preservation, the North Dakota State Historic Preservation Officer, and the Minnesota State Historic Preservation Officer to detail what actions the Corps has to take in order to be in compliance with Sections 106 and 110 of the National Historic Preservation Act (P.L. 89-665), as amended. A copy of the Programmatic Agreement is included as Exhibit D to this EIS. This Programmatic Agreement stipulates the inventory, evaluation, preservation, and mitigation measures to be undertaken by the Corps or its representative(s) for National Register eligible or listed archeological, historical, and architectural properties in the Project's area of potential effect. The PA also requires both tribal consultation, particularly in regards to burials and traditional cultural properties, and the involvement of interested parties in the Section 106 process.

5.2.2 Environmental Effects-Introduction

Project features with the potential to affect historic properties include the proposed levee and floodwall alignments; tieback levees; associated road raises; the Heartsville Coulee diversion south of East Grand Forks; the English Coulee diversion west of Interstate 29; greenway access, parking, restroom, and trail developments; use of the greenway as a Project-related floodway; riverbank erosion protection (riprapping); ponding areas for interior flood control; and borrow, disposal and staging areas related to Project construction.

The Cities of Grand Forks and East Grand Forks specified that the flood protection system had to be permanent, had to provide a 210-year level of protection (1997 flood plus 3 feet of freeboard), and had to be economically, environmentally, and socially acceptable. Geotechnical and soil stability were the main factors determining how close to or far from

the river the levees or floodwalls could be built. Once the general alignment was determined for each city, refinements were made by substituting mechanically stabilized earthen walls (MSE walls) and floodwalls for segments of levee in order to preserve additional historic buildings and city infrastructure, especially city streets and utilities, which would have been lost using only levees. A goal of keeping levee heights at 10 feet or less was established to lessen the visual impacts of the flood protection features, i.e., a 10 foot levee or floodwall is much less visually intrusive than a 22 foot one. However, at a few locations, notably along Belmont Road, a higher levee is necessary in order to save more houses. In one case, a combination of shifting the proposed levee footprint landward and floodproofing the lower level was selected as a means of preserving a National Register listed property in place.

5.2.3 Effects on Listed Historic Properties

As of June 15, 1998, there are six National Register listed properties within the Project area in Grand Forks and no listed properties in the Project area in East Grand Forks which will be directly affected by the proposed permanent flood protection system. The historic properties of concern in Grand Forks include: St. Anne's Guest Home and Annex (32GF14) at 813 Lewis Boulevard; portions of the R.S. Blome Granitoid Pavement (32GF165) at Lewis Boulevard, South 4th Street, Elm Avenue, and 4th Avenue South; Boom Town Store #1 (32GF1276) at 201 South 3rd Street; Red River Valley Brick Company (32GF1280) at 215 South 3rd Street; Viet's Hotel Annex (32GF1287) at 317 South 3rd Street; and the Thomas D. Campbell House (32GF118) at 2405 Belmont Road. These buildings and structures are located under the proposed levee or floodwall footprint or in what will be the unprotected greenway area riverward of them. Proposed actions at these properties include floodproofing St. Anne's and leaving it in place on the unprotected river side of the levee, the removal of those parts of the Granitoid Pavement within the Project area, and the removal through either relocation or demolition of the other properties.

Two additional listed properties, the Viet's Hotel (32GF1286) at 309-311 South 3rd Street and the residence at 1648 Riverside Drive (32GF253) are within the Project area but have been acquired by the City of Grand Forks through its 1997 flood voluntary acquisition program. Their ultimate disposition will be handled under that program and not the currently proposed flood protection project.

5.2.4 Effects on Individually Eligible Historic Properties

As of June 15, 1998, there are seven individually eligible historic properties within the Project area in Grand Forks and two individually eligible properties in the Project area in East Grand Forks which may be directly affected by the proposed permanent flood protection system. This total does not include those individually nominated properties making up the Downtown Grand Forks Multiple Resource Area which is discussed in the

next section. The individually eligible properties, which are all architectural, are located either under the proposed levee or floodwall footprint or in what will be the unprotected greenway area riverward of them. Because of levee and floodwall construction and because the greenway will function as a Project-related floodway, proposed actions at these National Register eligible properties consists of their removal through either relocation or demolition. Removal of the Northern Pacific Railroad Swing Bridge (32GF127), now a pedestrian bridge, crossing the Red River north of DeMers Avenue is proposed to reduce obstructions to in-town flow of the Red River a short distance downstream of where the Red Lake River joins it. No Project-related alterations are currently proposed for the Sorlie Memorial Bridge (32GF279/1473, PL-EGC-007), which crosses the Red River at DeMers Avenue, beyond tying the recreation trail system into it and confirming that it can safely withstand the river flow with the Project's system of flood protection levees and floodwalls in operation.

Thirty-one (31) additional individually eligible historic properties in the Project area have been acquired by the City of Grand Forks through its 1997 flood voluntary acquisition program. Their ultimate disposition will be handled under that program and not the currently proposed flood protection project.

5.2.5 Effects on Historic Districts and Multiple Resource Areas

Parts of the proposed Riverside Park Historic District (RPHD), the East Side Residential Historic District (ESRHD), and the Downtown Grand Forks Multiple Resource Area (DGFMRA) are within the Project area. Direct physical effects to these two historic districts and the multiple resource area will result from the need to remove various individually eligible or contributing historic properties through either relocation or demolition in order to provide permanent flood protection to the City of Grand Forks. The overall physical integrity of the districts and multiple resource area will thus be affected. Because the proposed levee and floodwall alignments have been located as far riverward as is geotechnically stable in order to preserve as many residences and commercial buildings as possible, there are only a few areas where plantings will be able to screen out the floodwalls or where the levees can be overbuilt and vegetation plantings used to break up the grassy 10 to 20 foot high levee profile. As a result, the levees and floodwalls will affect the visual setting of the districts and multiple resource area, particularly for those properties located on the streetscapes directly facing the levee or floodwall and for several blocks from street intersections.

Nine individually eligible and/or contributing properties will be directly affected by the Project in the RPHD. Fourteen individually eligible and/or contributing properties will be directly affected by the Project in the ESRHD. Three individually listed properties in the DGFMRA will be directly affected by the Project. This is in addition to the 21 eligible or listed properties in the RPHD, ten eligible properties in the ESRHD, and one listed property in the DGFMRA which are being directly affected as a result of the City of Grand Forks's 1997 flood voluntary acquisition program, which is a separate undertaking from the proposed flood protection project.

5.2.6 Cumulative Effects on Historic Properties

The construction of the proposed permanent flood protection system of levees and floodwalls for the Cities of Grand Forks and East Grand Forks will adversely affect a total of six listed and 32 eligible historic properties including properties in parts of two historic districts and a multiple resource area in Grand Forks. It is expected that some of the 58 unevaluated buildings and structures in the Project area will also be determined eligible to the National Register and be similarly adversely affected. The adverse effect by the proposed flood protection project on the Cities' historic character comes on top of another two listed and 62 eligible historic properties in these same neighborhoods being recently acquired and ultimately removed (relocated or demolished) by the Cities' respective 1997 flood voluntary acquisition programs. In addition, there will be visual impacts to historic buildings and structures remaining landward of the proposed levees and floodwalls due to their height and prominent position in the respective cityscapes.

Archeological deposits associated with these historic buildings and structures will also be affected, if for no other reason than by the ground disturbance taking place during the removal through either relocation or demolition of the building or structure. Relocation of a historic building should have less effect on the archeological deposits unless the disturbances associated with basement and utility removal are considered.

Not all effects on architectural historic properties in the cities will be negative, however. Those historic properties landward of the levees and floodwalls will be protected from future flooding up to a level equivalent to that experienced during the 1997 flood.

Based on cultural resources investigations along other stretches of the Red River (e.g., Norman County, Minnesota), prehistoric archeological sites tend to occur within one-quarter mile of the river or along the banks of its major tributaries, particularly where they enter the Red River. With the Project in place, the land along both in-town banks of the Red River and Red Lake River will be developed as a greenway for use during the majority of each year and for use as a floodway during periods of high water in the Red and Red Lake rivers. Stabilization of any portions of riverbank will protect any prehistoric or historic archeological sites at that location from future erosion. The proposed levee and floodwall alignments are generally set back a city block or more from the rivers, so their construction should affect fewer archeological sites than if they were constructed closer to the rivers' channels. Because the cultural resources inventories and evaluations have not yet been completed (as of June 15, 1998), it is unknown how many archeological sites eligible to the National Register will ultimately be affected by the Project. Any archeological sites lost as a result of project construction will be an addition to those lost to past urban and/or agricultural development in the Grand Forks/East Grand Forks portion of the Red River Valley.

5.2.7 Programmatic Agreement

Because of the complexity of the proposed flood protection project at Grand Forks and East Grand Forks, the St. Paul District, U.S. Army Corps of Engineers has elected to fulfill its Section 106 and 110 of the National Historic Preservation Act responsibilities using a Programmatic Agreement. Use of a Programmatic Agreement (PA) for this purpose is provided for in Section 800.13 of the Advisory Council on Historic Preservation's regulation on the Protection of Historic and Cultural Properties (36 CFR Part 800). Specific reasons for using a PA include the multi-state nature of the project (portions in both Minnesota and North Dakota) and the fact that the effects on historic properties in the Project area cannot be fully determined prior to its authorization. A total of 37.5 acres of levee, floodwall, tieback levee, road raise, and coulee diversion alignments and 1310 acres of proposed Greenway, including 20.8 miles of riverbank, have yet to be inventoried for archeological sites. Project borrow areas will also need to be surveyed for cultural resources once they are selected. The main signatory parties to the PA are the St. Paul District, U.S. Army Corps of Engineers, the Advisory Council on Historic Preservation, the North Dakota State Historic Preservation Officer, and the Minnesota State Historic Preservation Officer. Concurring parties to the PA are the City of Grand Forks, the City of East Grand Forks, and the Grand Forks Historic Preservation Commission. A copy of the Programmatic Agreement is included in Exhibit D of this EIS.

Stipulations of the PA cover (1) the identification of archeological, historical, and architectural sites in the Project area; (2) the National Register eligibility evaluation of these sites, buildings, and structures; (3) the procedures to be followed if human burials are found in the Project area; (4) the identification of traditional cultural properties in the Project area; (5) the identification of new historic districts, multiple resource areas, historic landscapes and viewsheds in the Project area; (6) guidelines to be followed in the treatment of historic properties in the Project's area of potential effect; (7) mitigation of adverse effects, both individual and cumulative, to historic properties; and (8) provisions for public and tribal involvement in the Section 106 process.

Treatment of historic properties in order of preference are avoidance, reduction of effects to properties preserved in place, alteration/floodproofing of properties, relocation of buildings and structures, and demolition. Mitigation measures for individual properties include, but are not limited to, documentation, archeological data recovery, salvage and donation of significant architectural elements, and off-site mitigation for the loss of a historic property. Mitigation of cumulative effects to historic properties may include the development of an interpretive exhibit, such as kiosk panels, a film or video, a school curriculum, brochures, models or dioramas, which is/are to be developed in consultation with interested parties and made available to the general public.

5.3 EFFECTS ON SOCIOECONOMIC RESOURCES

This section provides the evaluation of the social and economic effects of the levee alternative that would provide protection against a flood equivalent to that of 1997.

The No-Action alternative serves as the base condition against which the levee alternative will be compared for the purpose of evaluating impacts. The No-Action plan assumes no Federal action but does assume full implementation of local protection systems so that some level of flood protection will continue for the community.

The social and economic effects of the proposed action were evaluated using information obtained through interview, site visits, and review of existing documents. An impact assessment matrix for the proposed plan (Table 13) is located at the end of Section 5.0.

After record-setting snow deposition across most of the Red River Valley, 1997 spring flooding on the Red River was the worst this region has experienced in modern history. At Grand Forks and East Grand Forks the river rose to a height of 54.3 feet - more than 26 feet above its flood stage. The cities had begun preparing for the flood of 1997 well in advance. But on April 19, after weeks of advance protection measures and ongoing heroic floodfighting efforts, the emergency levee systems were overtopped and the floodwaters came pouring into Grand Forks and East Grand Forks. During this devastating disaster, more than 90 percent of the 52,500 residents of Grand Forks were evacuated and all of East Grand Forks' 9,000 residents were forced to leave their homes. Three-quarters of the homes in Grand Forks and 99 percent of the homes in East Grand Forks were damaged. The flooding heavily damaged all the downtown businesses in both communities, and 11 commercial buildings in Grand Forks were totally destroyed by fire. In addition to the tremendous personal economic hardship that the flood caused, most of the citizens lost city services such as water, sewer, and power and were forced to live in temporary shelters and housing. The 1997 Grand Forks/East Grand Forks flood was one of the worst disasters experienced in North Dakota and Minnesota, and the effects were felt regionally and nationally.

The purpose of this General Reevaluation Report has been to collect information about current conditions and to evaluate them in an effort to define a feasible and implementable Federal local flood protection project that would provide permanent flood protection for Grand Forks/East Grand Forks. To accomplish this, an array of possible alternative plans were considered including: a variety of downstream and in-town channel modification plans; bridge modifications; a variety of diversion channel plans on both sides of the Red River; basin-wide flood reduction measures; nonstructural measures; and a variety of permanent levee/floodwall plans with differing levels of protection.

The Corps and the Local Sponsors worked closely to identify the alignments for the levees and floodwalls. Public information meetings were held to inform community members of these activities. The Corps used critical design criteria to define the best alignment for each reach. The most important criteria used to determine the levee alignment was a combination of the geotechnical stability of the levee foundations and the hydraulic capacity of the river channel. The levee alignments were located as close to the river as these key criteria would permit in areas where occupied structures would be affected.

Other criteria that affected project alignment included the following: minimizing the cost of an effective engineering solution; avoiding historic structures wherever possible; consideration of system integrity; and maintaining system infrastructure. (Design criteria and a detailed discussion of design sections and slope stability analysis can be found in Appendix B in the second volume of the main report.)

Where the proposed levee alignments were critical (i.e., close to structures or streets), field geotechnical investigations were conducted to obtain supplementary field data and additional borings to refine decision-making information.

If, after further analysis, the levee alignment could not be adjusted, alternative forms of protection were evaluated. These were the modified levee section geometry utilizing a MSE (mechanically stabilized earth) wall and the floodwall. They were evaluated to determine if they could reduce the setback distance enough so that a house or street could be retained. MSE walls would provide a small amount of additional distance and were used where the setback line was very close to the structure. Floodwalls were used where the decreased setback distance provided enough benefit to offset the additional cost (e.g., Where the construction of a floodwall would permit retention of a street, the houses on the landward side of the street could be spared.)

During the investigation, alternative forms of bank stabilization were proposed. It was assumed that using them would allow levee setback distances to be reduced. These were not included in this report due to time constraints. Evaluation of these techniques will continue in the next phase of study and if any are proposed for implementation, further environmental evaluation may be necessary.

5.3.1 Mitigation

There are adverse effects associated with the proposed project which require mitigation. This can be achieved in several ways. First, adverse effects, or impacts, should be avoided wherever possible. As discussed in the previous paragraphs, the levee alignments avoided structures and streets to the maximum extent possible. Where conflicts still occurred, modifications in the type of protection were made to minimize adverse effects to the community. In some cases, it was not possible to avoid or minimize adverse effects. In those situations, mitigation would be provided by P.L. 91-646, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

5.3.2 Social Effects

Noise

Temporary increases in noise could be expected from the operation of construction equipment. No increases in noise would be expected during project operation.

Aesthetics

This topic is discussed in section 5.05 which follows.

Recreational Opportunities

This topic is discussed in section 5.04 which follows.

Transportation

A former railroad swing bridge, now used only for walking and bicycling, would be removed. However, the function of this bridge will be replaced by project construction of two new pedestrian bridges across the RRN at Lincoln and Riverside Parks. No highway or railroad bridges would be modified with this plan. Thus, the project is not expected to have any appreciable effects on the transportation network or traffic patterns. The need to close bridges during high water events would remain the same as the without project condition.

Public Health

Protection would avoid the adverse effects that occurred in 1997 including: large-scale community evacuation, potential contamination of the drinking water supply, spoilage of food through loss of refrigeration or floodwater contamination, lack of access to health care, evacuation of hospitals and nursing homes and stress and trauma. Flooding of buildings introduced multiple contaminants into the water including sewage, fuel oil, pesticides, solvents and so forth. The cleanup of flooded structures exposed individuals to potential adverse health effects from exposure to contaminants, bacteria, and molds.

Public Safety

The proposed levees would provide direct protection from floods equal to that of 1997 and provide improved capability to fight floods larger than the 1997 event. The threat of injury or loss of life would be significantly reduced with the higher level of flood protection.

Community Cohesion

The proposed project, by providing protection from future floods, would enhance community stability. With increased security, residents would be less likely to relocate. Similarly, they would be able to devote greater attention to other community issues and needs.

The community as a whole would become more cohesive after project construction, but some areas would lose the cohesion that they have had. Some neighborhoods were permanently changed by the flood. Severely damaged businesses, schools, and homes will not be replaced in their current locations. In some areas, this means the permanent elimination of an entire neighborhood. In others, neighborhood structure will be altered by clearing of certain properties to accommodate levee construction. Some residents will be able to stay, but others may have to relocate to new or different neighborhoods. This would diminish existing community cohesion for these areas in the near future.

Community Growth and Development

The proposed project is expected to have a beneficial effect on the growth and development of the Grand Forks / East Grand Forks community. Provision of this level of flood protection will likely foster investment in homes, businesses, and community infrastructure.

Business and Home Relocations

The proposed project would require the relocation of homes and businesses including some that are historic. Structures that fall either in the footprint or riverward of the proposed levee alignment would be razed or moved to other locations.

The subject of relocations is controversial. Especially because some of the homes slated for relocation received either no damage or only minor damage in the 1997 flood. Some of those affected by planned relocations have expressed feeling that the range of alternatives has been unnecessarily limited, plan formulation has been hasty, and innovative levee technology has not been given full consideration.

Because the affected owners will be covered by P.L. 91-646 (Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970), they should not experience direct financial loss from the moves. However, there is no direct way to quantify any stress and anguish that some may experience over these moves.

Existing and Potential Land Use

Land use was altered by the 1997 flood as damaged properties were purchased by the cities. Further changes would occur along and near the proposed levee alignments with the purchase of project right-of-way. Land riverward of the levees will be left open and most would be allowed to revert to natural vegetation.

Because tieback levees were located along the most economical alignments (i.e., high ground), some open and agricultural areas were included within the proposed levees. It is expected that some of this land may be converted to new housing and associated businesses.

Controversy

Most of the controversial aspects of the proposed project are related to the selection of the proposed plan or the location of levee alignments. Individual areas of controversy are discussed in various sections of the EIS and those pertaining to socioeconomic resources are summarized here.

There is controversy regarding the removal of homes to accommodate the levees. The substantial levee setback distances required to meet design criteria would impact numerous homes. Some of these homeowners have indicated opposition about being forced to move and have challenged criteria for levee alignments. Levee foundation stability was an important criteria for selecting levee alignments and some individuals do not agree with the levee foundation stability assumptions made in the plan formulation.

There is also controversy regarding the limits of the project. Some area homeowners living outside the existing city limit's feel that the project should be extended to protect their properties and have expressed very strong feelings about not being included. Economic and hydraulic evaluations were conducted as part of this study to determine if this would be feasible. The evaluations found that the additional costs incurred to protect these areas would outweigh the additional benefits, and therefore are not economically justified and were not considered as part of the proposed project. Extending the project to protect additional properties existing outside of the city limits in some cases would necessitate removal of additional homes to accommodate the levees. Alternative alignments could be pursued as a possible betterment during future detailed design and construction phases. Betterments are 100 percent non-Federally funded. It is important to note that alignment changes would need to be checked and verified to determine if there would be any significant changes in water stages during flood events and therefore inconsistent with our hydraulic design criteria.

There will always be requests and arguments for expansion of the project but somewhere a limit must be drawn encompassing economic, hydraulic, engineering, and environmental considerations. Although project benefits for those outside the project area may be minimal, our studies indicate that these properties would not be negatively impacted with construction of the proposed project as currently designed.

Construction of a levee at Reeves Drive will directly impact six residences which have been determined eligible for listing on the National Register of Historic Places either individually or as a contributing member to the East Side Residential Historic District. There is the potential to move most of these houses to the front of their lots versus having to relocate them to another part of the city. This would at least retain some of the historic character of the neighborhood. In addition to the houses on Reeves Drive, seven historic houses (1925-1947) along the adjacent Reeves Court and River Street will have to be relocated or torn down regardless of whether the levee or floodwall option is chosen.

The City of Grand Forks acquired a railroad bridge from the Burlington Northern Railroad and converted it to a pedestrian bridge in 1983. This railroad bridge was designed to swing open on a center pivot to allow steam boats passage on the Red River. It is one of only two such bridges in North Dakota, the other being in Fargo. Both the North Dakota State Historic Preservation Office and the Grand Forks Historic Preservation Commission would prefer that the bridge remain where it is. Removal of the bridge is proposed in order to reduce the obstructions to flow in the Red River. Some parts of the bridge may be preserved in an adjacent park.

5.3.3 Economic Effects

Property Values

The proposed project is expected to have a positive effect on community property values. Currently developed and developable lands within city limits would retain or increase in property value through removal of the risk of flood damage. Some concern has been expressed regarding the effects that house relocation and levee construction may have on properties within the neighborhoods where levees are built. After construction, property values throughout the cities are expected to be comparable.

Properties outside of the line of protection would not be affected by the construction of the project since increased flooding would not be induced. There is concern that property values may decrease because of levee placement. However, the line of protection would not be close and would be in the form of a road raise and, as such, unobtrusive. In addition, there are other factors that may influence property value including rural setting, larger lots, proximity to river and natural areas, limited exposure to flooding, proximity to the golf course, and so on. Therefore, property values are expected to remain in line with market trends for property outside city limits.

Tax Revenues

Similar to property values, the proposed project is expected to have a positive effect on tax revenues. The project would preserve property values in protected developed and developable areas, allow for redevelopment of marginal properties, and remove restrictions on capacity to attract additional businesses and industry.

Public Facilities and Services

The proposed plan would reduce the potential for damage to public facilities and reduce the potential for disruption in the delivery of public services.

Regional Growth

The proposed project would preserve the capacity of Grand Forks-East Grand Forks to function as the trade, financial, and a cultural center of the region.

Employment

There will be an increase in construction employment for project construction and for the replacement of the homes and businesses removed for levee construction. In addition, the

protection provided by the project will contribute to community growth and associated increases in employment opportunities.

Business Activity
The protection provided by the project will facilitate redevelopment of marginal downtown properties, and provide a climate for business expansion and attraction.

Farmland/Food Supply
The levee plan is judged to have no appreciable effect on farmland or food supply.

Flooding Effects
The proposed plan is intended to provide direct protection from extreme floods, such as the one experienced in 1997, with the potential for efficient flood fights for floods larger than the 1997 event.

Energy Needs and Resources
The levee plan will have no appreciable effect on energy needs and resources.

5.4 EFFECTS ON RECREATIONAL RESOURCES

5.4.1 Regional

Recreation resources for this region are sparse; i.e., there are few area-wide recreation contributors in the region. As there are no region-wide recreation ties such as regional trails or large (National or State) parks or other attractions and the affected area is not a contributor to specific regional recreation resources or activities, this project will not affect regional recreation.

5.4.2 Local: Grand Forks

The following changes are considered for Grand Forks parks located within the project:

Sunbeam Park will experience an increase in open green-space. The removal of houses along the river valley edge and the plantings along, and on, the proposed levees will result in an increase in open area, west of the existing trail. Additional trails are proposed that will link the existing trails into a single trail system along the Red River (and Red Lake River).

Lincoln Park will be one of the more heavily affected parks along the project. The existing high levee, close to the river, is to be removed and the main features of the park will be moved north and re-established as part of a flood memorial park that is to be formed in the Lincoln Park neighborhood area destroyed by the flood. The existing trails will be connected to the trail system that is part of the project – this will include a connecting

bridge to the East Grand Forks trails on the east side of the Red River. This park will have a separate entrance designed into the levee and a connecting bridge . The existing 18-hole golf course will be re-sized to 9-holes along the south (higher) end of the course; the proposed levee, which is quite low in this area, will be integrated into the playing area of the course. The existing clubhouse and parking area will remain and the entrance will be redesigned into the levee system.

Central Park will be visually and physically separated from the downtown area by the project. Access will be via a designated entrance through the levee. It will be connected to the trail system that is proposed – this will include a connecting bridge to the East Grand Forks downtown area and trails on the east side of the Red River.

Kannowski Park will also be visually and physically separated from the downtown area by the project. Again, access will be via a designated entrance through the levee. It will be connected to the trail system that is proposed.

Riverside Park will be expanded. The existing levee will be removed and the contiguous neighborhoods destroyed by the flood will be converted into green-space. The public swimming pool will be relocated. Riverside Park facilities will be connected to the proposed trail system with a connecting bridge to the East Grand Forks trails on the opposite side of the Red River.

5.4.3 Local: East Grand Forks

Folson Park will experience an increase in open green-space. The removal of houses along the river valley edge and the plantings along, and on, the proposed levees will result in an increase in open area, south of the existing trail. Additional trails are proposed that will link the existing trails into a single trail system along the Red River and Red Lake River.

O'Leary Park will also experience a large increase in open green-space. The removal of many houses (the Point was heavily damaged) along the river valley edge and upland areas, and plantings on the levees will result in a great increase in open area south of the existing trail. Again, a trail system linking this area with the entire project is planned.

Griggs Park too will see a large increase in open green-space. The entire Griggs Park neighborhood was destroyed in the flood. The removal of the existing levee, all of the houses in the low area near the confluence of the rivers, along the river valley edge, and certain upland areas, will result in a great increase in open area around the existing park. This park will connect to the planned trail system.

River Edge Park will be reconfigured. The boat launch is to be moved to the new Sherlock Park. The campground will be moved to higher ground in a different location. River Edge

Park and La Fave Park, situated between the central business district and the Red River, serve as a buffer zone. Use of a removable floodwall in this area will maintain physical connections with the downtown businesses. The 2 parks will serve as urban green space.

Sherlock Park residential area and park facilities were also heavily damaged by the flood. The park will be redesigned but will still function as a traditional city park. Present plans call for the park to exist on both sides of the levee, with built facilities situated on the dry side, and open green space from the levee to the river. This park will host the boat launch formerly at River Edge Park.

River Heights Park will be reconfigured into the proposed levee design but without major changes. It will still serve as open green-space along River Road.

Valley View Golf Course will also be reconfigured into the proposed levee design.

Red Lake River Golf Course will feature a Greenway trailhead and a connecting bridge to the trail on the south side of the Red Lake River.

All of the community parks will be affected in some way by the proposed project. The subject parks and golf courses along the Red River of the North and the Red Lake River will be unavailable to the public during construction because of the movement of heavy equipment along the river corridors. With this interruption, existing programs and facilities will be unavailable from these parks and the recreation patterns of users of the parks and golf courses will be interrupted. As a result, other community recreation facilities will have to host the programs, and/or see an increase in facility use during the construction phases of the project. In this way the remaining parks in both park systems will also be affected by the temporary closure of the subject parks.

Those areas within the project boundaries that are not part of the park system will be part of the proposed Red River Greenway. The Greenway will incorporate all of the project area into greenspace that will be available for a variety of floodway compatible uses; i.e., parks, trails, open space, environmental restoration, outdoor classrooms, etc. Sunbeam, Lincoln and Riverside Parks in Grand Forks and most of the parks in East Grand Forks will gain in useable area and/or green-space. Flat 'upland' areas of Central and Kannowski Parks will be converted to levee but green-space will not be lost as the levee will be landscaped. When considering that the reason most people use parks is to get away from the urban environment, loss of area will be more than offset by the visual segregation of these parks, and the Greenway, from the central business district and remaining residential areas. This will be considered a net gain in the "park experience". Installation of the trail system, connecting the parks and Greenway with the central business districts, existing trails and neighborhoods will facilitate pedestrian and bicycle movement along the river corridors. Greenway and park facilities will contribute to the quality of life for the

residents of the cities. With the completion of the trail system, the project area has the opportunity to become a hub in a proposed regional trail network. Proposed boat launching facilities and dam re-configurations, along with a program to clean up the Red River of the North and Red Lake River, will result in an increase in water based recreation – currently lacking in this area.

Because of the project there will again be considerable city-wide disruption of area recreation resources. This will be temporary, lasting through the construction phase of the project and into the vegetation re-establishment period. Considering the powerful public sharing of the park experience; the expected long-term favorable impacts of this plan; and the proposed expansion of city recreation facilities and opportunities associated with this project; overall, the environmental effects to the recreation resources affected by the project will be a substantial positive effect.

5.5 EFFECTS ON AESTHETIC RESOURCES

5.5.1 Regional

The regional landscape is extremely flat. There is virtually no topography except for the small valleys along the rivers and coulees. A Greenway is planned for the river valley between the cities of Grand Forks and East Grand Forks. This will be a very important attribute to the area. Since the Greenway is estimated to contain 2000+ acres, much of the land will revert to a natural floodplain condition. Natural vegetation and landscaping will provide a valuable visual corridor of green space within an urban center. Regionally this corridor can be the beginning of a much larger corridor linking the cities of Fargo/Moorhead to the south, moving further north to Winnipeg. The Greenway will create scenic quality with a strong visual character.

Levees of 10 to 20+ feet wide will definitely be a dominant structure in this region. The typical levee grassed slope of 1:3, rising higher than 5 feet will be intrusive to an area where the average slope is only fractions of a percent. It will be important to address the visual resources of the project early in the next phase of design.

The US Army Corps of Engineers Visual Resource Assessment Procedure (VRAP) is to be used to evaluate the visual resources of Grand Forks and East Grand Forks that will be affected by the Corps flood control project. The VRAP process includes identification of the regional landscape, an inventory of existing visual resources, assessing visual impacts, obtaining public input, evaluates alternative plans and solutions, and forecasts with and without project conditions using visual simulations to show design alternatives. Professional evaluators have completed the visual similarity zone map and the VRAP inventory for Grand Forks and East Grand Forks. Due to time constraints, these have yet to be evaluated.

The VRAP evaluations of project visual quality will be prepared during the next phase of the flood control project using the visual similarity zone map and the visual assessment inventories for Grand Forks and East Grand Forks. This will be accomplished before the public workshops and neighborhood meetings can take place. Early computer generated visual simulations of project alternatives have been invalidated by changes in the levee and floodwall (flood control structures) alignment. Additional simulations of project alternatives will be prepared during the next phase of the flood control project. Areas of concern will be noted as part of the VRAP process:

* Identifying significant visual resource impacts to be avoided (soil stability/erosion, etc.).
* Predicting adverse changes in the visual resources, such as site specific components (e.g. riparian vegetation) that should be protected to preserve existing visual and environmental quality.
* Examining the landscape composition to identify the spatial dominance, scale, contrast, and compatibility of landscape elements and characteristics.
* Combining public and professional input to determine what visual changes are acceptable.
* Recommendations on how to proceed into the design phase will address items such as flood wall treatments, blending levees into surrounding topography, limiting access to areas of high visual quality, and visual screening (using trees and shrubs to improve the visual qualities of the project).

5.5.2 Local

Grand Forks and East Grand Forks

Three types of aesthetic experience of the viewer are impacted by changes in the view of or from the levee or floodwall: 1) changes in the natural environment, 2) impacts on landmarks and other cultural resources, and 3) the design quality of the levee or floodwall. Its value, scale, and extent may measure each of these impacts. The value of changes to an existing scene as caused by reconstruction may be defined as benefiting, distracting, or leaving unchanged a person's sense of visual enjoyment of the scene. The scale of changes may be minor (elements that complement the existing scene) or major (adding or eliminating the existing scene and/or a cluster of minor impacts that result in a major impact). The extent of visual changes is a measure of the visibility of the construction and the number of people it affects.

Physical barriers and overwhelming visual dominance issues have been created by the height of some of the floodwalls and levees. This could have a negative impact on the visual qualities of the project and undermine public enthusiasm, support, and participation in the project. Specific causes for concern include:

Cultural/historic areas where levees or flood walls will be built.
Extremely high flood walls or levees in some neighborhoods.
Views of typical levee construction (1:3 slopes).
Views of specific levee or floodwall treatments.
Walls that block existing pedestrian/bike connections.
Walls or levees that block prominent views of open, urban green space.
Walls or levees that block views to the river.
Fitting walls/levees into the surrounding landscape (especially neighborhoods).
Lack of real estate for levee overbuild and landscape plantings (naturalization).
Lack of pedestrian spaces near the levee - auto dominant planning and design.
Lack of space for the "Fingers of Green" concept of the Greenway plan.

Measures to lessen impacts

Landscaping needs to be provided to minimize impacts and blend walls and levees into the surrounding landscape. Vegetation can be used to minimize the visual and physical dominance of high flood control structures by visual screening, providing or distorting scale, presenting diversity and piquing interest.

Wall treatments will be needed to lessen visual impacts in historic as well as non-historic neighborhoods.

Significant viewsheds will need to be addressed with creative design solutions to modify impacts.

Areas for wall enhancements and special features in the commercial downtown areas need to be identified.

Modifications to the flood control structures will require additional costs.

Gathering visual resource information from the public will need to be accomplished at public workshops and neighborhood meetings. Public concerns and desires need to be addressed and used in future design work.

Table 13. Environmental Assessment Matrix

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

PARAMETER	MAGNITUDE OF PROBABLE IMPACTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise					X		
2. Aesthetic Values						X	
3. Recreational Opportunities	X						
4. Transportation				X			
5. Public Health		X					
6. Public Safety	X						
7. Community Cohesion (Sense of Unity)		X (LT)			X (ST)		
8. Community Growth and Development		X					
9. Business and Home Relocation						X	
10. Existing and Potential Land Use		X (P)					
11. Controversy						X	
B. ECONOMIC EFFECTS	[LEGEND: ST=Short Term, LT=Long Term, E=Existing Land Use, P=Potential Land Use]						
1. Property Values		X					
2. Tax Revenues		X					
3. Public Facilities and Services			X				
4. Regional Growth			X				
5. Employment			X				
6. Business Activity			X				
7. Farmland/Food Supply				X			
8. Flooding Effects	X						
9. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat		X					
3. Wetlands				X			
4. Aquatic Habitat			X				
5. Habitat Diversity and Interspersion		X		X			
6. Biological Productivity		X		X			
7. Surface Water Quality			X				
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS	Legend: (L)-Landward of the levee alignment; (R)-Riverward of, or within the levee alignment						
1. Historic Architectural Values	X (L)					X(R)	
2. Pre-Historic and Historic archeological				X			

6.0 PUBLIC INVOLVEMENT AND COORDINATION

6.1 SCOPING

Scoping determines the environmental attributes which will be evaluated in the EIS. A Notice of Intent to Publish a Draft EIS was published in the Federal Register on December 15, 1997. The scope of the EIS was determined by soliciting public and agency comment on the preliminary scope which was sent to state, federal, and local agencies as well as to over 1,100 newsletter recipients. The comments received were incorporated into a draft scoping document which was announced in the newsletter, provided to city halls and libraries and mailed to agencies and commentors.

In order to acquaint people in the two communities with the flood control study, a series of meetings was held. In addition to general information meetings, neighborhood meetings were held to provide greater detail on proposed alignments. These meetings and those of the governmental bodies, i.e, city council and county boards, were reported in considerable detail by the community newspaper, the *Grand Forks Herald*.

State, Federal, and local agencies with interest, or oversight, in the flood control project were notified of the project through telephone calls, email, and letters. They were invited to participate in the scoping process and the greenway workshops.

6.2 PUBLIC INVOLVEMENT

Throughout the Grand Forks/East Grand Forks flood control study, the St. Paul District has coordinated with interested public agencies and officials, groups, and individuals. The following are the objectives of the public involvement process:

- provide information and education regarding the seriousness of the flooding
- provide information and education regarding our problem solving methods and decision making processes
- identify and clarify critical issues and manage related conflict
- ensure that all interests have the opportunity to communicate with the study team
- manage expectations regarding flood control and study products.

The city of Grand Forks has taken the lead in the public information process. This process took the following forms: neighborhood meetings, information newsletters, diversion meeting, open houses, weekly updates to the Grand Forks Flood Response Committee, press releases and media interviews.

The following meetings were held:
- October 29, 1997..... Neighborhood Meeting: Rural Community
- November 6, 1997.... Neighborhood Meeting: Riverside Park Area
- November 12, 1997.. Neighborhood Meeting: North Coulee Area
- November 13, 1997.. Neighborhood Meeting: Downtown Area

- November 18, 1997.. Neighborhood Meeting: Elks/Elmwood/Olson Drive Area
- November 19, 1997.. Neighborhood Meeting: South Coulee Area
- November 19, 1997.. Neighborhood Meeting: East Grand Forks
- November 20, 1997.. Neighborhood Meeting: Sunbeam Area
- November 25, 1997.. Neighborhood Meeting: Lincoln/Reeves/Walnut Place
- December 10, 1997.. Informational Briefing: Presentation of Northern Levees and Diversion Alignments
- December 11, 1997.. Public Open House: Presentation of Northern Levees and Diversion Alignments
- January 8, 1998..... Public Open House: Presentation of Southern Levees
- January 8, 1998..... "Kickoff" Meeting: Greenway Concepts Workshop
- February 5, 1998..... Greenway Concept Workshop
- February 6, 1998..... Greenway Concept Workshop
- February 18, 1998.... Public Open House: Presentation by the cities' engineering staffs of their recommendation on the flood protection project.
- February 19, 1998.... Public Open House: Presentation by the cities' engineering staffs of their recommendation on the flood protection project.
- March 11, 1998..... Greenway Public Workshop
- March 12, 1998..... Greenway Public Workshop

Synopses of these meetings may be found in Appendix C. Also enclosed are copies of the Flood Protection Update newsletters published by the city of Grand Forks with assistance from the U.S. Army Corps of Engineers and the city of East Grand Forks. Their purpose is to provide information regarding both the short- and long-term flood protection plans for the two cities.

Coordination with the city of Grand Forks Engineering/Public Works Department and their consultants and the city of East Grand Forks and their Engineering consultant has been ongoing throughout the planning process. Representatives from both cities have been present at each of the weekly/biweekly study team meetings to provide their ideas regarding possible flood reduction actions.

The draft General Reevaluation Report and Environmental Impact Statement is being distributed to interested agencies for formal review and comment There will be a workshop/meeting during the review period to obtain comments from the public.

6.3 REQUIRED COORDINATION

6.3.1 Fish and Wildlife Coordination

The U.S. Fish and Wildlife Service provided a Planning Aid Letter on the diversion alternative. The Bismarck and the Twin Cities Field Offices cooperated in the completion of a Draft Coordination Report in June 1998. A Final Coordination Act Report is included in this report in Exhibit C. The recommendations of the Fish and Wildlife Service as presented in the Final Coordination Act Report are presented below along with the

responses of the Corps of Engineers.

Recommendations:

1. Remove and properly dispose of all man-made structures such as buildings, roads, sidewalks and utilities within the greenway area.

Concur. All man-made structures will be cleared from properties acquired for the flood control project. We will encourage the local sponsor to adopt similar practices for the other properties within the greenway that they have acquired.

2. Control streambank erosion caused by floodwater confined between levees using non-structural methods (e.g., vegetation, levee design, land use) where possible. If structural erosion control (e.g., rip-rap, gabion) is used, it should be the minimum required to do the job.

Concur. Disturbed areas will be revegetated, primarily with native species. Structural measures will be limited to the minimum required.

3. Create wetlands with gently sloping sides within the greenway and allow wetland vegetation (e.g., cattail, bulrush) to reclaim the site.

Concur. Any wetlands that are created as part of this project will be constructed with gently sloping sides and allowed to revegetate with native species.

4. Follow appropriate construction practices and safety regulations (including a spill prevention plan) to minimize erosion and prevent environmental contamination during project construction.

Concur. We will review the contractor's environmental protection plan and will require that the contractor utilize best management practices for erosion control.

5. Restrict development within the floodplain to environmentally sensitive projects that are throughly reviewed by the appropriate agencies for environmental impacts and regulated to protect natural resources.

Concur. Within the flood plain, development would be restricted to uses compatible with project function. Environmental review of proposed projects would be conducted according to existing federal and state laws and regulations.

6. Preserve the existing trees and shrubs, to the extent possible, when removing man-made structures.

Concur. Existing woody vegetation would be preserved to the maximum extent possible during removal of structures.

7. Restore and revegetate disturbed areas with native plants. Coordinate with state and Federal agencies such as National Resource Conservation Service or the Fish and Wildlife Service to develop a native plant species list.

Concur. Agency review of the St. Paul District's existing list of native species is welcome.

8. Maintain and protect a vegetative buffer strip within the lower and more vulnerable portion of the floodplain.

Concur. To the extent possible, it is planned that the riverbanks be allowed to revegetate naturally which would create a vegetative buffer strip of riparian species.

9. Allow vegetation to grow naturally where possible, with little or no human manipulation such as mowing or pruning. Periodic burning may be permitted to maintain native vegetation.

Concur. To the extent possible, riparian vegetation would be left in a natural state except for possible periodic burning.

10. Maintain the water quality of the Red and Red Lake Rivers in the project area. Coordinate with State Health Departments and the Environmental Protection Agency to insure water quality is in compliance with state and Federal standards.

Concur. Coordination has been and will continue to be conducted with the North Dakota Department of Health, Minnesota Pollution Control Agency, and the U.S. Environmental Protection Agency. Water quality will likely improve as a result of the implementation of this project.

11. Provide for environmental education opportunities for local schools and public organizations as well as visitors to the Grand Forks/East Grand Forks Greenway.

Concur. One of the stated objectives of the greenway is to provide interpretive (environmental education) opportunities.

12. Develop a holistic water management strategy for the watershed above the project area that includes structural and non-structural features to help reduce peak flows during flood events.

The St. Paul District of the U.S. Army Corps of Engineers fully recognizes the need for consideration of basin-wide water management strategies in the Red River of the North Basin. In fact, the Corps of Engineers is actively engaged with the International Red River Basin Task Force to specifically address basin-wide flooding issues following the 1997 floods. Reduction of peak flows could increase the factor of safety in East Grand Forks and Grand Forks but this would not result in a substantial alteration of the proposed alignment.

13. Create a tallgrass prairie preserve in the project area if suitable land is available and the habitat values are compatible with greenway development.

Concur. The local sponsors will be encouraged to develop tall-grass prairie areas if suitable sites and resources are available.

14. Replace unavoidable losses of trees and shrubs with native trees on a 2:1 basis.

The revegetation plan, which specifies native species, is expected to result in a replacement rate for tree and shrub losses equal to, or greater than, 2:1.

15. Replace wetland losses by restoring equal or greater acreage of similar wetland habitat.

Concur. There will be no net loss of wetlands.

16. Design operation and maintenance plans for the greenway that encourage conservation of fish and wildlife resources.

Concur. The operation and maintenance manual provided to the local sponsors will encourage activities for the conservation of fish and wildlife resources.

17. Provide upland nesting habitat for waterfowl and other species on the levee alignment right-of-way by planting appropriate native vegetation and allowing natural growth.

Upland nesting habitat cannot be provided in the levee right-of-way which would be a highly disturbed area. Sufficient area for nesting should be available between the levee right-of-way and the riparian habitat.

18. Improve waterfowl nesting habitat by installing nesting boxes (especially wood duck nesting boxes in remaining riparian areas), creating wetlands, and providing nesting cover.

Concur. The local sponsors will be encouraged to adopt improvements to waterfowl nesting habitat as part of the operation and maintenance of the greenway.

6.4.1 Cultural Resources--Coordination with Minnesota and North Dakota SHPOs, the Advisory Council, and Other Interested Parties

The St. Paul District, U.S. Army Corps of Engineers has negotiated a Programmatic Agreement (PA) with the Advisory Council on Historic Preservation, the North Dakota State Historic Preservation Officer and the Minnesota State Historic Preservation Officer for the purpose of complying with Sections 106 and 110 of the National Historic Preservation Act. The City of Grand Forks, the City of East Grand Forks, and the Grand Forks Historic Preservation Commission are concurring parties to this PA and are being consulted with in its development. Stipulations in the PA provide for the continued consultation with these parties during historic preservation activities covered by the PA.

6.4.2 Cultural Resources-Coordination with Indian Tribes

Initial letters of coordination were sent to the Red Lake Band of Chippewa, the White Earth Band of Chippewa, and the Upper Sioux in Minnesota; the Spirit Lake Nation and Turtle Mountain Chippewa in North Dakota; and the Sisseton-Wahpeton Dakota in South Dakota. These letters requested these tribes provide the St. Paul District Corps with any concerns they may have about the Project's potential effects on properties important to their culture or religion. These tribes are also on the mailing list to receive scoping documents and the draft and final EIS for review and comment.

6.4.3 Cultural Resources-Coordination with the General Public

Initial Project-related information on cultural resources issues was provided to the Grand Forks Historic Preservation Commission and the interested public at the commission's January 7, 1998 meeting. City-wide and neighborhood meetings in December 1997 and January 1998; greenway workshops in the spring of 1998; extensive newspaper coverage of the Project; the *Flood Protection Update* newsletter; preparation of the draft EIS scoping document; and the 45-day review and comment period on the draft EIS in August and September 1998 have provided additional information to and solicited input from the general public on cultural resources issues.

6.5.1 Environmental Impact Statement Review

The Draft EIS was sent out for public review on 15 August 1998. A Notice of Availability of the draft EIS was published in the Federal Register on 21 August 1998. After publication of the Notice of Availability in the Federal Register, a 45 day review period commenced, ending on 5 October 1998.

At the end of the public review period, changes were made, where required, to the document in response to comments received. Responses were written to all comments (Exhibit C) and the Final EIS is prepared. After publication of the Notice of Availability in the Federal Register, a 30 day public review period will commence.

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EXHIBIT A: 404(b)(1) EVALUATION

404(b)(1) EVALUATION
FLOOD PROTECTION ALONG THE
RED LAKE RIVER and RED RIVER OF THE NORTH
EAST GRAND FORKS, MINNESOTA
AND
GRAND FORKS, NORTH DAKOTA

I. PROJECT DESCRIPTION

A. Location - The proposed flood control project is located in and near the cities of Grand Forks, North Dakota and East Grand Forks, Minnesota on the Red Lake River and the Red River of the North. (Plate 1).

B. General Description -The proposed flood control plan includes levee construction, flood walls, mechanically stabilized earth wall levees, and the excavation of two coulee diversion channels (Plate 1). Sluice gate closure structures would be constructed in the mouths of English and Heartsville Coulees to seal the levee during flood events. Another closure structure would be constructed at the site of the proposed diversion structure where Heartsville Coulee enters East Grand Forks. Three existing drop structures would be replaced in English Coulee. Erosion protection would be required at 5 locations to ensure the stability of the levees and associated structures (Plate 167-typical sections).

C. Authority and Purpose -The proposed action is authorized by the Flood Control Acts of 30 June 1948, 17 May 1950, and 31 December 1970. Its purpose is to reduce the frequency of flooding by the Red River of the North and the Red Lake River in the cities of Grand Forks, North Dakota and East Grand Forks, Minnesota.

D. General Description of Dredged or Fill Material

1. General Characteristics of Material - The riprap would be clean quarried rock or field stone. Bedding would be clean granular material. Poured-in-place concrete would be used for the foundation of the sluice gates which would seal reinforced concrete culverts into a closure structure and for drop structures.

2. Quantity of Material - The quantity of the fill material would be as follows: 18" riprap - 111,400 cubic yards, 24" riprap - 1,900 cubic yards, 36" riprap - 3,400 cubic yards, 9" bedding - 55,700 cubic yards, geotextile - 3,800 square yards, concrete - 3046 cubic yards.

3. Source of Material - The availability of suitable material is limited in the vicinity of the project area. The

rock would be obtained from farmer's field piles and active pits in moraine areas. If sufficient material cannot be found, rock would be hauled from commercial quarries in Minnesota. If any new source, other than farmer's field piles, is identified, then surveys of natural and cultural resources would be conducted before the site was disturbed. Pre-cast and ready-mix concrete would be obtained from commercial sources.

E. Description of the Proposed Discharge Sites

1. Location - The proposed fill activities would take place at locations along the bank of the Red Lake River and Red River of the North, within the two cities.

2. Size - Downstream of the Red Lake River, the cross section of the fill would be 320 linear feet, upstream of the Red Lake River the cross section would be 200 linear feet. Reach lengths vary from 600 feet to 4,600 feet.

3. Type of Site - The riprap and bedding would be placed on the primary river bank, which is mostly without vegetation, and extend across the river. The primary bank is closest to the water and does not include the higher flood plain bench. Closure and drop structures would be placed within two coulees at several locations.

4. Types of Habitat - The immediate project area is predominantly vegetated with a thin band of riparian trees and shrubs.

5. Timing and Duration - Construction would be initiated in calendar year 2000. It is estimated that the project would take about 5 years to complete.

F. Description of Disposal Method - Slopes are shallow and would allow direct access to the toe of the bank for the placement of material. Bedding, riprap, and concrete would be delivered by truck. The material would be placed by construction equipment.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations

1. Substrate Elevation and Slope - The slopes would follow the existing slope of the bank. Only minor shaping would be required and shaping would not extend into the river.

2. Sediment Type - The river channel and bank are primarily heavy clay with some silty sand.

3. Dredged/Fill Material Movement - No movement of fill material is expected to take place.

4. Physical Effects on Benthos - Some benthic organisms could be buried by fill activities, but the bank and river bottom do not provide much benthic habitat. New benthic species could colonize the area after rock placement.

5. Actions Taken to Minimize Impacts - Because the placement of the material would have only minimal impacts, no special actions to minimize adverse impacts would be taken.

B. Water Circulation, Fluctuation, and Salinity Determinations

1. Water - The proposed action would not affect water quality. It would not change the existing salinity levels, water chemistry, clarity, color, odor, taste, temperature, dissolved gas levels, nutrient levels or eutrophication potential.

2. Current Patterns and Circulation

a. Current Patterns and Flow - The placement of material in the water would not affect current patterns or flow in the rivers. Water depth is controlled by the Riverside Dam which creates pool conditions at the riprap placement sites. Flow in the Heartsville Coulee would be diverted from the Red Lake River to the Red River of the North for less than 21 days during a flood event.

b. Velocity - The main channel velocities would not be appreciably altered by the placement of rock. Normal flows are influenced by the Riverside Dam. Flows in the coulees would not be altered by the structures except when closed during floods.

c. Stratification - The proposed fill activities would have no effect on the development of stratified conditions in the river.

d. Hydrologic Regime - The proposed placement of rock would not affect the hydrologic regime of the project area.

3. Normal Water Level Fluctuations - The proposed action would not affect normal water level fluctuations.

4. Salinity Gradient - Not applicable.

5. Actions Taken to Minimize Impact - Since project

impacts would be minor, measures to minimize impacts would not be needed.

C. Suspended Particulate/Turbidity Determination

1. Expected Changes in Suspended Particulates and Turbidity Levels in the Vicinity of the Disposal Site - Although some minor temporary increases in turbidity would occur during rock placement, levels of turbidity would return to normal after project construction.

2. Effects on Chemical and Physical Properties of the Water Column - No effects are expected on light penetration, dissolved oxygen, toxic metals and organics, pathogens or the aesthetics of the water column during construction or after the project is in place.

3. Effects on Biota - Effects on biota would be minimal. Minimal losses of benthic organisms would be expected to result from placement of riprap. Benthic organisms would be expected to colonize the newly riprapped bank.

4. Actions Taken to Minimize Impacts - None required.

D. Contaminant Determinations - The fill material would be clean rock and would not introduce contaminants into the aquatic system. No excavation would occur in the river channel. Neither the material nor its placement would cause relocation or increases of contaminants in the aquatic systems.

E. Aquatic Ecosystem and Organism Determinations

1. Effects on Plankton - No effect expected.

2. Effects on Benthos - Minor losses of benthic organisms might occur during placement of riprap. However, benthic organisms would be expected to colonize the riprap after construction.

3. Effects on Nekton - No effect expected.

4. Effects on Aquatic Food Web - No significant or long-term effects on the aquatic food web are expected.

5. Effects on Special Aquatic Sites - No special aquatic sites are located in the project area; therefore, no effects on such sites are expected.

6. Threatened and Endangered Species - No known

federally-listed or State-listed threatened or endangered species would be affected by the proposed action.

7. Other Wildlife - Some temporary disturbances of wildlife could result from equipment operations during construction. Some trees and brush would be removed by the proposed action. Because of the limited extent of the proposed action, actual displacement of wildlife would be minor.

8. Actions Taken to Minimize Impacts - No actions are required because of the lack of impacts associated with the proposed action.

F. Proposed Disposal Site Determinations

1. Mixing Zone Determination - Not applicable. Material would not be dispersed.

2. Determination of Compliance with Applicable Water Quality Standards - The fill material would be obtained from an operating quarry or rain-washed farmer's field piles. Since only clean rock and bedding material would be used, State water standards would not be violated because of project-related activities.

3. Potential Effects on Human Use Characteristics - The proposed action would result in no adverse effects on municipal or private water supplies; recreational or commercial fisheries; or water-related recreation, aesthetics, parks, national historic monuments, or similar preserves.

G. Determination of Cumulative Effects on the Aquatic Ecosystem -Implementation of the proposed action would cause no significant cumulative impact on the aquatic ecosystem.

H. Determination of Secondary Effects on the Aquatic Ecosystem - No significant secondary effects would be expected.

III. FINDINGS OF COMPLIANCE WITH RESTRICTIONS ON DISCHARGE

The proposed fill activity would comply with the Section 404(b)(1) guidelines of the Clean Water Act. No significant adaptations to the Section 404(b)(1) guidelines were made for this evaluation. Other alternatives considered included variations of the proposed project and taking no action. These alternatives were not selected because they would be more expensive or were not as effective as the selected plan.

The proposed fill activity would comply with all State of Minnesota and State of North Dakota water quality standards, Section 307 of the Clean Water Act, and the Endangered Species Act of 1973, as amended. The proposed fill activities would not have a significant impact on human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, wildlife and special aquatic sites. The life stages of aquatic organisms and other wildlife would not be adversely affected. No significant adverse effects on aquatic ecosystem diversity, productivity and stability, or on recreational, aesthetic, and economic values would occur.

Since the proposed action would result in so few adverse effects, no additional measures to minimize impacts would be required.

On the basis of this evaluation, I specify that the proposed placement of rock riprap for bank protection, drop structures, and coulee closure structures complies with the requirements of the guidelines for discharge or placement of fill material.

10/20/98 /S/

_____ WILLIAM J. BREYFOGLE
Date LTC, EN
Acting Commander

Exhibit B:HABITAT EVALUATION PROCEDURE

The U.S. Fish and Wildlife Service's 1980 version of Habitat Evaluation Procedures (HEP-80) was used to quantify and evaluate the potential effects of the proposed flood control project for East Grand Forks and Grand Forks.

The HEP methodology utilizes a Habitat Suitability Index (HSI) to rate habitat quality on a scale of 0 to 1 (1 being optimum). The HSI is multiplied by the number of acres of available habitat to obtain Habitat Units (HU's). One HU is defined as one acre of optimum habitat. By comparing existing HU's to HU's expected to occur with a proposed action, the effects can be quantified.

Professional judgement, rather than specific models, was used to arrive at HSI values for future conditions with and without the proposed project. The habitat value of the area was evaluated for species characteristic of riparian habitat including neo-tropical migrant birds, white-tail deer, and small mammals.

Existing Condition

Residential neighborhoods and commercial property are behind high levees built close to the river. Approximately 1000 acres are outside the line of emergency levees including parks and golf courses. The riparian habitat formed by the bankside trees and underbrush, where present, is of limited habitat value because much of it is in narrow, disconnected, and relatively small parcels, close to sources of disturbance. The area is mainly used by wildlife species characteristic of a disturbed urban area. Overall, the community habitat quality of the riparian corridor before the flood would be considered low.

In the post-flood condition, the emergency levees are still in place but areas with damaged housing are abandoned and demolition is proceeding. Based on the above, the existing condition was assigned a low value of 0.2 HSI. It was projected that the habitat would improve slightly over time because of the abandonment of ruined neighborhoods close to the river and increased awareness of the importance of riparian habitat. It was estimated that over fifty years the habitat conditions would improve to slightly less than twice its original value.

Future Condition With Project

If the proposed plan is constructed, damaged structures and foundations, and most sidewalks, streets, and power poles would be removed. The existing emergency levees would be removed and new levees would be constructed away from the river. The corridor would double in size to 2000 acres. With the exception of established parks and 9 holes of the Lincoln Park Golf Course, minimal or no management of vegetation would be practiced on the majority of land within the greenway corridor. The increased area encompassed by the greenway will include the riparian habitat at the outlets of the coulees

and diversions which drain the area in and around the communities.

Public workshops and meetings with city and park district personnel revealed a consensus for the development of natural vegetation in the greeway. Over a few years it is expected that understory plants and saplings will begin to fill open spaces. Although the area would still be used, the increased area and the greater separation from residential areas would be expected to reduce disturbance and permit vegetation to grow with minimal disturbance. Over the project life the riparian habitat in the green way would approach a natural state. Based on the above information, the HSI is estimated to be good with a value of 0.5. When combined with the increased area that would result from construction of new levees and removal of old ones, the overall increase in habitat attributable to the greenway would be a factor of 3.05.

EXISTING	Year								AAHU
(Area: 1000 acres)	0	1	5	10	15	20	30	50	
HSI	.20	.20	.20	.25	.30	.30	.35	.35	
HU	200	200	200	250	300	300	350	350	295
WITH PROJECT	Year								AAHU
(Area: 2000 acres)	0	1	5	10	15	20	30	50	
HSI	.20	.20	.30	.35	.40	.45	.50	.50	
HU	200	400	600	700	800	900	1000	1000	901
								NET CHANGE	606

HSI-Habitat Suitability Index
HU-Habitat Unit (HSI x Area)
AAHU-Average Annual Habitat Unit