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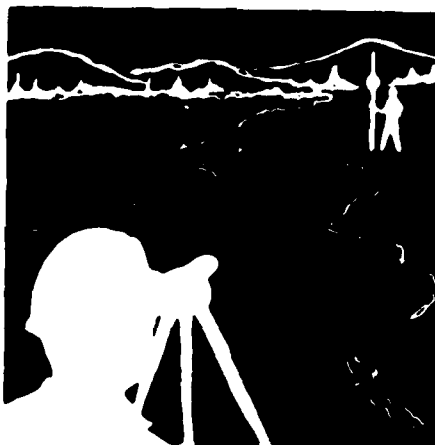
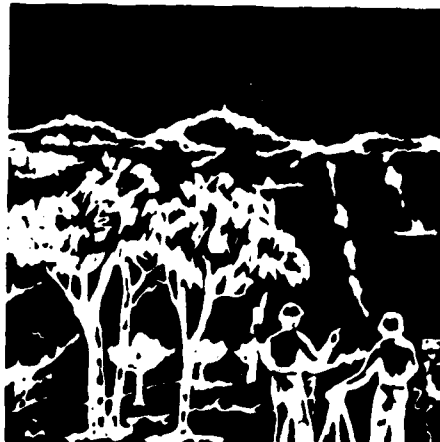
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FINAL SUPPLEMENT
ENVIRONMENTAL IMPACT
STATEMENT
MODIFICATION PROJECT
BIG STONE LAKE -
WHETSTONE RIVER



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The Big Stone Lake-Whetstone River Modification Project was authorized by the Flood Control Act Approved 27 October 1965. The Final Environmental Impact Statement was filed with the President's Council on Environmental Quality on 18 December 1971. Construction has been completed for all project features except for the upstream works on the Minnesota River and the areas of rechannelization and bank stabilization on the lower 4 miles of the Whetstone River.			

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This supplement has been prepared to address a significant alignment change for the proposed diversion channel into the project U.S. Highway 75 Reservoir in the Big Stone National Wildlife Refuge and to fulfill requirements which were established subsequent to the preparation of the final EIS.

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FINAL SUPPLEMENT
ENVIRONMENTAL IMPACT STATEMENT
MODIFICATION PROJECT
BIG STONE LAKE-WHETSTONE RIVER
BIG STONE AND LAC QUI PARLE COUNTIES, MINNESOTA, AND
GRANT COUNTY, SOUTH DAKOTA

Abstract: The Big Stone Lake-Whetstone River Modification Project was authorized by the Flood Control Act approved 27 October 1965. The Final Environmental Impact Statement was filed with the President's Council on Environmental Quality on 18 December 1971. Construction has been completed for all project features except for the upstream works on the Minnesota River and the areas of rechannelization and bank stabilization on the lower 4 miles of the Whetstone River.

✓ This supplement has been prepared to address a significant alignment change for the proposed diversion channel into the project U.S. Highway 75 Reservoir in the Big Stone National Wildlife Refuge and to fulfill requirements which were established subsequent to preparation of the final EIS: (1) the Endangered Species Act of 1973, as amended, and (2) Section 404(b) of the Clean Water Act of 1977 and applicable Corps of Engineers regulations and guidance. The supplement itself consists of three parts: (1) an evaluation of the significant environmental impacts which would be expected to result from construction of the alternative diversion channels along the new alignment; (2) a Section 404(b)(1) evaluation of all remaining fill activities associated with work on the Whetstone and Minnesota Rivers; and (3) a biological assessment which addresses the impacts of remaining work on all currently listed threatened and endangered species. ↗



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List of Preparers

The following people were primarily responsible
for preparing this Environmental Impact Statement

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FINAL SUPPLEMENT
ENVIRONMENTAL IMPACT STATEMENT
MODIFICATION PROJECT
BIG STONE LAKE-WHETSTONE RIVER
BIG STONE AND LAC QUI PARLE
COUNTIES, MINNESOTA, AND
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PART I: IMPACT ASSESSMENT OF NEW DIVERSION CHANNEL
BIG STONE AND LAC QUI PARLE COUNTIES, MINNESOTA

1.00 SUMMARY

Major Conclusions and Findings

1.01 The proposed change in the diversion channel alignment represents a significant design change from the plan discussed in the Final Environmental Impact Statement (EIS); and, as a result, no specific National Economic Development (NED) or Environmental Quality (EQ) alternatives were developed. In the opinion of concerned Federal and State fish and wildlife agencies, the proposed alignment does, however, represent the least environmentally-damaging plan. The proposed plan has been reviewed for compliance with Section 404, Executive Order (EO) 11988 and EO 11990; an analysis of impacts on prime and unique farmlands has also been made. Filing this final supplement with Congress, as required by Section 404(r) will complete compliance with Section 404 of the Clean Water Act. The proposed diversion alternative is considered to be in compliance with both EO 11988 and EO 11990, as it is the only practicable alternative for diverting flood flows to the Big Stone National Wildlife Refuge. An analysis of impacts on prime and unique farmland indicates that the selected plan would not affect these resources.

Areas of Controversy

1.02 To date, no areas of controversy have developed concerning selection of the proposed diversion channel alignment east of the Minnesota River.

Unresolved Issues

1.03 The primary unresolved issue which developed during the diversion channel study relates to the acquisition of lands and rights-of-way for the original diversion alignment (West 3 Alternative) discussed in the Final EIS and Design Memorandum No. 3. The local sponsor has not been able to obtain the required lands and rights-of-way from the Big Stone Canning Company. It was primarily this issue which prompted the Corps of Engineers to investigate an alternative alignment east of the Minnesota River that would be acceptable to all parties concerned.

1.04 A second unresolved issue relates to the construction of a portion of the proposed diversion channel in the Big Stone National Wildlife Refuge and the requirement that the local sponsor obtain a right-of-way permit from the U.S. Fish and Wildlife Service (FWS). Upon completion of this Final Supplement and prior to construction of the refuge portion of the diversion channel, the local sponsor must apply for a permit from the FWS. This action would likely be subject to additional and separate evaluation by the FWS at the time of application. Under the originally proposed alignment west of the Minnesota River, no such permit was required since the Corps of Engineers retained ownership through the refuge when lands were transferred to the FWS.

Relationship to Environmental Requirements

1.05 Table 1 describes the relationship to applicable environmental regulations of the two feasible alternatives that were developed in detail (see section 3.00 for a discussion of all the alternatives considered).

Table 1
Relationships of Plans to
Environmental Requirements

<u>Federal Statutes</u>	<u>Plan East 2</u> <u>(Selected Plan)</u>	<u>Plan West 3</u>
Archeological and Historic Preservation Act, as amended, 16 U.S.C. 469 et seq.	Full ¹	Full
Clean Air Act, as amended, 42 U.S.C. 7401, et seq.	Full	Full
Clean Water Act, as amended (Federal Water Pollution Control Act), 33 U.S.C. 1251, et seq.	Partial ²	Partial
Coastal Zone Management Act, as amended, 16 U.S.C. 1451, et seq.	N/A ³	N/A
Endangered Species Act of 1973, as amended, 16 U.S.C. 1531, et seq.	Full	Full
Estuary Protection Act, 16 U.S.C. 1221, et seq.	N/A	N/A
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), et seq.	Full	Full
Fish and Wildlife Coordination Act, as amended, U.S.C. 661, et seq.	Full	Full
Land and Water Conservation Fund Act, as amended, 16 U.S.C. 4601-4601-11, et seq.	N/A	N/A
Marine Protection, Research and Sanctuaries Act, 22 U.S.C. 1401 et seq.	N/A	N/A
National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321, et seq.	Partial	Partial
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470a, et seq.	Full	Full
Rivers and Harbors Act, 33 U.S.C. 401 et seq.	N/A	N/A
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001 et seq.	N/A	N/A

Notes - The compliance categories used in this table were assigned based on the following definitions:

1. Full compliance - All requirements of the statute, EO, or other policy and related regulations have been met.
2. Partial compliance - Full compliance will be achieved upon completion of this document.
3. Not applicable (N/A) - The statute, EO, or other policy is not applicable.
4. Partial compliance - The local sponsor will be required to obtain permit prior to initiation of construction.

<u>Federal Statutes</u>	Plan East 2 (Selected Plan)	Plan West 3
Wild and Scenic Rivers Act; as amended, 16 U.S.C. 1001, et seq.	Full	Full
<u>Executive Orders, Memoranda</u>		
Floodplain Management (EO 11988)	Full	Full
Protection of Wetlands (EO 11990)	Full	Full
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)	N/A	N/A
Analysis of Impacts on Prime and Unique Farm- lands, CEQ Memorandum 30 August 1976	Full	Full
State and Local Policies	Full	Full
Land Use Plans	Full	Full
<u>Required Federal Entitlements</u>		
U.S. Fish and Wildlife Service Special Use Permit	Partial ⁴	Partial

2.00 NEED FOR AND OBJECTIVES OF ACTION

Study Authority

2.01 The Big Stone Lake-Whetstone River Modification Project was authorized by the Flood Control Act of 1965.

Project Purpose and Status

2.02 The project purposes are flood control, general recreation, and fish and wildlife resource conservation. The Highway 75 Dam and Reservoir is completed and functioning. Actions yet to be completed are the upstream works on the Whetstone River; the upstream works on the Minnesota River, including the silt barrier and control structure modification; and the upstream works on the Minnesota River, including channel modification and the diversion channel discussed in this supplement.

Public Concerns

2.03 Throughout the course of studies for the Big Stone Lake-Whetstone River Project, public concerns, problems, and needs identified in relationship to the total project and the modifications discussed in this supplement include (1) fish and wildlife resource management and the Big Stone National Wildlife Refuge, (2) sedimentation and pollution of Big Stone Lake, (3) erosion control of the Minnesota and Whetstone Rivers, and (4) flood control in the Minnesota and Whetstone River area. These concerns have been addressed, resource management needs discussed, and management plans formulated in the following documents: Final Environmental Impact Statement, Big Stone Lake-Whetstone River Modification Project, Minnesota and South Dakota, 18 December 1971; Flood Control, Big Stone Lake-Whetstone River, Minnesota-South Dakota, Design Memorandum No. 3, Upstream Works on the Minnesota River, June 1973; Design Memorandum No. 4, Master Plan for Resource Management, June 1973; Design Memorandum No. 1, General, Supplement No. 2, November 1979; and this supplement.

Planning Objectives

2.04 Development of the alternative plans for the Minnesota River diversion channel considered the public concerns mentioned above and incorporated the resource management needs of the area and national planning objectives of National Economic Development (NED) and enhancement of Environmental Quality (EQ).

2.05 The planning objectives developed for the Minnesota River state that a diversion plan:

- a. Must provide a safe, dependable channel for passage of flood flows.

b. Must reduce adverse impacts of sedimentation on the Big Stone National Wildlife Refuge.

c. Must reduce adverse impacts on lands of the Big Stone Canning Company.

d. Must function as part of the whole Big Stone Lake-Whetstone River Flood Control Project.

e. Must not adversely affect the environment to a significant degree.

In the development of plans for the Minnesota River diversion, the planning objectives listed above were satisfied to the maximum extent practicable.

3.00 ALTERNATIVES

Alternatives Considered

3.01 The alternatives being considered in this supplement are five diversion alignments (including the original design discussed in the Final EIS, and the proposed alignment plan) plus the no action alternative.

Alignment Plans Eliminated During Early Planning

3.02 During early planning stages, five alignments were identified for possible diversion channel locations (see Plate 2). Three of these alternatives were not carried forth into advance planning efforts for the reasons described below.

a. East 1 - This alternative would divert flood flows via a channel from the east side of the Minnesota River. It would divert water to a low area through a wetland, then back to a Minnesota River channel crossing where it would follow the same lower new channel alignment as East 2. This plan was eliminated early because it had the highest cost, would require the most rock excavation, and would destroy the most wetland habitat.

b. West 1 and West 2 - These alternatives would divert water from the Minnesota River on the west side about one-half mile below the diversion point of the two east alternatives. From the diversion point, both alternatives would use the same channel for about one-half mile. West 1 would then run easterly, cross the Minnesota River channel one-fifth mile above the proposed East 2 crossing, make another crossing of the Minnesota River at the proposed East 2 crossing point, and then generally follow the proposed East 2 lower channel into the refuge. This plan was eliminated because of excessive cost and the amount of wetland destroyed. West 2 would run south at its diversion from West 1, cut through a meander wetland area, and flow south for about 1 mile until it terminated in the refuge ditch system. This plan was eliminated because of adverse impacts to the meander wetland area.

Plans Developed in Detail

3.03 The following discussion will describe plans that were developed in detail.

a. East 2 - This alternative diversion channel alignment would consist of a new channel as shown on Plate 1. At the point of diversion, a riprapped restriction would be placed in the existing river channel and a weir would be placed across the new channel. The weir would restrict normal flows up to elevation 957 msl to the existing channel. Steel sheetpiling, fill, and gabion protection would provide a weir height of about 2-1/2 feet. Riprap would be placed upstream and downstream of the weir and on the channel nose separating the new channel from the riprapped restriction on the existing channel. At approximately 1 mile downstream of the diversion structure, the new channel would cross the existing channel. Riprap would be placed at the intersection of the two channels, and a riprapped restriction would be placed on the continuation of the existing channel (which is about 4 feet lower than the new channel would be at this point). The plan also includes an additional weir in the diversion channel just downstream of the existing river channel to divert up to 200 cubic feet per second of flows into the existing river channel under low-pool conditions of the Highway 75 Reservoir. A concrete paved crossing of the new channel would also be provided downstream of the intersection. The crossing would be used for maintenance, public access, and operation and maintenance in the wildlife refuge. The diversion channel would enter the Big Stone National Wildlife Refuge on the north boundary, one-eighth mile north of the intersection of the channel alignment with the Minnesota River. The channel would then continue into the refuge for approximately 1 mile where it would terminate in an existing ditch. New channel width in reaches above the Minnesota River intersection would gradually increase from about 50 feet to 100 feet. Above the intersection, the total width, including the disposal mounds, would average 400 feet. Below the intersection, the channel would be about 200 feet wide (400 feet including levees) to its end at the drainage ditch.

b. West 3 (Original Design Memorandum No. 3 Plan) - The original Design Memorandum No. 3 plan consisted of channel improvement with primarily one-side excavation. The plan provided for a channel plug and culvert in the existing river channel and a new channel extending to the Highway 75 reservoir (see Plate 2). The plan provided for a weir in the new channel to assure continued passage of normal flows in the existing river channel. A roadway was proposed across the existing channel plug and a concrete paved Texas crossing of the new channel for maintenance purposes and for access to severed land. Channel width would increase from about 100 feet at the upper reaches of the channel to 230 feet at its end. The total width, including the disposal mounds, would average about 350 feet.

No Federal Action

3.04 This alternative implies that the Federal Government, acting through the Corps of Engineers, would take no further action to complete the Big Stone Lake-Whetstone River flood control project.

4.00 AFFECTED ENVIRONMENT

Environmental Conditions

4.01 Within the project area, the Minnesota River Valley is a broad alluvial plain averaging about 2 miles wide, broken by prominent granite knolls and elongated ridges of glacial drift that lie approximately parallel to the axis of the valley. In the Minnesota River Valley above U.S. Highway 75 is a two-pool retarding basin built for flood control and wildlife benefits as part of the Big Stone Lake-Whetstone River Modification Project. This 10,000-acre reservoir forms part of the Big Stone National Wildlife Refuge.

4.02 Land in the private sector of the valley is used for cultivation and live-stock pasture. Riparian timberland is found along the Minnesota River channel in scattered patches in the valley. Urban land uses are associated with Big Stone City, South Dakota, and Ortonville, Minnesota. Big Stone Canning Company is the major industrial land user of the area.

4.03 Prior to construction of the Highway 75 Dam and Reservoir, much of the sediment carried by the Minnesota and Yellow Bank Rivers was deposited in Marsh Lake. The existing average annual sediment load for these two rivers was computed to be 17.0 acre-feet for the Minnesota River at Ortonville and 20.4 acre-feet for the Yellow Bank River near Odessa. Land treatment measures proposed by the Soil Conservation Service for the Whetstone and Yellow Bank Watersheds would reduce these amounts. During flood events, some of this sediment load would have been deposited in overbank areas upstream of Marsh Lake and, therefore, would not have reached the lake.

4.04 Construction of the Highway 75 Dam reduced the sediment load reaching Marsh Lake. It was estimated that initially the Highway 75 Reservoir would trap 86 percent of the incoming sediment load. The project would not change the Yellow Bank River sediment load and would have only a minor effect on the Minnesota River sediment load. Therefore, the sediment load passing through the Highway 75 Dam would initially be only about 14 percent of the pre-project sediment load. The trap efficiency of the reservoir will slowly decrease; however, a long reservoir life is expected because the conservation pool storage of 11,700 acre-feet is many times larger than the total sediment load entering the reservoir. Sedimentation in the reservoir will be monitored every 5 years. Because of the nature of the terrain and shape of the pool, the sediment would not be deposited uniformly in the pool. The sediment transported by the Whetstone River to the Minnesota River would form a delta in the upper end of the reservoir while the sediment carried by the Yellow Bank River would be deposited in a delta at the mouth of the Yellow Bank River in the lower reaches of the reservoir.

4.05 Although no recent studies have been conducted, the benthic habitat of the Minnesota River below Big Stone Lake for a distance of 14.5 miles was studied during 1959. These studies indicated that the river was polluted and that the benthic populations were of low diversity. Principal species collected were Tendipedids and Oligochaetes. These studies did not reveal the presence of any valuable assemblages of benthic organisms or threatened or endangered species.

4.06 The terrestrial fauna found in the project area include white-tailed deer (Odocoileus virginianus), red fox (Vulpes vulpes), cottontail rabbit (Sylvilagus floridanus), fox squirrel (Sciurus niger), gray squirrel (S. carolinensis), raccoon (Procyon lotor), striped skunk (Mephitis mephitis), shrews, mink (Mustela vison), ring-necked pheasant (Phasianus colchicus), songbirds, various reptiles, and amphibians.

4.07 The resources of the National Wildlife Refuge would be affected by the remaining work on the Minnesota River. (The impacts are discussed in section 5.00 below.) The project area lies within the range of the endangered Arctic peregrine falcon. An assessment of the impacts of the project upon the peregrine falcon is given in Part III of this report. The ball cactus (Mamillaria vivipara), listed as endangered by the State of Minnesota, is considered a significant local resource by some area residents and agencies. The ball cactus is protected in the Big Stone National Wildlife Refuge and was determined not to be a significant resource which would be impacted by the proposed diversion channel.

4.08 As of 2 September 1980, no sites listed on the National Register of Historic Places or eligible for inclusion on the Register were located in or near the project area.

4.09 Resources of the project area that are of concern to local interests include the cultivated and pasture land and the recreational uses of the river corridor. Potential undesirable impacts on river valley use could occur during construction of the project.

5.00 ENVIRONMENTAL EFFECTS

General

5.01 This section discusses the significant environmental effects of the two alternative channel alignment plans studied in detail. It is divided into two major subsections: (1) the immediate effects of construction which are essentially the same for both alternatives, and (2) the possible long-term impacts on the project area and region.

Short-Term Impacts

5.02 Effects on Water Quality, Air Quality, Aesthetic Values, and Noise - Construction of the East 2 diversion structure and associated entrance channel to the Minnesota River, the weir at the downstream confluence of the bypass channel with the river, and the West 3 diversion structure would temporarily increase turbidity and siltation. A majority of the new channel construction for both alternatives would be accomplished in the dry. The entrance channel works for both alternatives and the weir and downstream confluence works for the East alternative are the only segments of the project in which work may not be possible in the dry. These activities could temporarily increase the silt load entering the Big Stone National Wildlife Refuge via the natural river channel. Every effort will be made to accomplish these activities during low water periods to keep impacts to a minimum.

5.03 In addition, minor amounts of runoff and sedimentation from land areas during construction could also increase turbidity levels. Short-term effects on air quality and increases in noise would occur from operation of construction equipment during construction operations. The project would have no significant long-term effect on aesthetic values, although some short-term adverse effects would occur during construction.

5.04 The East 2 alternative alignment would pass through an area of scattered hardrock outcroppings. If surface or underground solid rock is encountered during construction of the new channel, some blasting would be required. The blasting would adversely affect the local area by introducing additional noise vibration impacts on local residences, livestock, and wildlife. Blasting could also increase construction time by 3 to 6 months.

5.05 Community Cohesion, Growth, and Displacement of People - The diversion alternatives would have no significant impact on the local community cohesion or growth or on regional growth. No displacement of households will result from any of the alternatives.

5.06 Effects on Property Values and Tax Revenues - Both diversion alternatives would have no significant impact on property value. Land use in the immediate project area is mostly agricultural. Land values may go up slightly due to the increased flood protection afforded by the completed project. Likewise, little significant impact on tax revenues is expected.

5.07 Effects on Public Facilities and Public Services - The Big Stone National Wildlife Refuge is the major public facility impacted by the project. Effects of the alternatives on the Big Stone National Wildlife Refuge are discussed in paragraphs 5.02-5.04 and 5.09-5.20. The project will have no other significant impact on any public facilities or public services in the region.

5.08 Effects on Business and Labor - Implementation of either alternative would have a short-term beneficial impact on the region's labor force by creating construction and support jobs. The West 3 alignment would require lands of the Big Stone Canning Company. The canning company has expressed some opposition to the West 3 alignment. Their canning factory has effluent discharges in the area which require EPA permits. Their discharge apparently has poor water quality now and a close channel alignment would present additional problems in obtaining a permit. Therefore, implementation of the West 3 alternative would adversely affect their business activities.

Possible Long-Term Impacts

5.09 No Action - The primary long-term effect of the no action alternative would be continued flooding in the upstream area along the Minnesota River. If the proposed diversion channel were not completed, the other features (such as the silt barrier, the channel works, and those already constructed) would be essentially useless because the flood control project is designed to be a system that requires the functional operation of all its parts. Adverse and beneficial effects associated with the proposed diversion plan would not occur under the no action alternative.

5.10 Diversion Alternatives - The primary positive long-term effect of construction of either diversion channel would be a reduction of flooding in the upstream area along the Minnesota River. Flooding in that area of the Big Stone National Wildlife Refuge along the natural Minnesota River channel would also be reduced, because floodwaters would pass directly into the pool area instead of following the winding natural river channel.

5.11 Construction activities within the right-of-way limits of the East 2 diversion channel and disposal of excavated materials would adversely impact about 65 acres of habitat in the Big Stone National Wildlife Refuge: 45 acres of old field dominated by quackgrass, bromegrass, and exotic annual and perennial herbs; 15 acres of floodplain woodland, composed chiefly of mature cottonwood, willow, elm, ash, boxelder, and silver maple; and 5 acres of sedge and grass wetland. Above the wildlife refuge, about 55 acres would be adversely impacted. About 25 acres is old field, which is infrequently used for pasture. Beyond these fields, the channel would pass through about 30 acres of grazed floodplain woodlands.

5.12 Construction of the West 3 alternative would adversely impact about 25 acres of old field and 5 acres of floodplain woodland consisting of dense stands of willows in the refuge and about 35 acres above the refuge; 25 acres of cultivated land and 10 acres of grazed floodplain woodland.

5.13 Frequent flooding and livestock grazing have diminished the wildlife value of the privately-owned floodplain above the refuge woodland; however, it does provide good furbearer denning habitat, nesting habitat for cavity-nesting bird species, and a travel lane for numerous species of mammals and birds. Construction of the East 2 channel would also prevent the stream-woodland ecotone from returning. Since the wildlife displaced by the construction cannot simply move to another area, there could be a net reduction in wildlife numbers and species in the immediate project area.

5.14 The old fields are presently covered with dense stands of annual forbs and grasses which provide food and cover for game birds, songbirds, and small mammals. Construction activities in these areas would result in an immediate loss of habitat with associated adverse wildlife impacts. In addition, the old field areas within the East 2 alignment are being considered for possible conversion to tall grass prairie by the Fish and Wildlife Service. The existence of a channel would not preclude this conversion; however, planting plans which would not interfere with the transport of floodwaters would need to be developed.

5.15 Construction of the East 2 channel would eliminate about half of the 5-acre sedge and grass wetland. In addition, the raised elevation of the levee would likely eliminate the growth of wetland plants. The upland area of the levees would be revegetated and could be included as part of the tall grass prairie management program. The channel itself would be near the water level of the refuge pool and, as such, sedges and wetland grass communities should establish naturally from surrounding areas. Natural vegetation would be allowed to establish in the channel as long as channel function is not impaired.

5.16 As discussed above, the East 2 alignment would impact about 65 acres in the refuge as compared to 30 acres for the West 3 alignment. In general, habitat along the West 3 alignment is much more diverse and remote than the East 2 alignment. As a result, impacts associated with construction of the West 3 alternative through the refuge are expected to be significantly greater than with the East 2 alternative. In addition, both the Fish and Wildlife Service and the Minnesota Department of Natural Resources have indicated a preference for the East 2 alignment since it would avoid disturbance of the higher quality West 3 habitat.

5.17 In addition to natural revegetation in wet areas, loss of habitat and adverse impacts to wildlife associated with the habitat would be mitigated somewhat by planting the levees, channel banks, and bottoms with native grasses and other prairie plants compatible with the ecological conditions and project operation.

5.18 Construction of the entrance channel works and of the downstream confluence of the East 2 channel with the river and placement of riprap around the downstream confluence would eliminate about 1,500 feet of benthic habitat. Although some benthic organisms would be destroyed, long-term impacts would be minimal because the river almost yearly, during dry periods, becomes a series of disconnected pools with flow, if any, being subsurface. Disturbed areas with suitable habitat would quickly become repopulated through recruitment from adjacent areas as soon as construction is completed.

5.19 The bottom elevation of both diversion channel alignments would likely be below the existing water table in many areas; therefore, ideal conditions for emergent aquatic vegetation, such as cattail (*Typha* sp.) and sedges (*Carex*) would be created. Emergent vegetation would not present a problem unless channel capacity or velocity were affected, which would require the vegetation to be removed. If such a situation did occur, any use of chemical herbicides for control purposes would result in short-term adverse impacts on the environment.

5.20 Both channel alignments, in conjunction with overall project operation, could have some adverse impacts on the Big Stone National Wildlife Refuge. Wildlife and recreation resources of the refuge are closely related to water levels on the refuge pools. Waterfowl generally construct their nests, beginning in early May, with the bottom of the nest bowl approximately 6 inches above the water surface. A possible adverse impact to waterfowl populations could be expected if sudden rises of more than 6 inches occur during May and June. High water flows which would have enough volume to raise the pool water level occur early in spring during snowmelt before nesting time. Spring and summer rainstorms also could raise pool elevation, but impacts on waterfowl would be similar regardless of project alternatives and plans.

5.21 Proposed modifications of the Big Stone Lake outlet structure and silt barrier would have a minor effect on the sediment load down the Minnesota River. Although the total amount of sediment entering the Highway 75 Reservoir would be the same for the approved diversion channel alignment (West 3) shown in Design Memorandum No. 3 and the presently proposed East 2 alignment, the different diversion alignment could cause some minor change in the location of the delta formed. For both alignments, however, the amount of sediment going down the existing Minnesota River channel would be much less than that going down the diversion channel since the majority

of flood flows would follow the diversion channel and since flood flows carry most of the sediment load. For example, in the Whetstone River, the highest 5 percent of the flows transport over 90 percent of the sediment load. The U.S. Fish and Wildlife Service has expressed concern that the sediment storage in the Highway 75 Reservoir would be exhausted before the project reached its design life. Their concern was based on the earlier sediment volume estimates. As discussed in section 4.04 above, the present study indicates that the storage capacity is more than adequate.

5.22 In general, less sediment would be transported down the natural Minnesota River bed below the downstream confluence with either diversion alternative during periods of high water. This would have a possible long-term impact by scouring and washing away the riverbed sediments without an approximately equal amount of sediment being deposited in the riverbed after each flood event: the natural cyclic process of erosion and sedimentation would be altered. The East 2 and West 3 alternatives would not affect flows or sedimentation patterns during periods of normal and low water flow (200 cfs and below) in the Minnesota River channel. Post-project conditions would be the same as existing conditions for flows below 200 cfs.

5.23 Cultural Resources - Reconnaissance level cultural resources surveys were undertaken in the Big Stone-Whetstone Flood Control Project Area in 1974 and 1975 by archaeologists from the University of Minnesota. One site was located during the 1974 survey but was deemed too disturbed to warrant further attention. No sites or structures of historic or prehistoric significance were located during the 1975 survey. Another reconnaissance level survey was undertaken in May 1980 in the area of the proposed channel realignment to the east of the Minnesota River. No archaeological sites or historic structures were located during that survey.

5.24 The National Register of Historic Places has been consulted; and, as of 2 September 1980, no sites listed on or determined eligible for the Register were in the project area. Coordination with the State Archaeologist, the State Historic Preservation Officer, and the Heritage Conservation and Recreation Service has been initiated.

6.00 PUBLIC INVOLVEMENT

6.01 The proposed channel realignment has been coordinated with Federal, State, and other interested agencies, and they have indicated a general concurrence with the study findings. Representatives of the U.S. Fish and Wildlife Service and the Minnesota Department of Natural Resources participated in a field inspection and meetings during the analysis of the feasible alternative sites.

6.02 This final supplement will be coordinated with all agencies, conservation groups, and interested citizens who received the draft supplement for review and comment. Concerned Federal, State, and key local agencies, plus individuals and groups who have commented upon the draft or who have requested this final, will be sent copies of this document. Other interests who received copies of the draft will be notified of the availability of this supplement and will be sent copies upon request. A listing of those individuals who received the draft supplement is presented in Appendix 2. All letters of comment and the responses thereto are presented as Appendix 1.

PART II:
SECTION 404(b) EVALUATION OF UPSTREAM WORKS ON THE
BIG STONE LAKE-WHETSTONE RIVER PROJECT
BIG STONE AND LAC QUI PARLE COUNTIES, MINNESOTA,
AND GRANT COUNTY, SOUTH DAKOTA

The following is an evaluation of the proposed construction and fill activity in accordance with the requirements of Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1344).

1. PROJECT DESCRIPTION

a. Fill Activities Associated with Project Work

(1) Modification of a silt barrier on the Minnesota River, including placement of Cofferdams (A) during construction (see Plate 7 for the location of Cofferdams (A)).

(2) Modification of 1 mile of the Minnesota River downstream of its confluence with the Whetstone River (see Plates 1 and 3 for typical sections).

(3) Construction of a bypass high-flow channel parallel to the Minnesota River, including placement of a temporary channel plug in the old channel a weir at the upstream end of the new channel, and channel intersection construction at the downstream confluence with the Minnesota River (see Plates 1 and 3 for typical sections).

(4) Modification of a control structure on the Minnesota River, including placement of upstream and downstream Cofferdams (B) during construction (see Plate 7).

(5) Excavation work of the Whetstone River (see Plates 4, 5, 6, and 7).

(6) Bank stabilization in an upstream reach of the Whetstone River (see Plate 8).

b. Description of the Proposed Discharge of Dredged or Fill Materials

(1) General Characteristics of Material - Fill material would consist of rock for riprap, derrick stone, bedding material, and sand fill selected from channel excavation.

(2) Quantity of Material Proposed for Discharge - Modification of the silt barrier would require placement of 830 cubic yards (cy) of bedding, 1655 cy of derrick stone, and 545 cy of riprap into the Minnesota River. An unknown quantity of random fill would be used for two cofferdams needed during silt barrier construction; the quantity would depend on the amount of flow in the Minnesota River. Fill for control structure modification would require 510 cy of bedding, 135 cy of derrick stone, and 910 cy of riprap, as well as 3,000 cy of silty sand fill for two cofferdams needed during construction. Access roads and a culvert for a parking area near the control structure would require placement of 40 cy of riprap and 20 cy of bedding into the Minnesota River, after the control structure modification is complete. Enlargement of the Minnesota River would require placement of 420 cy of riprap, 200 cy of bedding, and 350 cy of silty sand fill. Realignment of the Minnesota River would require 11,600 cy of silty sand fill, 2,870 cy of riprap, and 1,435 cy of bedding for channel restrictions and channel intersection construction. Work on the Whetstone River would require placement of 1,460 cy of riprap, 690 cy of bedding, and 2,730 cy of sand fill in the river for bank stabilization. The Whetstone River diversion channel would require placement of 1,200 cy of riprap, 560 cy of bedding over slope areas prepared with at least 2,000 cy of silty sand fill, and placement of at least 14,000 cy of silty sand fill to shape the channel slopes.

(3) Source Of Material - Rock for riprap, derrick stone, and suitable bedding material is available from areas located between 5.0 and 7.0 miles from the Whetstone River project area. Quarried granite for riprap and bedding and concrete aggregate for work on the Minnesota River are available from a commercial source located 3½ miles west of Odessa, Minnesota. Natural sand and gravel are available from a commercial gravel pit in South Dakota located 20 miles west of Odessa, Minnesota, as well as from others near Ortonville, Minnesota, and Big Stone City, South Dakota. Random and channel fill materials would be obtained from channel excavation. Material placed in water would be composed of clean gravel, sand, and silty sands.

c. Description of the Proposed Disposal Sites for Dredged or Filled Material

(1) Location - The upstream works on the Whetstone River are located on the eastern boundary of South Dakota near Big Stone City and on the western boundary of Minnesota near the City of Ortonville. The upstream works on the Minnesota River are located in a reach of the river extending about 3½ miles downstream from Big Stone Lake (Plate 1).

(2) Type of Disposal Sites - Most fill activities, other than cofferdam construction, would be done in the dry after the water has been redirected to the opposite side of the channel. Water would not cover the material until after construction and riprapping. In most cases, fill would be placed on the sides of existing banks. Temporary cofferdams would be constructed by placing fill material directly into the river channels at various points. Modification of the silt barrier and control structure would require placement of fill at existing structures, in a dry state.

(3) Method of Discharge - Fill placed in water would be placed by dump-trucks, dozers, and cranes equipped with clamshell buckets and draglines.

(4) When Will Disposal Occur? - Disposal would occur during calendar years 1981, 1982, 1983, and 1984.

(5) Projected Life of Disposal Sites - The life of the project is 100 years.

(6) Bathymetry - The rivers are generally shallow with uneven sandy bottoms. Silt deposits occur in areas of little current. High silt loads are characteristic of the rivers, and sedimentation in both the rivers and Big Stone Lake is a problem to local landowners.

2. PHYSICAL EFFECTS

a. Potential Destruction of Wetlands - Effects on (40 CFR 230.4-1(a) (1) (i-v))

(1) Foodchain Production - Invertebrate habitat would be destroyed when fill and riprap are placed in the rivers. Recolonization by new species adapted to living on gravel and rock substrates probably would occur after construction is completed. Terrestrial animals in riparian habitat destroyed by channelization would be displaced. Revegetation after construction is completed would reduce the long-term effects.

(2) General Habitat - General habitat in channelized areas and those areas covered with fill and riprap would be altered. Temporary increases in turbidity during cofferdam construction would adversely affect aquatic biota, especially algae and invertebrates which form the base of the foodchain. Rock and gravel placed during project construction would provide habitat for some aquatic species after construction is completed, thus reducing long-term adverse impacts. Revegetation of upland areas altered by construction would reduce the long-term impacts on terrestrial species.

(3) Nesting, Spawning, Rearing and Resting Sites for Aquatic or Land Species - Yellow perch spawning sites in rooted vegetation could be covered with fill. Disposal banks in channelized areas would be unstable for burrowing activities of muskrat and other mammals. Removal of streamside vegetation on one side could eliminate some shading over the river which might be required by some fishes and invertebrates.

(4) Areas Set Aside for Aquatic Environmental Study or Sanctuaries or Refuges - Suspended material entering Big Stone National Wildlife Refuge could reduce the utility of this refuge as an area for waterfowl, although this reduction would not be substantial and the life of the refuge would not be reduced by the fill actions.

(5) Natural Drainage Characteristics - Drainage would be accelerated in the channelized portion of the Whetstone and Minnesota Rivers. Realignment of the lower Minnesota River provides for drainage of low flows along the existing Minnesota River channel and for drainage of high flood flows along the new channel to the existing drainage ditch system leading to the project reservoir. High flows (above 10-year flood level) would enter the reservoir via the new channel work and the existing ditch system at the upper end of the reservoir. Normal flows would enter the reservoir via the existing Minnesota River channel at about the midpoint of the reservoir.

(6) Sedimentation Patterns - The change in operating plan and modifications to the silt barrier would reduce sedimentation downstream. The amount of silt deposited into Big Stone Lake from the Whetstone River is very small and no significant change will occur. Sediment load to the Highway 75 Reservoir would be slightly reduced by the proposed project.

(7) Salinity Distribution - Not applicable.

(8) Flushing Characteristics - Base flow characteristics of the river systems would not be changed. Water, however, would flow faster in channelized areas, and 90 percent of the mixing and settling in Big Stone Lake near the outlet would be eliminated.

(9) Current Patterns - Current would be accelerated in channelized areas, but base flow characteristics in the river channels would not be changed significantly by the project due to modifications of the outlet control structure.

(10) Wave Action, Erosion, or Storm Damage Protection - The channel slopes, 20-foot berm, disposal banks, sand fill areas, channel plugs, and the channel bottom of the new diversion channel would be seeded with native prairie grasses to reduce erosion. Riprap would be placed on the top and slopes of the channel restriction used to divert floodwaters down the new channel instead of the Minnesota River to provide protection from storm damage and erosion.

(11) Storage Areas for Storm Waters and Floodwaters - Fill activities themselves would not have an effect on storage areas for storm waters and floodwaters.

(12) Prime Natural Recharge Areas - Groundwater and prime natural recharge areas are not expected to be affected significantly by the proposed project. The source of the municipal water supply at Ortonville is groundwater pumped from a near-surface sand and gravel aquifer. The groundwater is a more than adequate supply for the city's needs as the aquifer is recharged from Big Stone Lake.

b. Impact on Water Column (40 CFR 230.4-1(a)(2))

(1) Reduction in Light Transmission - Increased turbidity during and shortly after construction in channelized areas would have minor effects on light transmission. Riprap and seeding would stabilize banks and reduce erosion of silt and other bank materials into the water.

(2) Aesthetic Values - Placement of fill materials would cause an increase in turbidity during construction and would temporarily make the rivers aesthetically displeasing to recreational users.

(3) Direct Destructive Effects on Nektonic and Planktonic Populations - Minor adverse impacts would occur as a result of increased turbidity during construction. Those organisms dependent on large amounts of light would be adversely affected by turbid conditions. Planktonic populations could decline or be eliminated in the affected area as a result of reduced light penetration.

c. Covering of Benthic Communities (40 CFR 230.4-1(a)(3))

(1) Actual Covering of Benthic Communities - Although no recent studies have been conducted, the benthic habitat of the Minnesota River below Big Stone Lake for a distance of 14.5 miles was studied during 1959. These studies indicated that the river was polluted and that the benthic populations were representative of polluted conditions and of low diversity. Principal species collected were Tendipedids and Oligochaetes. These studies did not reveal the presence of any valuable assemblages of benthic organisms or threatened or endangered species. The benthic communities in the construction area would be destroyed when covered with fill. This adverse impact would be felt until recolonization occurs through recruitment from adjacent areas.

(2) Changes in Community Structure or Function - Fill and riprap activities would cover and eliminate some benthic communities. Recolonization from adjacent communities would occur after construction if the new substrate is suitable habitat. It is likely that new species would be attracted to the riprap material.

d. Other Effects (40 CFR 230.4-1(a))

(1) Changes in Bottom Geometry and Substrate Composition - Riprap would cover the existing uneven sandy and silty surface of the riverbanks with a flat surface of rocks with slopes of 1 vertical on 3 horizontal. Bank stabilization would help decrease the amount of silt settling to the bottom of the rivers in areas of little current.

(2) Water Circulation - Modification of the outlet control structure on Big Stone Lake would permit 90 percent of the water from the Whetstone River to pass directly into the Minnesota River without first circulating in Big Stone Lake, if storage is available in the Highway 75 Reservoir.

(3) Salinity Gradients - Not applicable.

(4) Exchange of Constituents Between Sediments and Overlying Water with Alterations of Biological Communities - Fill activities would cover the existing sandy bottom sediments. Present benthic communities, as described in 2c.(1) above, are low in species diversity and poor in spatial development. The new conditions will not provide a means for exchange of constituents with overlying water in areas that recolonize with similar organisms from surrounding areas, or areas that do not recolonize.

3. CHEMICAL-BIOLOGICAL INTERACTIVE EFFECTS (40 CFR 230.4-1(b))

a. Does the Material Meet the Exclusion Criteria?

Most fill material would meet the exclusion criteria. The exclusion criteria state that dredged or fill material may be excluded from this evaluation if it is composed predominantly of sand, gravel, or any other naturally occurring sedimentary material with particle sizes larger than silt, characteristic of and generally found in areas of high current or wave energy such as streams with large bed loads. Riprap, derrick stone, bedding materials, and concrete meet the exclusion criteria because of their non-liquid and clean nature. The exclusion criteria also state that fill material may be excluded if it is substantially the same as the substrate at the proposed disposal site, is sufficiently removed from sources of pollution to provide reasonable assurance that the material has not been contaminated by pollution, and is discharged so that material will not be moved by currents in a manner damaging to the environment outside the disposal site. Sand fill selected from dredged material and used for bank stabilization and enlargement activities meets these criteria.

4. DESCRIPTION OF SITE COMPARISON (40 CFR 230.4-1(c))

a. Total Sediment Analysis (40 CFR 230.4-1(c)(1))

Sediment samples from the proposed construction sites were collected in January 1979 (see Exhibit 1). These samples were analyzed by the United States Geological Survey in February 1979 for heavy metals, organics, and nutrients. Analysis down to 1 part per billion shows no detectable levels of 16 different organics in five of the samples. Sample number 4 shows 0.7 part per billion of both DDT and Dieldrin. Sample number 7 shows 1.7 parts per billion of DDE and 2.8 parts per billion of DDT. The use of tested river bottom fill material and clean rock, gravel, and sand presents no major environmental impact in regard to concentration differences of critical constituents between the fill site and the fill material.

b. Biological Community Structure Analysis (40 CFR 230.4-1(c)(2))

Fill material would either be non-aquatic or would be selected from the stream channel adjacent to the fill site and probably would not contribute any species to the biological community structure at the fill sites.

5. APPLICABLE WATER QUALITY STANDARDS

a. Compare Constituent Concentrations

The constituent concentrations of the fill material are related to the source of the fill material. The riprap and bedding and some fill will be clean sand, gravel, and rock, minimizing the potential for constituent exchange. Some

small amounts of exchange could occur with the introduction of such fill items as gabions and concrete. The dredged fill material will be silty sand similar to that of the fill site. Fill will come from tested, clean deposits only. Constituent exchange in the fill material would be similar to the exchanges that currently occur on naturally eroding and depositing material in the area.

b. Mixing Zone

Not applicable. No liquid would be discharged into the river.

c. Based on a. and b. Above, Will Fill Operations Be in Conformance with Applicable Standards?

The project would not affect the river's ambient quality and is in conformance with applicable standards.

d. SELECTION OF DISPOSAL SITES (40 CFR 230.5) FOR DREDGED OR FILL MATERIAL

a. Need for the Proposed Activity

Modification of the existing silt barrier would help prevent sediment from entering Big Stone Lake, would improve recreation, and would be the only item of construction not required for flood control. Lakeshore interests at the lower end of Big Stone Lake claim that serious property devaluations would result if the siltation were to continue unchecked. Conservation interests report that damage to fish life results from the present siltation problem, and recreation interests note that the lake is becoming less desirable for boating and swimming. Social gains as a result of this project would be a reduction in flood damages and the maintenance of an optimum elevation in Big Stone Lake.

b. Alternatives Considered

Alternative channel alignments, site barrier locations, and control structure locations could not be functional without some type of fill activity. Therefore, any location alternatives would have impacts similar to the impacts associated with the fill activities of the proposed plans. The sites for fill and riprap activity are required in order to meet the desired project objectives.

c. Objectives to be Considered in Discharge Determination (40 CFR 230.5(a))

(1) Impact on Chemical, Physical, and Biological Integrity of Aquatic Ecosystem (40 CFR 230.5(a)(1)) - Fill activity would not have a significant effect on the integrity of the aquatic ecosystem. Clean rock, sand, and gravel would cause little change in water chemistry. Flow rates in channelized areas would be accelerated slightly. Fill material would cover some invertebrates, but habitat for new species may be provided at the same time.

(2) Impact on Foodchain - Plankton and invertebrate populations of the Big Stone Lake watershed in general and the fill areas on the Minnesota and Whetstone Rivers in particular are indicative of a eutrophic system. The watershed is a major source of nutrients and organics that perpetuate the eutrophic condition and that limit the base of the foodchain to algae adapted to eutrophic conditions. Fill activities would have no impact on algae production. However, benthic invertebrate communities in the construction area would be destroyed when covered with fill. Recolonization by new species adapted to living on gravel and rock substrates should occur after construction is completed. Organisms directly dependent on benthic populations covered by fill activities would be forced to migrate to other areas or be lost.

(3) Impact on Diversity of Plant and Animal Species - Aquatic vegetation would be lost, and associated animal life would probably leave the area. The impact on diversity is not expected to be significant.

(4) Impact on Movement Into and Out of Feeding, Spawning, Breeding, and Nursery Areas - Channelization and riprap placement may cover vegetation and prevent yellow perch from using traditional spawning sites.

(5) Impact on Wetland Areas Having Significant Functions of Water Quality Maintenance - Fill activities would have an adverse impact on approximately 5 acres of wetlands which perform water quality maintenance functions.

(6) Impact on Areas that Serve to Retain Natural High Waters or Floodwaters - Provisions would be made for reducing floodwaters retained in Big Stone Lake by providing for storage in the Highway 75 Reservoir. Fill activities would have no impact on floodwater retention.

(7) Methods to Minimize Turbidity - Construction would be accomplished during low-flow periods. Water would be temporarily diverted by cofferdams so that fill placement could be done in a dry state.

(8) Methods to Minimize Degradation of Aesthetic, Recreational, and Economic Values - Channelization would affect the aesthetics of the project area by altering natural forested areas during realignment of the Minnesota River and by removing streambank vegetation during bank stabilization construction and riprap placement. Riverbanks would be replanted with trees and native grasses. The project should aid fishing in Big Stone Lake which is the most important use of the lake in terms of recreation and economic values. Fill activities would be conducted in a manner which would prevent unsightly erosion of riverbanks. (See Plate 9.)

(9) Threatened and Endangered Species - In a letter dated 30 April 1979, the U.S. Fish and Wildlife Service identified one endangered species that may be found in the area: the Arctic peregrine falcon. Fill activities would have no effect on the continued existence of this falcon.

(10) Investigate Measures that Avoid Degradation of Aesthetic, Recreational, and Economic Values of Navigable Waters - Filled portions of the project would not significantly impact aesthetic, recreational, or economic values of the navigable waters. Streambank channelization work has been designed to avoid aesthetic and recreational degradation by keeping vegetation intact on one side of the bank and by replacing destroyed vegetation.

d. Impacts on Water Used at Proposed Fill Sites (40 CFR 230.5(b)(1-10))

(1) Municipal Water Supply Intakes - Construction of the proposed project would have no significant temporary or long-range effects on the groundwater of the area. The source of the municipal water supply at Ortonville, Minnesota (groundwater pumped from a near-surface sand and gravel aquifer) is more than adequate for the city's needs.

(2) Shellfish - Little is known of shellfish populations in the project area, and none are known to be harvested commercially. Most of the species of mussels which inhabit streams of the region are intolerant of substrates composed of shifting sand, which occurs in the Whetstone and Minnesota Rivers; and this condition limits their distribution. Fill activities are not expected to have a significant impact on shellfish numbers.

(3) Fisheries - No significant fish habitat, other than the vegetative cover buried by fill material, would be affected by construction activities.

(4) Wildlife - Construction equipment would temporarily disturb some wildlife species, and removal of streambank vegetation would adversely affect some species. Revegetation after construction is completed would reduce long-term adverse effects.

(5) Recreational Activities - No significant water-related recreation activities are available in the fill areas. The upper Minnesota River provides some fishing, canoeing, and hunting recreation, but only a few localized areas along the river are considered to be of significant value.

(6) Threatened and Endangered Species - No known threatened or endangered species would be adversely affected by the proposed action.

(7) Benthic Life - Some benthic invertebrates would be destroyed by fill activities. However, recolonization by recruitment from adjacent areas would occur shortly after construction is completed and new species may be attracted to the new substrate.

(8) Wetlands - Five acres of palustrine emergent wetland would be adversely affected by the fill activities.

(9) Submersed Vegetation - Submersed vegetation is not present in dense concentrations in fill areas but probably would not become established on the new substrate.

(10) Size of Disposal Site - The sites for fill and riprap activity are the smallest possible that still meet the desired project objectives.

(11) Coastal Zone Management Programs (40 CFR 230.3(e)) - Not applicable. Fill sites do not conflict with any coastal zone management programs.

e. Considerations to Minimize Harmful Effects (40 CFR 230.5(e)(1-7))

(1) Water Quality Criteria - Fill activities would not affect the ambient qualities of the rivers, as outlined in each State's regulations, if turbidity during construction is kept to a minimum.

(2) Investigate Alternatives to Open Water Disposal - Open water disposal is necessary to construct the channel restrictions and cofferdams.

(3) Investigate Physical Characteristics of Alternative Disposal Sites - There are no feasible alternative sites. Channel location dictates where the fill would be placed.

(4) Ocean Dumping - Not applicable.

(5) Where Possible, Investigate Covering Contaminated Dredged Material with Cleaner Material - Dredged material to be used as a channel restriction to divert water into the new channel would be covered with clean riprap to prevent potential downstream movement of any contaminated material released during dredging.

(6) Investigate Methods to Minimize Effects of Runoff from Confined Areas on the Aquatic Environment - No confined disposal areas would be used.

(7) Coordinate Potential Monitoring Activities at Disposal Site with EPA - No monitoring activities are planned for the disposal areas.

7. STATEMENT AS TO CONTAMINATION OF FILL MATERIAL IF FROM A LAND SOURCE (40 CFR 230.5(d))

Land source fill material would be commercially purchased clean rock, gravel, sand, and concrete.

8. MIXING ZONE

Not applicable. No liquids would be discharged into the rivers.

9. DETERMINATIONS

The following determinations are those contained in the Section 404(b)(1) Guidelines, dated 5 September 1975, which are considered the most important in arriving at the findings required by Section 404(b)(1) of the Clean Water Act.

a. An ecological evaluation has been made following the evaluation guidance in 40 CFR 230.4, in conjunction with the evaluation considerations in 40 CFR 230.5.

b. Appropriate measures - such as using clean fill and riprap for construction features and scheduling work during the dry time of year - have been incorporated in the proposed plan to minimize adverse effects on the aquatic environment.

c. Consideration has been given to the need for the proposed activity, the availability of alternate sites and methods (see section 6, page 18 of this 404(b)(1) evaluation) of disposal that are less damaging to the environment, and such water quality standards (see section 5, page 17 of this 404(b)(1) evaluation) as are appropriate and applicable by law.

d. The fill activities must be associated with the Whetstone and Minnesota Rivers and adjacent lands in order to fulfill the basic project purpose. It was determined that the proposed plan was the only practicable alternative. The proposed fill and associated activity will not cause significant permanent disruption to the beneficial water quality uses of the affected Whetstone and Minnesota Rivers ecosystem.

10. FINDINGS

Based on the above determinations, I find that the fill sites discussed above for the flood control project at Big Stone Lake-Whetstone River, Minnesota-South Dakota have been specified through the application of the Section 404(b)(1) Guidelines.

DATE

WILLIAM W. BADGER
Colonel, Corps of Engineers
District Engineer

PART III:
BIOLOGICAL ASSESSMENT
UPSTREAM WORKS ON THE BIG STONE
LAKE-WHETSTONE RIVER PROJECT

BIG STONE AND LAC QUI PARLE COUNTIES, MINNESOTA,
AND GRANT COUNTY, SOUTH DAKOTA

1.00 PROJECT DESCRIPTION

Location

1.01 The upstream works project on the Whetstone and Minnesota Rivers is located on the eastern boundary of South Dakota near Big Stone City and on the western boundary of Minnesota near the city of Ortonville.

Description of Proposed Project and Purpose

1.02 The project will include alteration of the existing control structure and a silt barrier at the outlet of Big Stone Lake, channel enlargement of the Minnesota River channel for a distance of about 1 mile below the Big Stone Lake outlet control dam, construction of about 2 miles of new channel from the lower limit of the improved channel downstream into the upper reaches of the Big Stone National Wildlife Refuge, all in Minnesota; and construction of erosion control works in the downstream reach of the Whetstone River in South Dakota. The project will meet area needs for flood control, recreation, and wildlife management purposes.

Alternatives

1.03 Alternatives to the proposed action include (1) no action; (2) providing for flood storage in Big Stone Lake; and (3) transfer of floodwater downstream into existing impoundments at Marsh Lake and Lac qui Parle.

2.00 ENVIRONMENTAL SETTING

2.01 Within the project area, the Minnesota River Valley is a broad alluvial plain averaging about 2 miles wide and broken by prominent granite knolls and elongated ridges of glacial drift that lie approximately parallel to the axis of the valley. In the Minnesota River Valley above U.S. Highway 75 is a two-pool retarding basin built for flood control and wildlife benefits as part of the Big Stone Lake-Whetstone River Modification Project. This 10,000-acre reservoir forms part of the Big Stone National Wildlife Refuge.

2.02 Land in the private sector of the valley is used for cultivation and livestock pasture. Riparian timberland is found along the Minnesota River channel and in scattered patches in the valley. Urban land uses are associated with Big Stone City, South Dakota, and Ortonville, Minnesota. Big Stone Canning Company is the major industrial land user of the area.

3.00 IMPACTS OF THE PROJECT ON THREATENED OR ENDANGERED SPECIES

3.01 The U.S. Fish and Wildlife Service, in a letter dated 30 April 1979 (AFA-SE), identified one endangered species that may be found in the area: the Arctic peregrine falcon (Falco peregrinus tundrius).

3.02 The peregrine falcon, with a historic breeding distribution throughout the United States, has apparently been extirpated from Minnesota and South Dakota (Whitney et al., 1978). The highly migratory Arctic peregrine falcon breeds in the tundra areas of North America (White, 1968). Occasional sightings of the Arctic peregrine falcon may occur in northeastern South Dakota and western Minnesota during its migration (Whitney et al., 1978; Midwest Research Institute, 1974). The upstream works on the Big Stone Lake-Whetstone River Project would have no effect on the continued existence of the peregrine falcon.

REFERENCES CITED

1. Midwest Research Institute, 1974. Natural Resources Study to Determine Causes and Alternative Solutions to the Siltation and Pollution Problems of Big Stone Lake. Contract No. DACW37-74-C-0107. Kansas City, Missouri.
2. White, C.M., 1968. Diagnosis and Relationships of the North American Tundra-Inhabiting Peregrine Falcon. *The Auk*. 85(2): 179-191.
3. Whitney, N.R., et. al., 1978. The Birds of South Dakota. South Dakota Ornithologists Union with the Cooperation of the W.H. Over Museum, Vermillion, S.D.

MODIFY SILT BARRIER
MODIFY CONTROL DAM

ORTONVILLE, MINN

BIG
STONE
CITY S D

CHANNEL MODIFICATION

DIVERSION EXCAVATION

BANK STABILIZATION

CHANNEL RESTRICTION

CHANNEL
WEIR

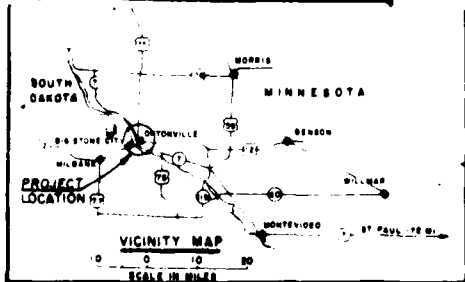
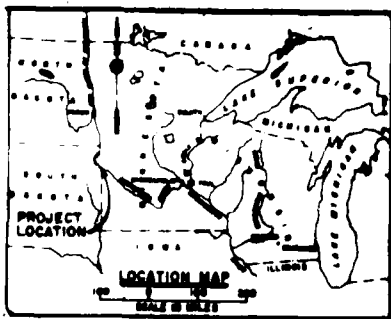
NEW CHANNEL

CUTOFF CHANNEL
CHANNEL RESTRICTION

CHANNEL FILL

CONCRETE PAVED ROAD
CROSSING OF CHANNEL

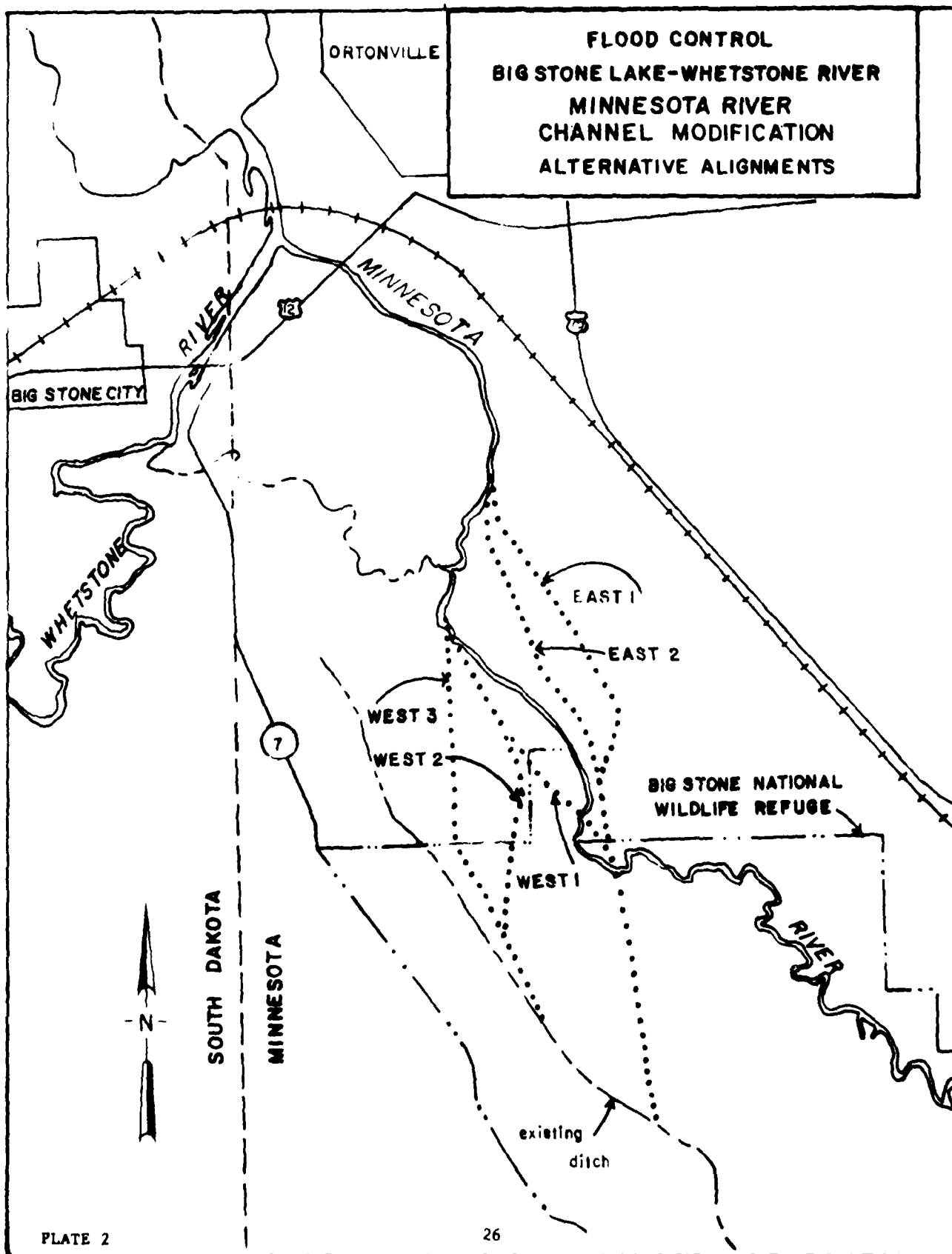
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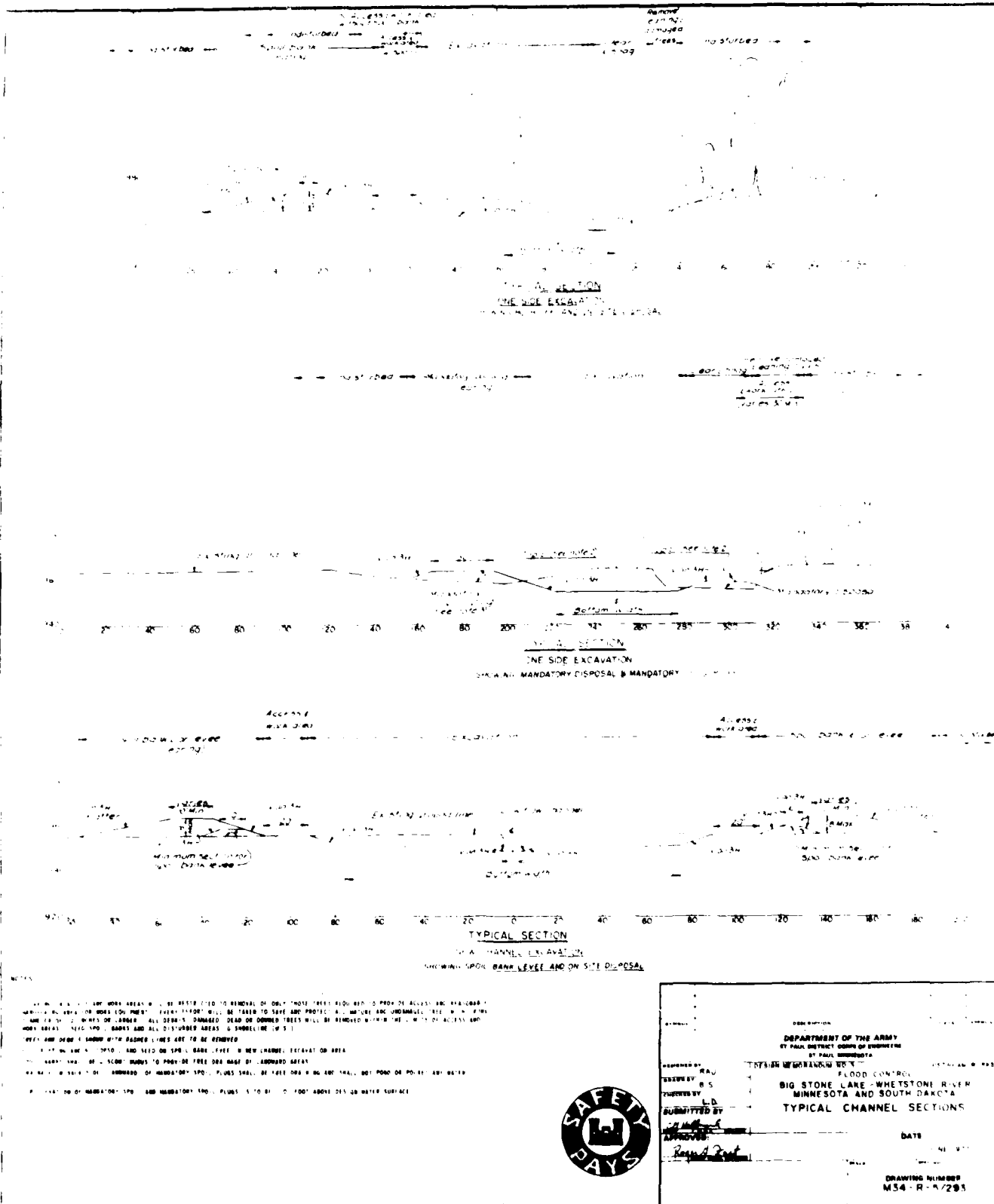


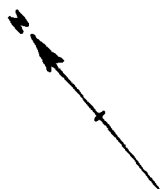
GENERAL PLAN

SCALE IN FEET
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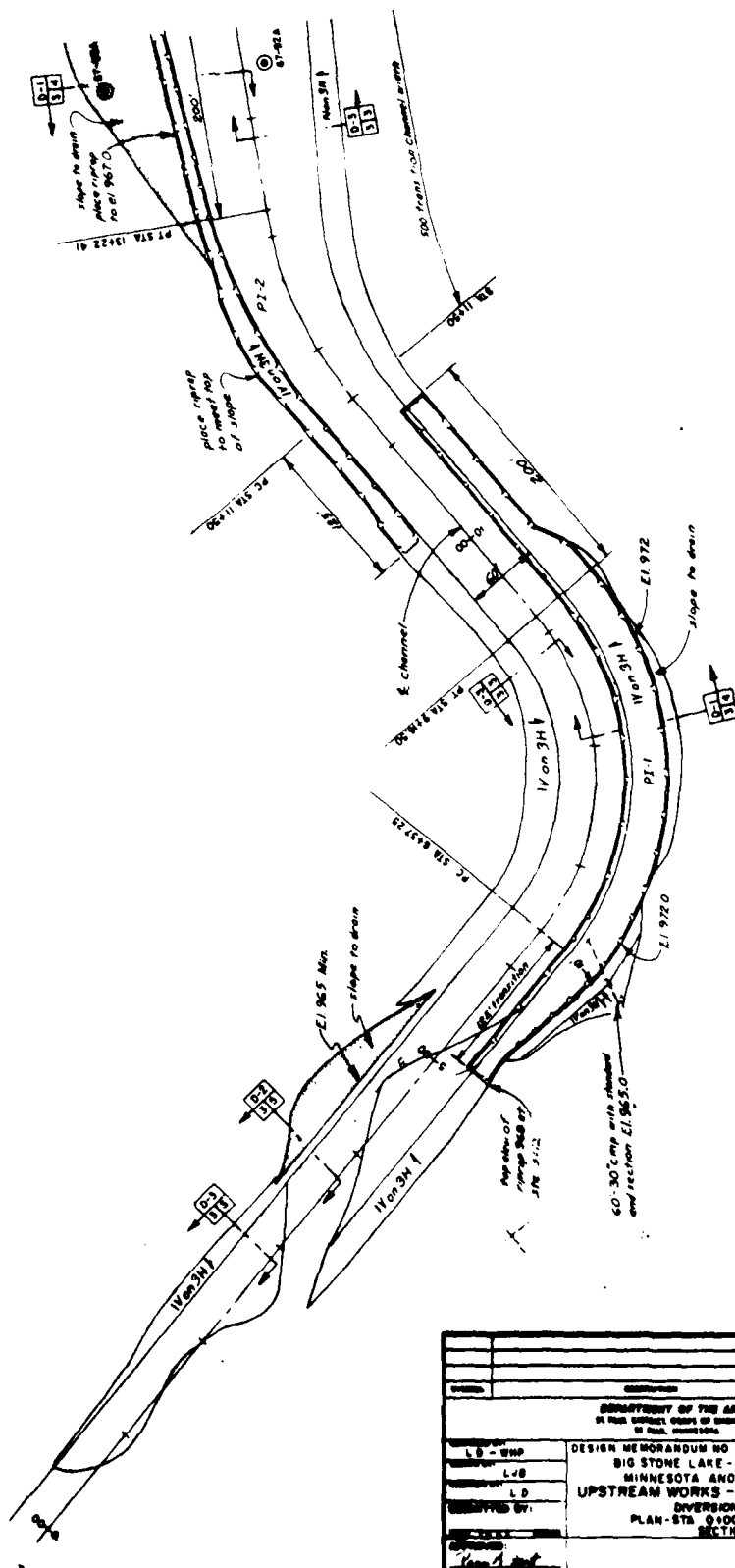
PLATE I



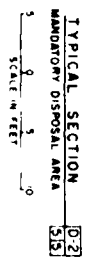
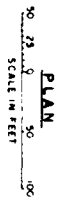


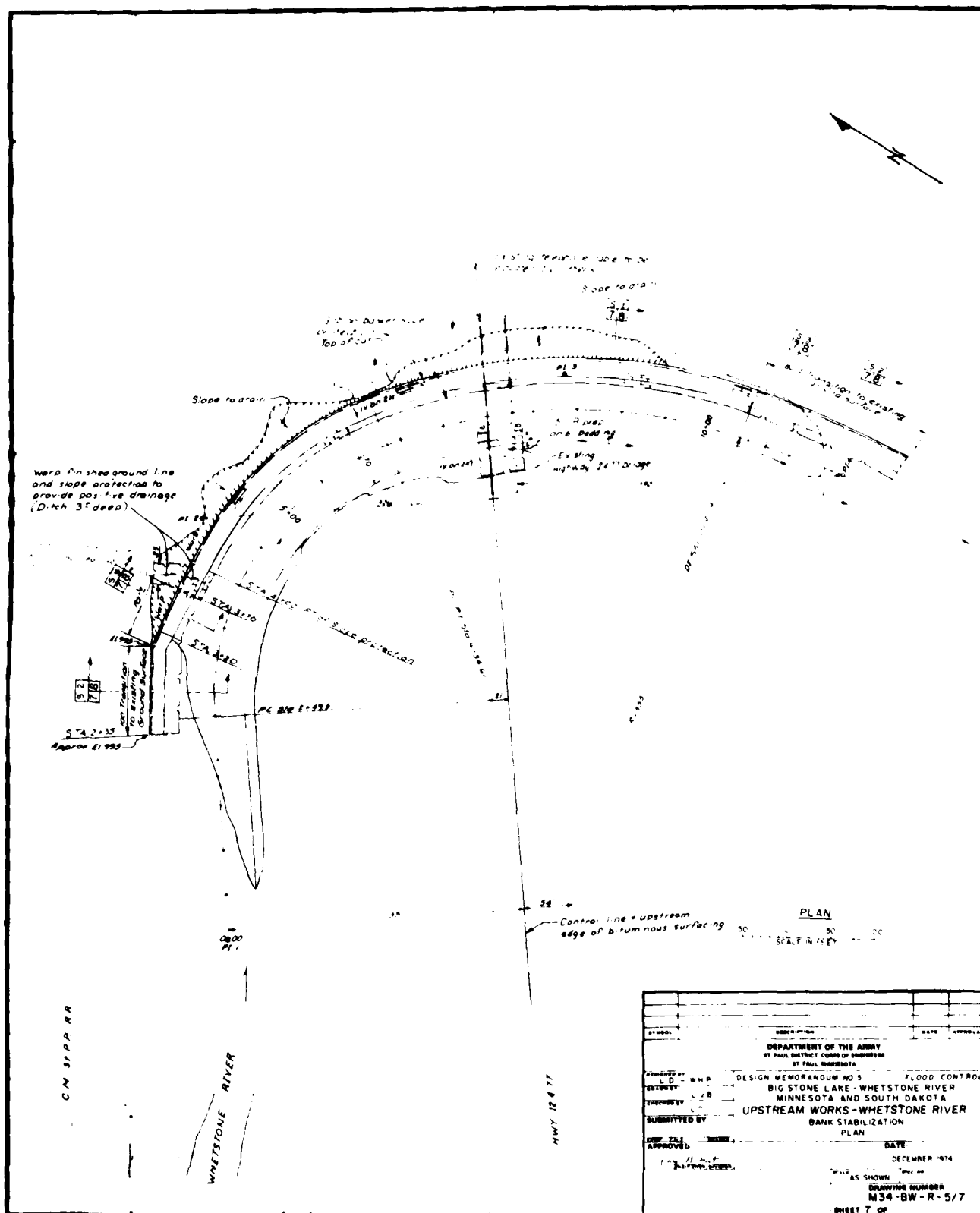


PLAN
SCALE 1" = 100'



DESIGN MEMORANDUM NO. 3		FLOOD CONTROL	
BIG STONE LAKE - WHEATSTONE RIVER			
MINNESOTA AND SOUTH DAKOTA			
UPSTREAM WORKS - WHEATSTONE RIVER			
DIVERSION CHANNEL			
PLAN - STA. 9+00 TO STA. 14+80			
SECTION D-3			
DATE: DECEMBER 1974		DRAWN BY: [Signature]	
CHECKED BY: [Signature]		APPROVED BY: [Signature]	
M34-BW-R-5/3			

[illegible]



DESIGNED BY	ENGINEER	DATE	APPROVED BY
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY	ENGINEER	DATE	APPROVED BY
DESIGN MEMORANDUM NO. 5 BIG STONE LAKE - WHETSTONE RIVER MINNESOTA AND SOUTH DAKOTA UPSTREAM WORKS - WHETSTONE RIVER BANK STABILIZATION PLAN			
DESIGNED BY	ENGINEER	DATE	APPROVED BY
DECEMBER 1974 AS SHOWN DRAWING NUMBER M34-BW-R-5/7 SHEET 7 OF			

Typical Cross Section

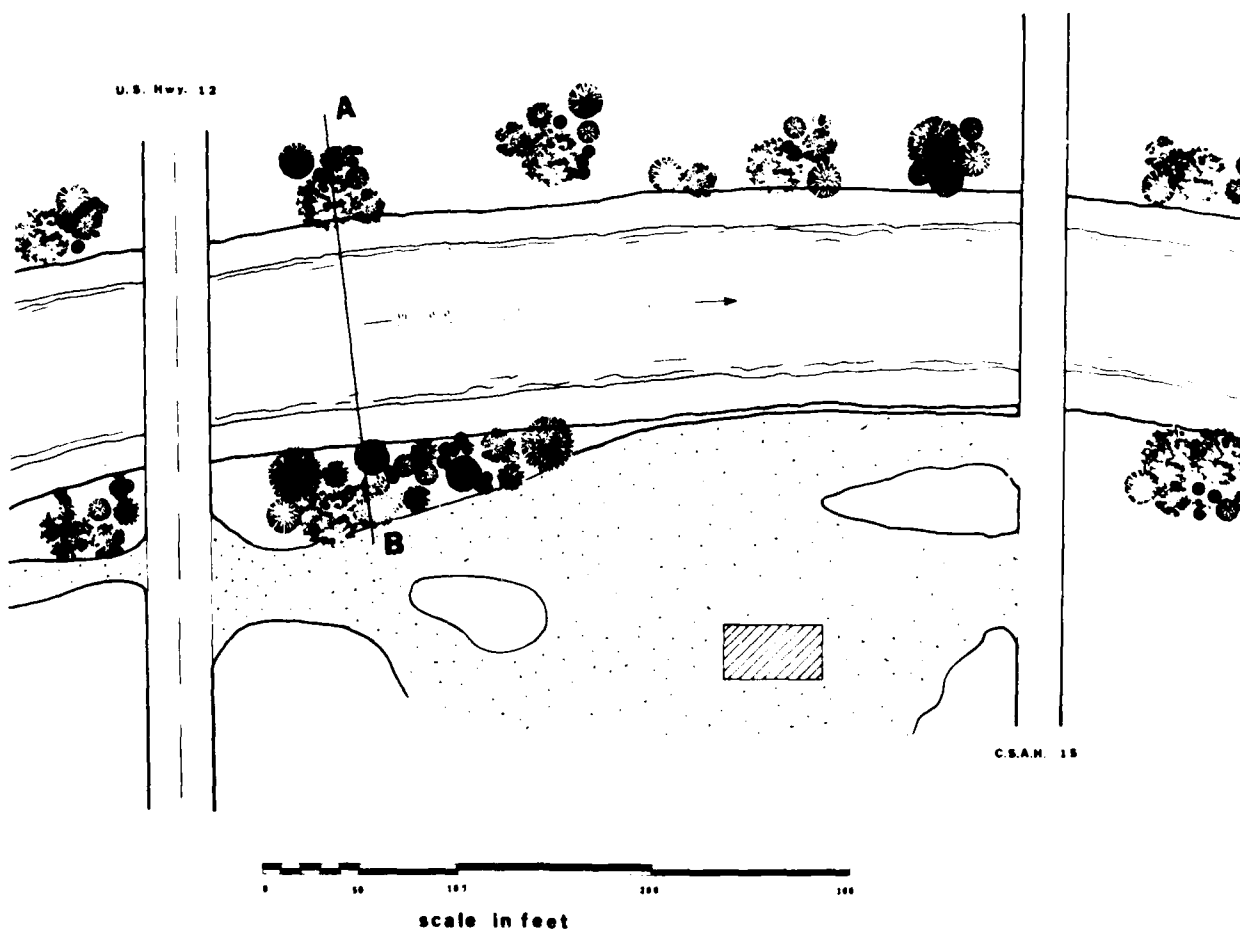


EXHIBIT 1 - SEDIMENT ANALYSIS

PARAMETER	SITE						
	1	2	3	4	5	6	7
Arsenic	2	2	3	4	1	3	3
Barium	700	600	500	500	200	200	700
Cadmium	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chromium (Tot)	10	10	10	< 10	< 10	10	< 10
COD (mg/kg)	35000	54000	98000	37000	14000	21000	58000
Copper	20	20	20	10	< 10	< 10	20
Cyanide	1	0	0	0	0	1	1
Iron	10000	9000	8200	9200	4100	5300	10000
Lead	40	40	20	20	20	20	30
Manganese	1400	1500	600	130	390	470	1400
Mercury	0.00	0.00	0.00	0.00	0.00	0.00	0.01
N KJD (mg/kg)	4800	6200	7200	4200	460	2400	5100
N, NH ₄ as N (mg/kg)	38	6.1	48	7.3	5.2	4.4	3.5
Nickel	40	40	20	20	20	20	30
Oil and grease (mg/kg)	0	0	0	0	0	0	0
Phos. (Tot.) (mg/kg)	700	640	700	780	200	530	670
Res. LOI (mg/kg)	40300	41500	50500	35600	14400	12600	43000
Zinc	40	40	40	50	20	20	40
Pesticides							
Aldrin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlordane	0	0	0	0	0	0	0
DDD	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DDE	0.0	0.0	0.0	0.0	0.0	0.0	1.7
DDT	0.0	0.0	0.0	0.7	0.0	0.0	2.8
Dieldrin	0.0	0.0	0.0	0.7	0.0	0.0	0.0
Endosulfin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Endrin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hept. Epox.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heptachlor	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lindane	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mirex	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PCB	0	0	0	0	0	0	0
PCN	0	0	0	0	0	0	0
Perthane	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Toxaphene	0	0	0	0	0	0	0

* Note: Unless otherwise stated, values are in ug/kg.

APPENDIX 1:
LETTERS OF COMMENT
AND ST. PAUL DISTRICT RESPONSES



UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

REGION V
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF

1 A

Colonel William W. Badger
District Engineer
U.S. Army Engineer District, St. Paul
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

RE: DS-80-024-194

We have reviewed the Draft Supplement Environmental Impact Statement (EIS) on the Big Stone Lake - Whetstone River Modification Project in Minnesota and South Dakota.

As part of our evaluation of the proposed action we have reviewed, in conjunction with the Draft Supplement, the 1971 Final EIS and Design Memorandum No. 3, Appendix E - Environmental Analysis. With these documents we have been able to trace the sequence of events leading to the action being proposed in the Draft Supplement. It is our understanding that the Big Stone Lake - Whetstone River project was authorized by the Flood Control Act of 1965 and the Final EIS for the project was filed with the Council on Environmental Quality (CEQ) on December 18, 1971. Since that time, construction has been completed on all project features except for the upstream works on the Minnesota River and the areas of rechannelization and bank stabilization on the lower 4 miles of the Whetstone River. The supplement has been prepared to address a significant alignment change for the proposed diversion channel to the U.S. Highway 75 Reservoir in the Big Stone National Wildlife Refuge.

During our review it became apparent that there has been insufficient consideration of alternatives to that portion of the project covered by the current EIS. For example, the Draft Supplement states that the no-action alternative was considered but its environmental consequences are not discussed. Design Memorandum No. 3 and the 1971 Final EIS list three alternatives, but they are described in terms of their cost/benefit analyses and not their environmental effects. The National Environmental Policy Act (NEPA) and CEQ's implementing regulations (40 CFR pts 1500 - 1508) require Federal agencies to, "...make the NEPA process more useful to decision makers and the public...and to emphasize real environmental issues and alternatives." Additionally, the regulations require the NEPA process to, "...identify and assess the reasonable alternatives to proposed actions that will avoid or minimize the adverse effects of these actions upon the quality of the human environment." In other words, the Draft Supplement should be an environmental document used by decision makers to make a reasoned choice among alternatives, not should not be a document justifying a decision that has already been made.

Although the project features being considered in the Draft Supplement were originally discussed in the 1971 Final EIS, we feel that since that time there has been opportunity for change in circumstances and information relevant to the environmental concerns bearing on the impact of the proposed action. Since 1971, flood control projects have been studied and analyzed and our understanding of the environmental effects of such projects has increased significantly. Also, the inclusion of an analysis of alternatives is appropriate in the Draft Supplement due to the length of time between the original analysis and the present, and because the public and decision makers should be able to review all of the pertinent information in one document. The lack of an assessment of alternatives makes it difficult to imagine how decisions based on the Draft Supplement will achieve the mandates of sections 101 and 102(1) of NEPA and other environmental laws and policies.

In order to present the supplemental information in the form of a decision-making document, we recommend the following information be included in the Final Supplement EIS.

1. | 1. A description of all project actions yet to be completed.
2. | 2. A description of alternatives that are being considered for the remaining actions.
3. | 3. A discussion of the environmental impacts of each alternative.

Because an analysis of alternatives is incomplete for this project, we are classifying our comments as Category 10-2. Specifically, we believe the alignment change described in the EIS should not result in significant environmental impact; however, because of an insufficient alternative analysis, it is not possible to identify an environmentally preferable alternative. In accordance with U.S. Environmental Protection Agency procedures, the classification of our comments will be published in the Federal Register.

We appreciate the opportunity to review and comment on the Draft Supplement EIS on the proposed Big Stone Lake - Whetstone River Modification Project. Upon completion of the Final Supplement EIS, please forward 3 copies for our review. Please contact Jim Hooper of my staff at 312/886-6694 if you have any questions concerning our comments.

Sincerely yours,

Barbara J. Taylor
Barbara J. Taylor, Chief
Environmental Impact Review Staff
Office of Environmental Review

1. Project actions yet to be completed are described in the Draft Supplement.

2. Alternatives considered for the diversion channel are described in section 1.00 of this supplement.

3. Environmental impacts of each alternative described in section 1.00 are discussed in section 2.00 of this supplement.

Advisory Council On Historic Preservation

1522 K Street NW
Washington, DC 20005

Reply to

Lake Plaza South, Suite 616
44 Union Boulevard
Lakewood, CO 80228

May 23, 1980

Colonel William W. Badger
District Engineer
Corps of Engineers, St. Paul District
Department of the Army
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

Thank you for your request of May 1, 1980, for comments on the draft supplement to the final environmental statement for the Modification Project Big Stone-Lake-Wheatstone River, Minnesota and South Dakota. Pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 and the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800), we have determined that your draft supplement does not contain sufficient information concerning historic and cultural resources for review purposes. Please furnish the following data indicating:

Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320).

The final supplemental must demonstrate that either of the following conditions exists:

1. No properties that may be eligible for inclusion in the National Register of Historic Places are located within the area of environmental impact, and the undertaking will not affect any such property. In making this determination, the Council requires evidence of an effort to ensure the identification of properties eligible for inclusion in the National Register, including evidence of contact with the State Historic Preservation Officer, whose comments should be included in the final environmental statement. The SHPO for South Dakota is Mr. John J. Little.
2. Properties that may be eligible for inclusion in the National Register

St. Paul District Responses to the Advisory Council on Historic Preservation

1. Cultural resources surveys conducted in 1974, 1975, and 1980 found no significant sites in the project area. See paragraph 5.23 of this supplement. Coordination letters from the Minnesota State Historic Preservation Officer and the Heritage Conservation and Recreation Service are included in Appendix 5. Coordination has also been initiated with the Minnesota State Archaeologist, but no letter of response has been received. Also, see paragraph 5.24. No action covered by this supplement that might endanger cultural resources has been proposed for South Dakota. The only action that would be taken in that State would be riprap placement, which was covered in the 1980 survey.

Page 2
Colonel William W. Badger
Modification Project
May 23, 1980

are located within the area of environmental impact, and the undertaking will or will not affect any such property. In cases where there will be an effect, the final environmental impact statement should contain evidence of compliance with Section 106 of the National Historic Preservation Act through the Council's regulations.

Should you have any questions, please call Betty J. LeFree at (303) 234-4946, an FTS number.

Sincerely,

B. H. Stacey

Acting
Louis S. Wall
Chief, Western Division of
Project Review

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN AREA STATE AND PRIVATE FORESTRY
370 REED ROAD - BROOMALL, PA 19008
Telephone: (215) 461-3170

1950
June 25, 1980



William W. Badger, Colonel
Corps of Engineers, District Engineer
Department of the Army
St. Paul District Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Refer to: NCSED-ER
Draft Supplement to the Final Environmental
Statement, Big Stone Lake - Whetstone River,
MN & SD

Dear Colonel Badger:

Measures proposed for mitigation of adverse impact and replacement of
woodland where practical, appear to be adequately considered in this
supplement. We appreciate the opportunity to comment.

Sincerely,

John F. Chaisler
John F. CHAISLER
Assistant Area Director
Resource Protection

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Policy

July 2, 1980

Mr. Robbin Blackman
Environmental Resources Branch
St. Paul District, Corps of Engineers
1135 U. S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Mr. Blackman:

This is in reference to your draft environmental impact statement entitled, "Big Stone Lake-Whetstone River, Minnesota and South Dakota." The enclosed comment from the National Oceanic and Atmospheric Administration is forwarded for your consideration.

Thank you for giving us an opportunity to provide this comment, which we hope will be of assistance to you. We would appreciate receiving eight (8) copies of the final environmental impact statement.

Sincerely,

Bruce R. Barrett
for
Bruce R. Barrett
Acting Director
Office of Environmental Affairs

Enclosure Memo from: Robert B. Rollins
National Ocean Survey - NOAA



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

JUN 17 1980

0A/C52x6:JLR

*Rec'd
6/17/80
PP/EC*

TO: PP/EC - Joyce M. Wood
FROM: OA/C5 - Robert B. Rollins
SUBJECT: DEIS #8005.13 - Big Stone Lake - Whetstone River, Minnesota
and South Dakota Modification Project (Supplement)

The subject statement has been reviewed within the areas of the National Ocean Survey's (NOS) responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

Geodetic control survey monuments may be located in the proposed project area. If there is any planned activity which will disturb or destroy these monuments, NOS requires not less than 90 days' notification in advance of such activity in order to plan for their relocation. NOS recommends that funding for this project includes the cost of any relocation required for NOS monuments.

1.

St. Paul District Responses to the U.S. Department of Commerce

1. The Corps of Engineers will provide the National Ocean Survey with 90 days notification and will allocate funds for any project activities which may disturb or destroy any NOS geodetic control survey monuments.

In Reply, Refer to:
Office File #

May 24, 1980

COL William Badger
District Engineer
St. Paul District, Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

This is in response to your May 1, 1980 letter inviting our review and comments on the Draft Supplement to the Final Environmental Impact Statement on the Modification Project, Big Stone Lake - Wnetstone River, Minnesota and South Dakota.

Comments of this office are made in accordance with the National Environmental Policy Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. We reviewed the Draft Supplement to determine the effect on matters concerning the Federal Energy Regulatory Commission's responsibilities. Such responsibilities stem from the Federal Power Act and the Natural Gas Act and relate to the licensing of non-federal hydroelectric projects and associated transmission lines; participation in planning and development of federal hydroelectric projects; certification for construction and operation of natural gas pipeline facilities, defined to include both interstate pipeline and terminal facilities; and the permit-sion and approval required for the abandonment of natural gas pipeline facilities.

Because the above-noted proposed development would not pose a major obstacle to the construction or operation of such facilities and because the Draft does not indicate that existing natural gas or hydroelectric developments would be adversely affected, we have no specific comments.

These comments are of this office and therefore do not necessarily represent the views of the Federal Energy Regulatory Commission.

Thank you for the opportunity to comment.

Sincerely,

Lawrence F. Coffill

Lawrence F. Coffill
Regional Engineer



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL/AREA OFFICE
EXECUTIVE TOWER 1405 CURTIS STREET
DENVER, COLORADO 80202

June 4, 1980

REGION VIII

IN REPLY REFER TO

850Q

Mr. Robbin Blackman
Environmental Resources Branch
Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Mr. Blackman:

Thank you for the opportunity to review and comment on the Draft Supplement to the Final Environmental Impact Statement (EIS) on the Modification Project, Big Stone Lake-Whetstone River, Minnesota and South Dakota.

Your Draft Supplement has been reviewed by both Regional Offices in Denver and Chicago. Specific consideration was given for the areas of responsibility assigned the Department of Housing and Urban Development. The review considered the proposal's compatibility with local and regional comprehensive planning and impacts on urbanized areas. Within these areas, the document is adequate.

If you have any questions regarding these comments, please contact Mr. Carroll P. Goodwin, Area Environmental Clearance Officer at (303) 837-3102.

Sincerely,

Raymond D. McKinney
Raymond D. McKinney

Director
Program Planning and Evaluation

AREA OFFICE
Denver, Colorado

United States Department of the Interior

Bureau of Reclamation

Washington, D.C.

June 6, 1989

JUN 6 1989

Department of the Army
Attention: HCSD-ER
St. Paul District Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Sir:

The proposed project as described in the "Draft Supplement
Environmental Impact Statement - Big Stone Lake - Whetstone
River Minnesota and South Dakota", does not involve any
trust lands. We do not have any objections to the impact on
the environment, as outlined in the statement.

Sincerely,

Elmer G. Nielson
Acting Assistant Area Director
Natural Resources



Save Energy and You Save America!



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Federal Building East Building
Twin Cities, Minnesota 55411

RA

JUL 10 1986

Colonel William W. Badger
District Engineer
U.S. Army Engineer District
St. Paul
1135 U.S. Post Office & Customs House
St. Paul, Minnesota 55101

Dear Colonel Badger:

This letter refers to the Draft Supplement to the Final Environmental Impact Statement (EIS) on the Modification Project, Big Stone Lake-Whestone River, Grant County, South Dakota, and Big Stone and Lac Qui Parle Counties, Minnesota.

Our St. Paul Field Office and your staff coordinated productively in the development of this project and the Draft Supplement EIS on the Modification Project reflects this coordination. Accordingly, and in response to inquiry from your staff, we wish to advise that for this Modification Project, the Draft Supplement EIS and Mr. John E. Ryttersky, Department of the Interior letter of June 24, 1985, reflect and satisfy the Fish and Wildlife Service transfer to the Fish and Wildlife Coordination Act is concerned.

I appreciate the excellent cooperation in this project. Please feel free to contact me if you have further questions.

Sincerely yours,

Henry K. Olsen
Henry K. Olsen
District Engineer



United States Department of the Interior

OFFICE OF THE DISTRICT ENGINEER
ROOM 400, FEDERAL BUILDING
DENVER, COLORADO 80202

June 24, 1980

Colonel William M. Badger
District Engineer
U.S. Army Engineer District
St. Paul
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

This provides Department of the Interior comment on the Draft Supplement to the Final Environmental Impact Statement (EIS) on the Modification Project, Big Stone Lake-Whetstone River, Minnesota and South Dakota.

The EIS adequately describes existing fish and wildlife resources and evaluates general project construction impacts. However, no mention is made in the statement about the need to obtain right-of-way from the Fish and Wildlife Service to construct and maintain that portion of the proposed high flow channel which would pass through Big Stone National Wildlife Refuge. Accordingly, the comments on this statement do not in any way preclude additional and separate evaluation by the Fish and Wildlife Service at the time application is made for a right-of-way permit.

By correcting the relatively minor inaccuracies and inconsistencies pointed out in our Specific Comments, we believe the document will comply with NEPA requirements.

SPECIFIC COMMENTS

Part 1: Draft Supplement:

Paragraph 2.02, Third Sentence:

We believe "normal flow" should be explicitly defined as all flows up to 200 cubic feet per second (cfs). The provision for 200 cfs flows on the Minnesota River downstream of its intersection with the high flow channel is implied many times in the document, but is never stated.

For information, the comments to the Draft Supplement are being referred to the District Engineer.

1. A discussion of the requirement to obtain right-of-way from the Fish and Wildlife Service has been included in section 1.04.

2. The weir referred to in the third sentence is the upstream weir in the diversion channel as shown on Plate 1. The weir is designed to control flows up to elevation 927 feet (2.5 feet above the channel bottom). The plan also includes an additional weir downstream of the existing river channel to divert flows up to 200 cfs into the existing river channel.



Paragraph 2.03, Last Sentence:

Big Stone National Wildlife Refuge is used for many forms of public recreation in addition to hunting. Consequently, "public hunting" should be changed to "public access".

Paragraph 2.03, Fifth Sentence:

Maintenance of the 200 foot channel width from the intersection with the Minnesota River all the way to the drainage ditch is inconsistent with information presented the Fish and Wildlife Service during previous interagency meetings. In those earlier discussions, the full width channel was proposed to be terminated 1,000 feet or more from the drainage ditch. Because the change would directly affect operation of Big Stone National Wildlife Refuge, the rationale for that change should be provided.

Paragraph 2.03, Last Sentence:

As written, this sentence is confusing. For clarification, we suggest the following change: "from about 100 (without the weir) to 200 cubic feet per second".

Paragraph 4.07, Last Sentence:

While frequent flooding and livestock grazing have indeed diminished the wildlife value of the privately owned floodplain woodland, it continues to provide good furbearer denning habitat, nesting habitat for cavity nesting bird species, and a travel lane for numerous species of mammals and birds.

Paragraph 4.08, Second Sentence:

The Minnesota River channel seldom becomes totally dry. Rather, during late summer of most years the river becomes a series of disconnected pools with flow, if any, being subsurface. We do agree that construction during such a period would produce localized adverse impacts to benthic organisms.

Paragraph 4.12:

Please define the term "low flow" as used in this paragraph. It appears to be used in two different contexts within the same discussion.

1. The paragraph has been changed to clarify the intent of the study.

2. The paragraph has been changed to clarify the intent of the study. The paragraph has been changed to clarify the intent of the study. The paragraph has been changed to clarify the intent of the study.

3. The paragraph has been changed to clarify the intent of the study.

4. The paragraph has been changed to clarify the intent of the study.

5. The paragraph has been changed to clarify the intent of the study.

6. The paragraph has been changed to clarify the intent of the study.

Part 11: Section 104(b) Evaluation:

Page 7, Section 1.a.(3):

9. Please identify what is meant by "Realignment of one mile of the Minnesota River". Is this meant to describe construction of the high flow channels?

Page 9, Section 2.a.(6):

10. The change in operating plan coupled with modifications to the silt barrier and outlet structure will increase, not reduce, sediment load carried by the Minnesota River. Much of that additional sediment will be deposited in the Highway 75 Reservoir.

Page 9, Section 2.a.(10):

11. Most native prairie grasses are found highly palatable by domestic livestock. Seeding the berms and disposal banks of the off-refuge segment of the high flow channel without also fencing those areas to exclude livestock would likely lead to severe erosion problems associated with livestock use. Please explain your fencing plans for the above channel segment.

Page 13, Section 6.c.(5):

12. This section is inconsistent with paragraph 4.06 of the Draft Supplement which identifies adverse impacts to 5 acres of wetland habitat. We would presume a palustrine emergent wetland dominated by sedge (Classification of Wetland and Deepwater Habitats of the United States) performs a significant water quality maintenance function.

Page 14, Section 6.d.(8):

13. We would consider the filling of 5 acres of palustrine emergent wetland to be a significant wetland effect.

Sincerely yours,

John E. O'Rourke

Part 12: Section 104(b) Evaluation:

10. Section 12 of the Supplement to the Draft Supplement identifies adverse impacts to 5 acres of wetland habitat. We would presume a palustrine emergent wetland dominated by sedge (Classification of Wetland and Deepwater Habitats of the United States) performs a significant water quality maintenance function.

11. Section 12 of the Supplement to the Draft Supplement identifies adverse impacts to 5 acres of wetland habitat. We would presume a palustrine emergent wetland dominated by sedge (Classification of Wetland and Deepwater Habitats of the United States) performs a significant water quality maintenance function.

12. This section has been rewritten to reflect the water quality maintenance function of palustrine emergent wetlands.

13. This section has been rewritten to reflect this impact.

DEPARTMENT OF TRANSPORTATION
FEDERAL AID TO NAVIGATION

ROCKY MOUNTAIN REGION
DENVER, COLORADO

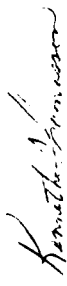
May 28, 1970

Colonel William M. Badger, District Engineer
Department of the Army
Corps of Engineers
1135 U. S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

We have reviewed your draft Supplement to the Final Environmental Impact Statement on the Modification Project, Big Stone Lake-Mhetstone River, Minnesota and South Dakota and do not foresee any impact on aviation or its activities.

Sincerely,



EDWARD G. TATAM
Chief, Planning and Appraisal Staff

fw

Minnesota Pollution Control Agency

May 12, 1980

Mr. Robbin Blackman
Environmental Resources Branch
St. Paul District Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

SUBJECT: Big Stone-Whetstone River Draft Supplement to the FEIS

Dear Sir/Hadam:

The purpose of this letter is to acknowledge receipt of the above-referenced document. The staff is currently reviewing this document and will transmit any significant comments in an additional letter.

We appreciate receiving this document. Please contact me concerning any questions regarding our review.

Sincerely,

Janet M. Cain

Janet M. Cain
Acting Chief
Environmental Planning & Review Unit



STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES
CENTENNIAL OFFICE BUILDING - ST. PAUL, MINNESOTA - 55155

August 5, 1980

Colonel William W. Badger
District Engineer
St. Paul District
Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

RE: NCSED-ER, Draft Supplement EIS for Big Stone Lake
Whetstone River Modification Project

Dear Colonel Badger:

We apologize for the tardiness of our comments but trust they will still be of use to your agency in the continuing development of this project.

The Department of Natural Resources (DNR) in a recent letter from Commissioner Alexander suggested changing the alignment of the proposed Minnesota River Crossing, to prevent destroying the existing meander loop. In a letter from you, the Corps explained that there was no economically or technically feasible alternative to that proposed by the Corps. The Final EIS supplement should include a discussion of the reasons why the meander loops for that part of the river would have to be eliminated, e.g. the rock bluff problems. There is need for substantial documentation.

The DNR has understood that one of the purposes of this project was to prevent sedimentation in Big Stone Lake. Sediment was to be transported to another area and in this case, part of the newly designated wildlife refuge could serve as a collective basin for the sediment. We recognize the trade-offs involved here. However, every effort should be made to mitigate any negative impacts of this project, as we suggested earlier in various letters and meetings.

Other specific comments are as follows:

Page 2, item 2.03 - The 200' wide channel was, we understood, to have terminated before it reached the ditch so that the flow would spread overland and allow the silt to start settling out in this upper flood pool area. A small low flow channel could be maintained to the ditch.

If the total width above the intersection will average 400 feet, this would eliminate a significant portion of the mature trees. The width should be reduced if at all possible.

AN EQUAL OPPORTUNITY EMPLOYER

St. Paul District Responses to the Minnesota Department of Natural Resources

1. Your suggestion to move the East 2 alternative new channel alignment westerly to allow the Minnesota River to cross the new channel on its present alignment instead of at our proposed upstream cutoff channel has been evaluated. This alignment would preclude the elimination of an existing meander loop of the Minnesota River. Our studies indicate that by shifting the new channel alignment westerly as suggested, a relatively small possibility exists that excavation of the channel could require removal of solid rock. To excavate and place riprap along the existing channel would require cutting and filling to provide an appropriate section and alignment. In addition, the existing channel would angle across the new flood bypass channel and require 43 feet or more riprap protection and more dewatering during construction than our proposed plan. However, the primary reason for maintaining the proposed alignment is that scouring of the outer bank at the upstream end of the meander could occur and ultimately modify or eliminate the channel meander that we would be trying to preserve.
2. Mitigation, enhancement measures, and reduction of negative impacts are being incorporated into the project to the extent possible. It should be noted that recent studies (see Appendix 3) indicate that less sediment will be carried by the Minnesota River with the project than without.
3. Excavation at full width to the existing drainage ditch is considered necessary to assure the project design capacity of 2750 cubic feet per second.

Colonel William M. Badger
August 4, 1980
Page Two

The weir downstream of the intersection should be designed to take 200 cfs downstream before it overflows into the Big Stone National Wildlife Refuge.

Page 4, item 4.07 - As noted above, if a 400' wide swath is cut through the woodland the impacts will be significant to some wildlife species. The loss of this habitat should be offset by revegetation and protection of the spoil banks in the woodland and old field areas by fencing. This would also help prevent erosion of the floodway which would be likely with heavy grazing. Perhaps a lease could be arranged to allow grazing for a couple weeks in midsummer.

Page 4, item 4.08 - The river in the project area does not normally become dry. It usually maintains a low flow or becomes pooled over summer thereby generally maintaining aquatic and benthic resources.

Page 7, item 1.a.(3) - It is not clear where the figure indicating the realignment of one mile of the Minnesota River comes from. If this refers to the floodway, it would seem to be longer than one mile.

Page 9, item 6 - The text indicates that the sediment load would be reduced in the downstream area. However, it would appear that it would have to increase if 90' of the water from the Whetstone River is diverted directly into the Minnesota River (page 10, item d-2).

Page 13, item (5) - There is at least one small wetland in the Big Stone National Wildlife Refuge that could be affected by the dredge spoil. This basin should not be encroached upon.

If you have any comments regarding these comments, please feel free to give us a call.

Sincerely,

Thomas W. Badger

Thomas W. Badger
Environmental Review Coordinator

TWB:KW:mp

cc: Earl Huber
Ron Harnack
Maynard Nelson

4. The weir will be designed to take up to 200 cfs downstream in the Minnesota River channel before it overflows into the diversion channel.
5. Channel banks and levees will be planted as noted in paragraph 2.10. If possible, fencing and levee arrangements will be incorporated in that plan.
6. The subject paragraph has been revised to reflect the moist and intermediate habitat of the Minnesota River channel during the late summer of most years.
7. This section has been clarified.
8. Detailed sediment analysis shows that less sediment (14.9 acre-feet per year under the proposed conditions as opposed to 17.8 acre-feet under existing conditions) will be carried by the Minnesota River below Big Stone Lake. See Appendix 3, Flood Control, Big Stone Lake-Whetstone River, Minnesota and South Dakota, DM No. 1, General Supplement No. 2.
9. This section has been rewritten to indicate adverse impacts on some wetlands; however, the wetland referred to in this comment would not be encroached upon by disposal operations.



Upper Minnesota Valley
Regional Development Commission

323 WEST SCHLIEMAN AVENUE
APPLETON, MINNESOTA 56208
(612) 269-1981 & 1982

August 19, 1980

Robbin Blackman
Environmental Resources Branch
St. Paul District Corps of Engineers
1135 U. S. Post Office & Custom House
St. Paul, Mn 55101

RE: (MSECD-ER) Draft Supplement to the Final Environmental
Impact Statement on the Modification Project, Big Stone
Lake-Metastone River. (80-0-38-4)

Dear Mr. Blackman:

As the area's agency designated to perform the clearinghouse
function under the provisions of the Office of Management and Budget
Circular A-95 and the Minnesota Regional Development Act of 1969, the
Upper Minnesota Valley Regional Development Commission has reviewed
the above referenced draft.

In accordance with the Commission's A-95 review procedures the
following were notified of the proposal and requested to comment:

Upper Mn Valley RDC Board of Directors:

Thomas Johnson John Thompson
Ron Stone Johnny Larson
Larry Seiden LuVerne Grinager

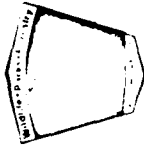
It is a pleasure to inform you that at its meeting on August 18, 1980,
the Commission's Board of Directors found the draft consistent with its
goals and objectives and planning process. The Board approves the Draft
Supplement to the Final Environmental Impact Statement.

If you have any questions regarding the above comments, please
contact me at your convenience. Thank you for your cooperation.

Sincerely,

(Signature)

Otto Schmitt
Executive Director



**South Dakota
Department of
Wildlife, Parks and Forestry**

Office of The Secretary

June 4, 1980

Colonel William W. Badger
District Engineer
St. Paul District Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Badger:

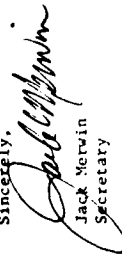
The South Dakota Department of Game, Fish and Parks has reviewed the Draft Supplement to the Final Environmental Impact Statement on the Modification Project, Big Stone Lake-Whestone River, Minnesota and South Dakota, and our comments are as follows.

This Department has been involved in this project for a great number of years. As a result of our participation a number of project modifications have been sought and attained. This Department has neglected to become involved in that portion of the project which has effects and impacts exclusively to the state of Minnesota, and has confined itself to the upstream works with direct impacts to South Dakota and the boundary water (Big Stone Lake).

Since our concerns have been resolved, and since we feel the upstream works will achieve a significant reduction of the silt load entering Big Stone Lake with indirect positive benefits, we endorse the project and encourage the construction to proceed as swiftly as possible.

Thank you for the opportunity to comment.

Sincerely,


Jack Merwin
Secretary

JM/JCK/jaj

cc: Connie Tweidt, State Planning Bureau

Department of Wildlife, Parks and Forestry • Sigurd Anderson Building • Pierre, South Dakota 57501 • (605) 773-3381

 **Department of
Water & Natural Resources**
Joe Foss Building
Pierre, South Dakota 57501

June 11, 1980

Mr. William W. Badger, Colonel
Corps of Engineers
District Engineer
1135 U. S. Post Office & Custom House
St. Paul, MN 55101

Dear Colonel Badger:

The Department of Water and Natural Resources foresees no problems with the proposed diversion channel into the project U. S. Highway 75 Reservoir in the Big Stone National Wildlife Refugees discussed in the "Draft Supplement Environmental Impact Statement Modification Project Big Stone Lake - Whetstone River, Minnesota and South Dakota". Any specific problems were discussed at a meeting initiated to discuss 208 Water Quality Management Planning for Big Stone Lake and Lake Hendricks on April 22, 1980, in Ortonville, Minnesota.

Thank you for the opportunity to comment.

Sincerely,


Vonni C. Kalliemyn, Office Administrator
Office of Water Policy
(605) 773-4214

VCK:nn

cc: Connie Tweidt, South Dakota State Planning Bureau

Equal Opportunity Employer

APPENDIX 2:
RECIPIENTS OF THE
DRAFT SUPPLEMENT

APPENDIX 2:
RECIPIENTS OF THE
BIG STONE LAKE-METSTONE RIVER
DRAFT SUPPLEMENT EIS

United States Senators

Hon. George McGovern - South Dakota
Hon. Larry Pressler - South Dakota
Hon. Rudy Boschwitz - Minnesota
Hon. David Durenberger - Minnesota

United States House of Representatives

Hon. Thomas A. Daschle - South Dakota
Hon. Richard Nolan - Minnesota
Hon. Arlan Stangeland - Minnesota

Honorable William J. Janklow, Governor of South Dakota

Honorable Albert H. Quie, Governor of Minnesota

U.S. Department of the Interior

Assistant Secretary for Program Policy, Washington, D.C.
U.S. Fish and Wildlife Service, Regional Office, Chicago, Illinois
U.S. Fish and Wildlife Service, Regional Office, Denver, Colorado
U.S. Fish and Wildlife Service, St. Paul, Minnesota
U.S. Fish and Wildlife Service, Pierre, South Dakota
Office of Archeology and Historic Preservation, Washington, D.C.
Heritage Conservation and Recreation Service, Ann Arbor, Michigan
Heritage Conservation and Recreation Service, Denver, Colorado
Interagency Archeological Services, Denver, Colorado
Bureau of Indian Affairs, Minneapolis, Minnesota
Bureau of Indian Affairs, Aberdeen, South Dakota
U.S. Geological Survey, Reston, Virginia
U.S. Geological Survey, Denver, Colorado
National Park Service, Denver, Colorado
Bureau of Land Management, Alexandria, Virginia

U.S. Department of Transportation

Federal Highway Administration, Homewood, Illinois
Federal Highway Administration, Denver, Colorado
Second Coast Guard District, St. Louis, Missouri
Ninth Coast Guard District, Cleveland, Ohio
Marine Safety Office, St. Paul, Minnesota
Federal Aviation Administration, Aurora, Colorado

Advisory Council on Historic Preservation, Washington, D.C.

Department of Energy

Division of NEPA Affairs, Washington, D.C.
Federal Energy Regulatory Commission, Chicago, Illinois
Federal Energy Regulatory Commission, Washington, D.C.

Upper Mississippi River Basin Commission, Minneapolis, Minnesota

International Joint Commission, Washington, D.C.

U.S. Environmental Protection Agency

Office of Federal Activities, Washington, D.C.
Region V, Chicago, Illinois
Region VIII, Denver, Colorado

U.S. Department of Agriculture

Forest Service, Region 9, Milwaukee, Wisconsin
Forest Service, Rocky Mountain Region, Lakewood, Colorado
Forest Service, Broomall, Pennsylvania
Soil Conservation Service, Minnesota State Conservationist
Soil Conservation Service, South Dakota State Conservationist
Soil Conservation Service, River Basin Planning Board, Washington, D.C.

U.S. Department of Commerce

Deputy Assistant Secretary for Environmental Affairs, Washington, D.C.
Economic Development Representative, Duluth, Minnesota
NOAA - National Marine Fisheries Service, Seattle, Washington
NOAA - National Marine Fisheries Service, Gloucester, Massachusetts
Federal Maritime Commission, Washington, D.C.
Maritime Administration, Cleveland, Ohio

U.S. Department of Health and Welfare

Deputy Assistant Secretary for Environmental Affairs, Washington, D.C.
Region V, Chicago, Illinois
Region VIII, Denver, Colorado

U.S. Department of Housing and Urban Development

Region V, Chicago, Illinois
Region VIII, Denver, Colorado

Minnesota State Agencies

Department of Agriculture
Department of Economic Development
Energy Agency
Environmental Quality Board
State Historical Society
State Historic Preservation Officer
State Archeologist
Pollution Control Agency
State Planning Agency
Department of Natural Resources
Department of Health
Department of Transportation
Water Resources Board
Office of Economic Opportunity
State Senate
State House of Representatives
Minnesota-Wisconsin Boundary Commission

South Dakota State Agencies

Department of Game, Fish, and Parks
Department of Natural Resources
State Historic Preservation Officer
State Archeologist
Office of Cultural Affairs
State Planning Agency
Committee on Water Pollution
Archeological Commission

Regional, County, Local Agencies - Minnesota

Upper Minnesota Valley Regional Development Commission
Lac qui Parle-Yellow River Watershed District
Upper Minnesota River Watershed District
Lac qui Parle County Soil and Water Conservation District (SWCD)
Swift County SWCD
Stevens County SWCD
Traverse County SWCD
Big Stone County SWCD
Big Stone County Commissioners
Stevens County Commissioners
Traverse County Commissioners
Lac qui Parle County Commissioners
Swift County Commissioners
Big Stone County Zoning Office
Stevens County Zoning Office
Lac qui Parle County Zoning Office
Swift County Zoning Office
City of Odessa, Minnesota
City of Ortonville, Minnesota
Traverse County Zoning Office

Regional, County, Local Agencies - South Dakota

First Planning and Development District
Fourth Planning and Development District
East Dakota Conservancy Subdistrict
Grant County Commissioners
Roberts County Commissioners
Grant County Zoning Office
Roberts County Zoning Office
Big Stone City, South Dakota

Libraries - Minnesota

Benson Public Library
Environmental Conservation Library, Minneapolis
Hill Reference Library, St. Paul
Madison Carnegie Public Library
Metropolitan Council Library, St. Paul
Minneapolis Public Library
Minnesota Legislative Library, St. Paul
Morris Public Library
Ortonville Public Library
St. Paul Public Library
University of Minnesota, Minneapolis
University of Minnesota, Morris
University of Minnesota, St. Paul

Libraries - South Dakota

Carnegie Library, Pierre
Grant County Public Library
Sisseton Library
South Dakota State University Library
University of South Dakota

Newspapers and Wire Services

Associated Press
Big Stone County Independent
Grant County Review
Lac qui Parle County Western Guard
Montevideo American News
Roberts County Courier
Stevens County Tribune
Traverse County Gazette
United Press International
Waterways Journal

Interest Groups and Other Organizations

Dakota Environmental Council
Defenders of Wildlife, Great Lakes Region
Ducks Unlimited
Environmental Defense Fund, Inc.
Friends of the Earth, Minnesota Branch
Izaak Walton League of America
Midwestern Gas Transmission
Minnesota Conservation Federation
Minnesota Environmental Control Citizens Association
Minnesota League of Women Voters
Minnesota Public Interest Research Group
National Audubon Society, North Midwest Region
National Safe Boating Association
National Wildlife Federation
National Wildlife Federation, North Central Region
Sierra Club, Dacotah Chapter
Sierra Club, North Star Chapter
South Dakota Association of Conservation Districts
South Dakota Water Developers Association
South Dakota Wildlife Federation
The Wildlife Society, South Dakota Chapter

Individuals

Robert V. Bartlett
Dennis Dragt
H. Paul Friesema
D.J. McQueen
Robert R. Pfluger
R.D. Schreiner

APPENDIX 3:
FLOOD CONTROL, BIG STONE
LAKE-WHETSTONE RIVER, MINNESOTA
AND SOUTH DAKOTA, DESIGN
MEMORANDUM NO. 1, GENERAL,
SUPPLEMENT NO. 2

APPENDIX 3:
FLOOD CONTROL, BIG STONE LAKE-WHETSTONE RIVER,
MINNESOTA AND SOUTH DAKOTA, DESIGN MEMORANDUM
NO. 1, GENERAL, SUPPLEMENT NO. 2

1. This supplement to the subject memorandum is furnished in accordance with Memo for Record NCSED-D, 6 September 1973, regarding sedimentation problems in the Bigstone Lake - Whetstone River vicinity.

2. During August 1973, a field investigation and office meeting were held concerning proposed modifications to features of the Bigstone - Whetstone Project. Personnel in attendance included representatives from OCE, NCD and the St. Paul District. One item discussed concerned modification of the Bigstone Lake silt barrier and outlet control structure and its effect on sediment deposition in the Lake and the Highway 75 reservoir. Results of a previous study indicated that large quantities of sediment from the Whetstone River were being diverted into Bigstone Lake as a result of the outlet works operations. Concern was expressed about the possibility of this sediment being routed into the Highway 75 reservoir as a result of the proposed modifications. It was decided to establish sediment monitoring stations on the Whetstone and Yellowbank Rivers in an effort to more accurately determine the quantities of sediment involved and their distribution. The following paragraphs describe the methods used to analyze the sediment problems and the results obtained. In general, it was determined that the volume of sediment discharging into the Highway 75 reservoir is considerably less than previously estimated and that the reservoir's sediment storage capacity is more than adequate for the design life of the project, and it is not necessary to provide for excessive sediment in the reservoir.

3. In order to determine sediment volumes it was first necessary to develop sediment vs. discharge rating curves. Sediment gaging stations were established by the USGS at Bigstone City on the Whetstone River and near Odessa on the Yellowbank River. Measurements used in this study were obtained during 1974, 1975 and 1976. Sediment rating curves were developed from these measurements (Plates 1 and 2). The measured values, when plotted on log-log paper, show a fairly wide band. A graphical method, developed by the USGS, was used to determine the line of best fit (see Ref. 1). It can be seen from the resulting curves that measurements at high discharges were not obtained. While this is admittedly a weak point, attempts were made to verify the assumed curve by correlating with other streams having longer records. Sediment vs. discharge measurements from several small streams in eastern South Dakota were plotted on the Yellowbank curve. A similar curve was developed for the Cottonwood River at New Ulm using the same procedures (Plate 3). The purpose of the Cottonwood curve was primarily to verify the procedure rather than correlate with the Yellowbank and Whetstone curves. The USGS had conducted a study of sediment yield in some Minnesota streams (Ref. 2), and the Cottonwood River at New Ulm was included. The sediment yield value ob-

tained by the methods used in this study agree with that determined by the USGS. This close agreement with the Cottonwood River and the general pattern of agreement with other streams in eastern South Dakota lend some degree of confidence to the results of the current study. In the absence of a longer record including higher discharge measurements, we believe the sediment rating curves derived for this study do accurately reflect conditions that exist on the Whetstone and Yellowbank Rivers.

4. Once the sediment rating curves were developed, the next step was to determine sediment yield. A Flow-Duration-Sediment Rating Curve Procedure used by the Bureau of Reclamation, Corps of Engineers, and others, was used (Ref. 3). For the Yellowbank River, this method could be used directly. The results are shown as Plate 4. They show the average annual yield on the Yellowbank River as 21,075 tons/year or 0.05 acre-feet/sq. mile/year. The latter figure falls within the range predicted by the USGS study for west central Minnesota. From this, it was estimated that an average annual sediment volume of 20.4 acre-feet will enter the Highway 75 pool from the Yellowbank River. The mathematics and assumptions used to obtain this value are as follows:

The sediment was assumed to be 50% clay and 50% silt based on analysis of boring sample taken from Bigstone Lake. From the table in Plate 5, unit weights of 65 pcf for silt and 30 pcf for clay were used.

$$\begin{aligned} .5(65) + .5(30) &= 32.5 + 15 = 47.5 \text{ pcf} \\ 1 \text{ acre-foot} &= 43560 \text{ cu. ft.} \\ (43560)(47.5) / 2000 &= 1035 \text{ tons/acre-foot} \\ 21075 / 1035 &= 20.4 \text{ acre-feet} \end{aligned}$$

5. Because of the complex flow relationships between the Whetstone River and Bigstone Lake, a somewhat different approach to the sediment analysis was taken. Initially the annual volume of sediment at Bigstone City was computed by the same method as that of the Yellowbank River (Plate 6). The computed volume of 19,525 tons/year converts to 18.9 acre-feet/year, considerably less than the 136 acre-feet/year value estimated in earlier reports. The problem was to determine the distribution of this sediment between Bigstone Lake and the Minnesota River and what effect proposed modifications to the lake outlet works would have on this distribution. The procedure for analysis is described.

6. Flow-Duration Curves were prepared for the Whetstone River at Bigstone City and the Minnesota River at Ortonville. The period of record used included the years 1947-1969. This period was chosen because the Bigstone Lake outlet control structure was not operated and both lake and river flow conditions were assumed to be "natural" (The same period was used for the Yellowbank River for consistency.). The Minnesota River flow-duration curve was superimposed on the Whetstone River curve (Plate 7). It was assumed that when Whetstone values exceeded Minnesota values a portion of the flows were diverting into Bigstone Lake. Sedi-

ment yield for this differential flow was computed using the Bureau of Reclamation procedure (Plate 8). This produced an average annual yield of 1962 tons or 1.9 acre-feet of Whetstone sediment diverted into Bigstone Lake under existing conditions. Again this is far less than previous estimates. Possible reasons for this discrepancy will be discussed in later paragraphs.

7. For proposed conditions, with the silt barrier raised one foot, historic lake stages were used to evaluate flow distribution. Average monthly lake stages, as measured by the USGS, over the period of record, were tabulated. Average monthly values for the entire period were calculated (Plate 9). For this analysis, it was assumed that whenever the lake stage was above elevation 964.7 (proposed top of silt barrier) all Whetstone flow would be passed down the Minnesota River, according to the proposed operating plan. These assumptions are not exactly correct, however, since the analysis deals with "average" conditions, some simplifying assumptions had to be made. From this, it was determined that flow would be diverted into the lake from July through March. To compute sediment volume a flow-duration curve is again required. Since it would be easier to develop the curve for three months instead of nine, the curve was developed for April, May and June (Plate 10). From this, the Bureau of Reclamation procedure was applied again (Plate 11) and by subtraction, the sediment volume diverted into Bigstone Lake was calculated. The volume calculated is 4093 tons or 4.0 acre-feet. This is about twice the volume diverted under existing conditions but again much less than previously estimated.

8. Based on the preceeding analysis the average annual volume of sediment entering the Highway 75 pool would be 35.3 acre-feet (20.4 from the Yellowbank River and 14.9 acre-feet from the Minnesota River). The reservoir has a design sediment storage capacity of 11,000 acre-feet. The Fish and Wildlife Service has expressed concern that the sediment storage would be exhausted before the project reached its design life. Their concern was based on the earlier sediment volume estimates. The present study indicates that the storage capacity is more than adequate.

9. Attempts were made to determine the exact distribution of sediment within the Highway 75 reservoir using computer program HEC-6. The topography of the reservoir and generally low discharges of the Minnesota and Yellowbank Rivers are not well suited to analysis by computer. The pool is wide and shallow with many islands, some of which are very large. At low conservation pool, the portion above County Road 15 is dry. For these reasons and because of the relatively low volume of sediment involved, further attempts at detailed distribution analysis do not seem necessary at this time. A reasonable assumption can be made that the bedload, which is approximately 10% of the total, will drop out and form a delta where the streams enter the reservoir. The suspended sediment will be evenly distributed throughout the pool. If the Yellowbank is diverted to the upper part of the pool, its bedload will form a delta there. The suspended load will still be distributed. Sediment ranges were established in 1974 and are scheduled to be resurveyed in 1981.

If that survey indicates a higher degree of sedimentation than anticipated, additional studies may be warranted.

10. As mentioned earlier, results indicate that the total sediment volume expected is considerably less than previously estimated. The earlier estimates were preliminary in nature and were based entirely on soundings of Bigstone Lake taken in 1956 and 1967. Sedimentation data was not available for the Whetstone River, and sediment contributed by the lake drainage basin itself was not considered. Following are some specific reasons why we believe that earlier estimates are inaccurate:

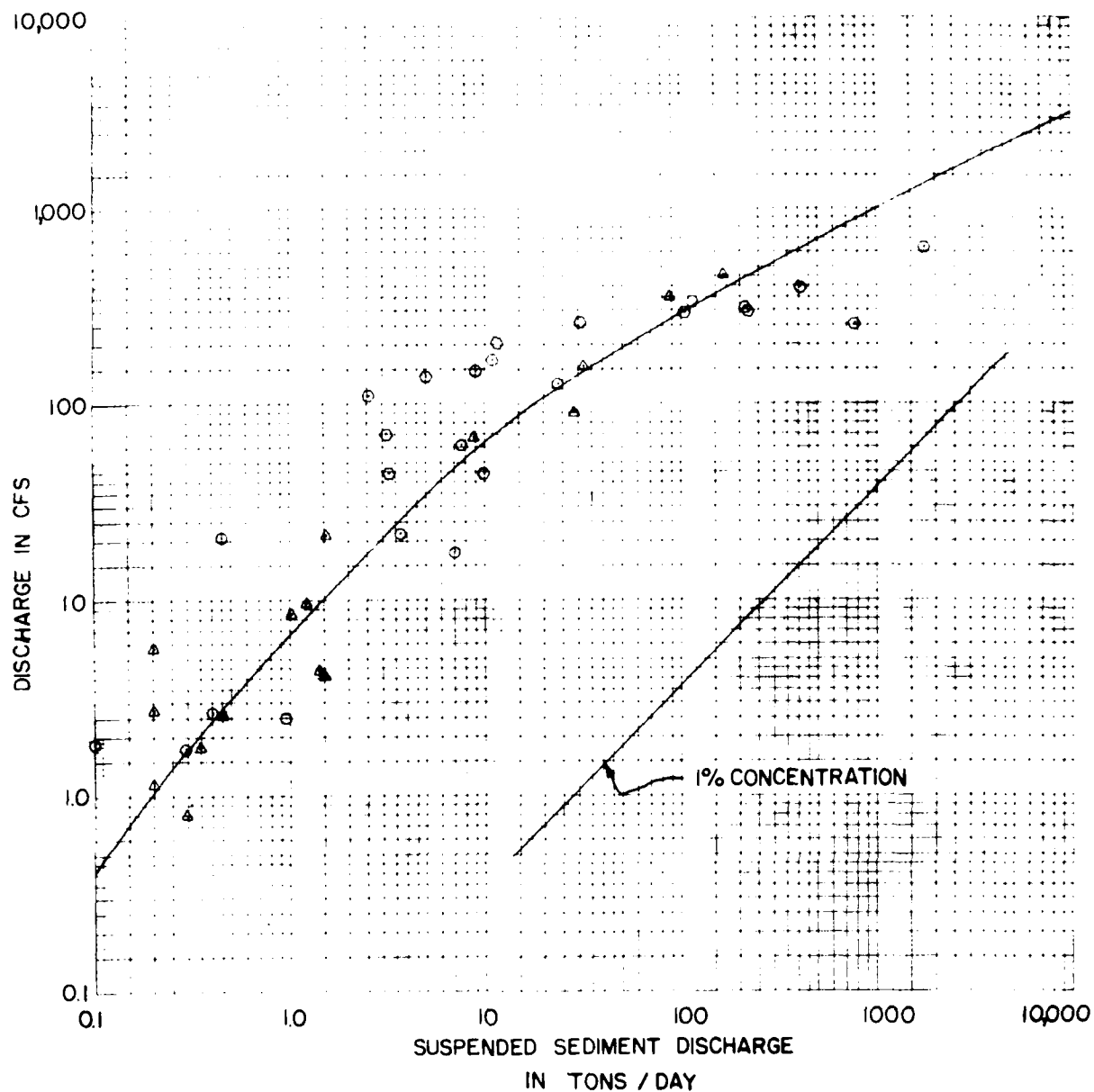
a. The 1956 and 1967 soundings were not necessarily surveyed along the same control lines. Control hubs were not established for either set.

b. Volume was computed by end area planimeter measurements. These measurements included areas possibly attributable to bank caving.

c. Sediment moved down the lake by littoral drift and wind action was overlooked. The entire lake was not sounded. The northwest to southeast orientation of the lake and its length (25 miles) make it appear likely that wind and wave action will have a significant effect on sediment movement. It is possible that the silt barrier acts more to retain this drift material in the lake than to keep sediment from the Whetstone River out.

References:

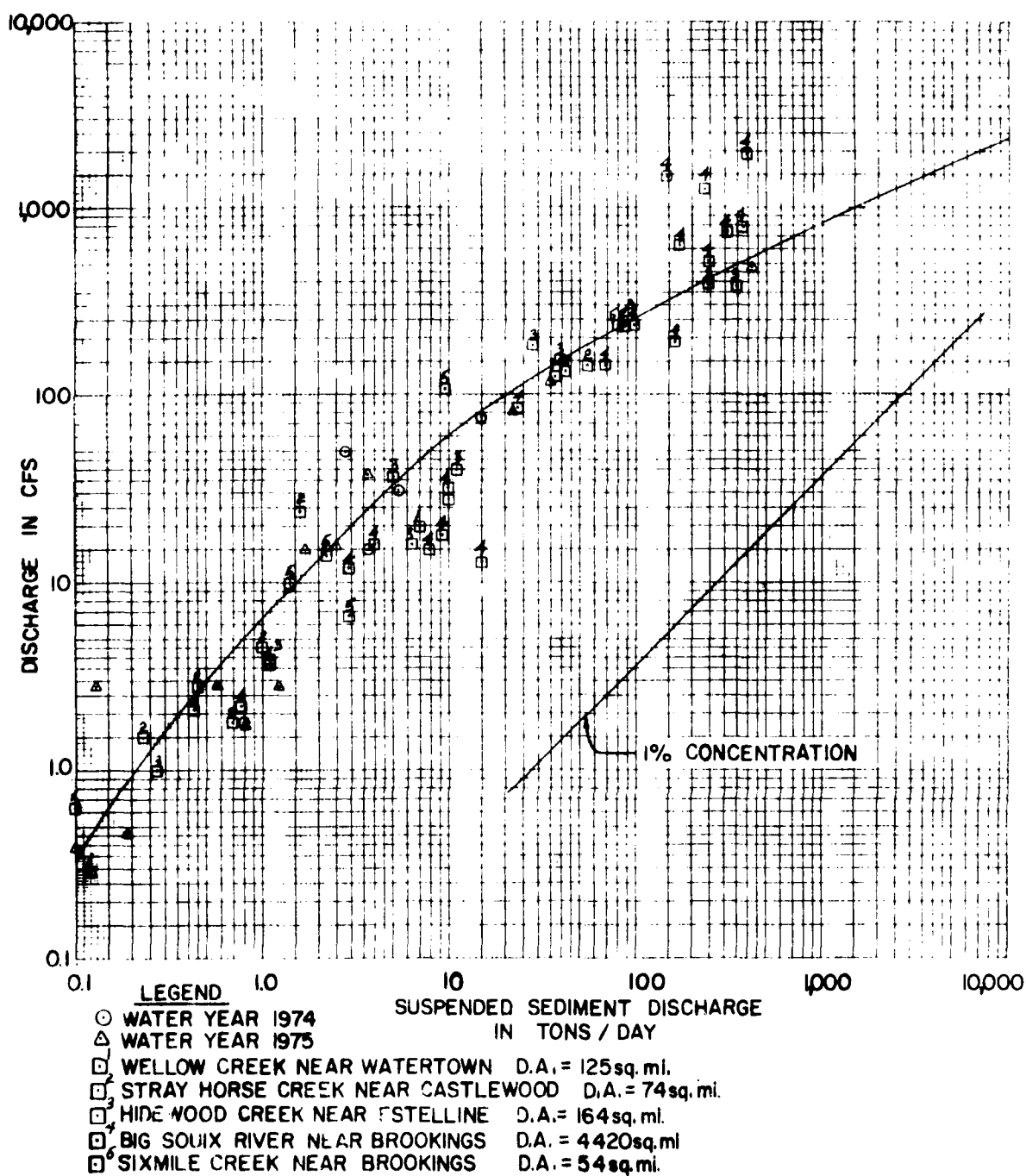
1. "Extending Streamflow Data," W.B. Langbein and C.H. Hardison, Proceedings, American Society of Civil Engineers, Volume 81, Paper No. 826, November, 1955.
2. "An Approximation of Sediment Yields from Watersheds in Minnesota," C.R. Collier, American Society of Agricultural Engineers, Paper No. 74-2506, December, 1974.
3. "Present and Prospective Technology for Predicting Sediment Yields and Sources," (ARS-5-40), Agricultural Research Service, U.S. Department of Agriculture, June, 1975.



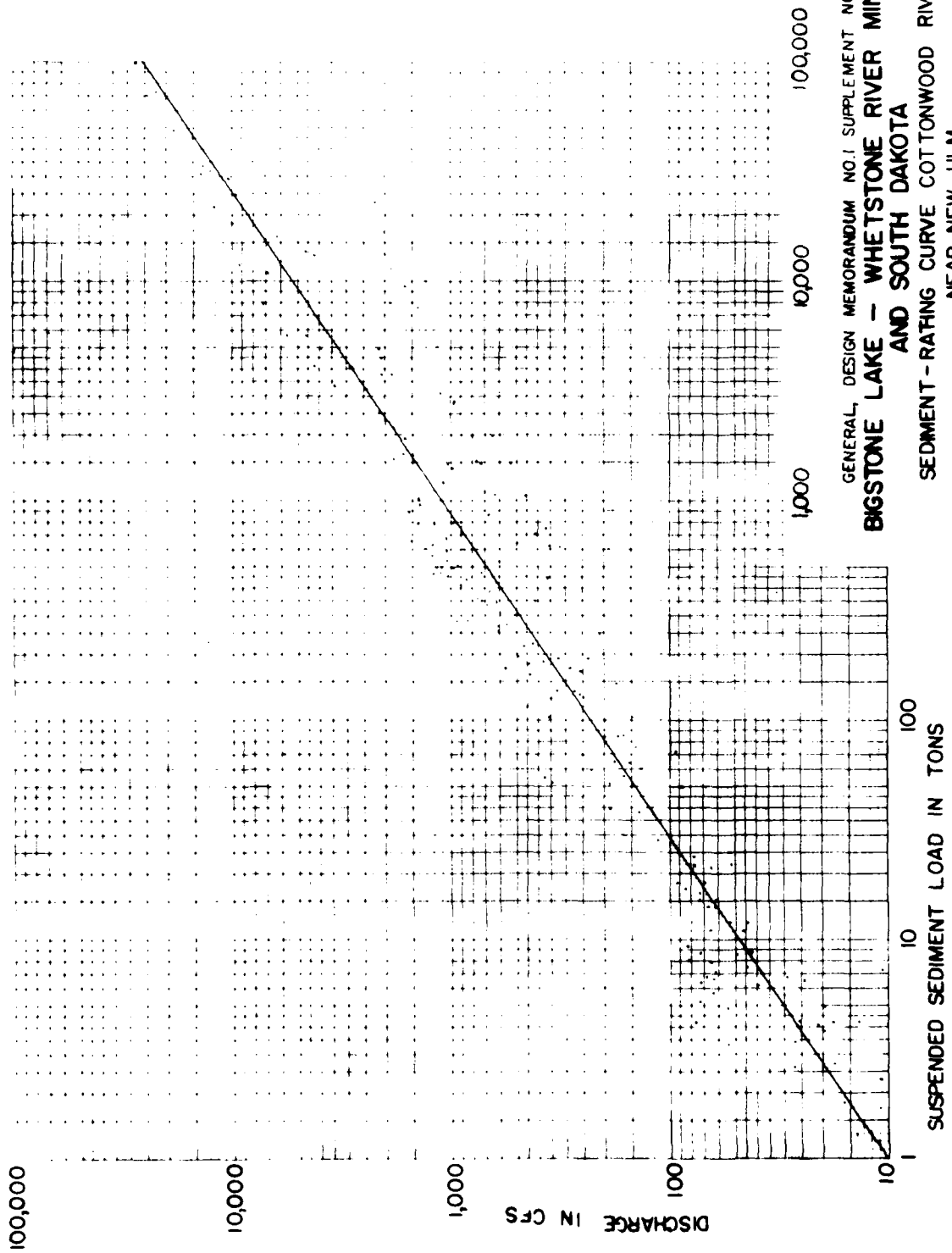
LEGEND

- WATER YEAR 1974
- △ WATER YEAR 1975
- ⬡ WATER YEAR 1976

GENERAL, DESIGN MEMORANDUM NO.1 SUPPLEMENT NO.2
**BIGSTONE LAKE - WHETSTONE RIVER MINNESOTA
 AND SOUTH DAKOTA**
 SEDIMENT - RATION CURVE, WHETSTONE RIVER
 NEAR BIGSTONE CITY, SOUTH DAKOTA
 ST. PAUL, MINNESOTA DISTRICT



GENERAL DESIGN MEMORANDUM NO. 1 SUPPLEMENT NO. 2
RIGSTONE LAKE - WHETSTONE RIVER MINNESOTA
AND SOUTH DAKOTA
 SEDIMENT-EATING CURVE YELLOW BANK RIVER
 NEAR ODESSA, MINNESOTA
 ST. PAUL, MINNESOTA DISTRICT



GENERAL DESIGN MEMORANDUM NO.1 SUPPLEMENT NO.2
**BIGSTONE LAKE - WHETSTONE RIVER MINNESOTA
 AND SOUTH DAKOTA**
 SEDIMENT-RATING CURVE COTTONWOOD RIVER
 NEAR NEW ULM
 ST. PAUL, MINNESOTA DISTRICT

Yellowbank River near Odessa, Minn.
Period of Record 1947-1969

Percent				Daily Avg	Daily Avg
Mid-Qd	Increment	Q _w (cfs)	Q _s (tons/day)	Q _w	Q _s
.05	0.1	3650	26300	3.65	26.3
0.3	0.4	1300	2700	5.20	10.8
1.0	1.0	650	610	6.50	6.1
3.25	3.5	280	160	9.80	5.6
10	10	100	20.5	10.00	2.05
20	10	46	6.1	4.60	.61
30	10	26	3.9	2.60	.39
40	10	16	2.4	1.60	.24
50	10	10	1.5	1.00	.15
60	10	6.5	1.01	0.65	.10
70	10	4.0	.75	0.40	.08
80	10	2.25	.40	0.23	.04
90	10	1.0	.21	0.10	.02
95	10	0.5	.13	0.05	.01
				46.38	52.49

$$\text{Annual } Q_w = 46.38 \times 365 \times 1.9835 = 33600 \text{ A.F./year}$$

$$\text{Annual } Q_s = 52.49 \times 365 = 19159 \text{ tons/year}$$

$$\text{Unmeasured Correction } 10\% = 1916 \text{ tons/year}$$

$$21075 \text{ tons/year}$$

$$21075 \text{ tons/year} \div 398 \text{ sq. mi} = 53.0 \text{ tons/sq. mi/year}$$

$$\approx 0.05 \text{ A.F./sq. mi/year}$$

Flood Control, Bigstone Lake - Whetstone River
Minnesota and South Dakota, Design Memorandum
No. 1, General, Supplement No. 2

Sediment Yield Determination Plate 4
Yellow Bank River

Reservoir Operation	Table 10 (Lane and Koelzer)										Table 7 (Trask)			
	Sand		Silt		Clay		Sand		Silt		Clay		K	K
	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K	W ₁ : K		
(a) Sediment always submerged or nearly submerged	93 : 0	65	5.7	30	16.0	88	0	67	5.7	13	16.0			
(b) Normally a moderate reservoir drawdown	93 : 0	74	2.7	46	10.7	88	0	76	2.7	--	10.7			
(c) Normally considerable reservoir drawdown	93 : 0	79	1.0	60	6.0	88	0	81	1.0	--	6.0			
(d) Reservoir normally empty	93 : 0	82	0.0	78	0.0	88	0	84	0.0	--	0.0			

* Estimated

Note: Values for clay are difficult to estimate and should be determined on the basis of the existing conditions such as the nature of the clay and the particular locale.

Reference: Tables obtained from Density of Sediments Deposited in Reservoirs, Report No. 9, A Cooperative Study of Methods Used in Measurement and Analysis of Sediment Loads in Streams.

Plate 5

Flood Control, Bigstone Lake - Whetstone River
Minnesota and South Dakota, Design Memorandum
No. 1, General, Supplement No. 2

Battalion Sediment Unit Weights

Whetstone River near Big Stone City S.D.
Full Year 1947-1969

Percent				Daily Avg	Daily Avg
Md - Ord	Increment	Q_w (cfs)	Q_s (tons/day)	Q_w	Q_s
.05	.1	4700	21000	4.7	21.0
.30	.4	1800	3200	7.2	12.6
1.0	1.0	920	880	9.2	8.8
3.25	3.5	260	88	9.1	3.08
10	10	90	16	9.0	1.6
20	10	39	5.7	3.9	.57
30	10	19	2.75	1.9	.28
40	10	11	1.60	1.1	.16
50	10	7.3	1.08	0.73	.11
60	10	5.2	.79	0.52	.08
70	10	4.0	.62	0.40	.06
80	10	3.1	.49	0.31	.05
90	10	2.05	.40	0.21	.04
97	4.0	1.14	.21	0.11	.00
99.5	1.0	0.15	.10	0.02	.00
				48.40	48.63

$$\text{Annual } Q_w = 48.40 \times 365 \times 1.9835 = 35000 \text{ A.F./year}$$

$$\text{Annual } Q_s = 48.63 \times 365 = 17750 \text{ tons/year}$$

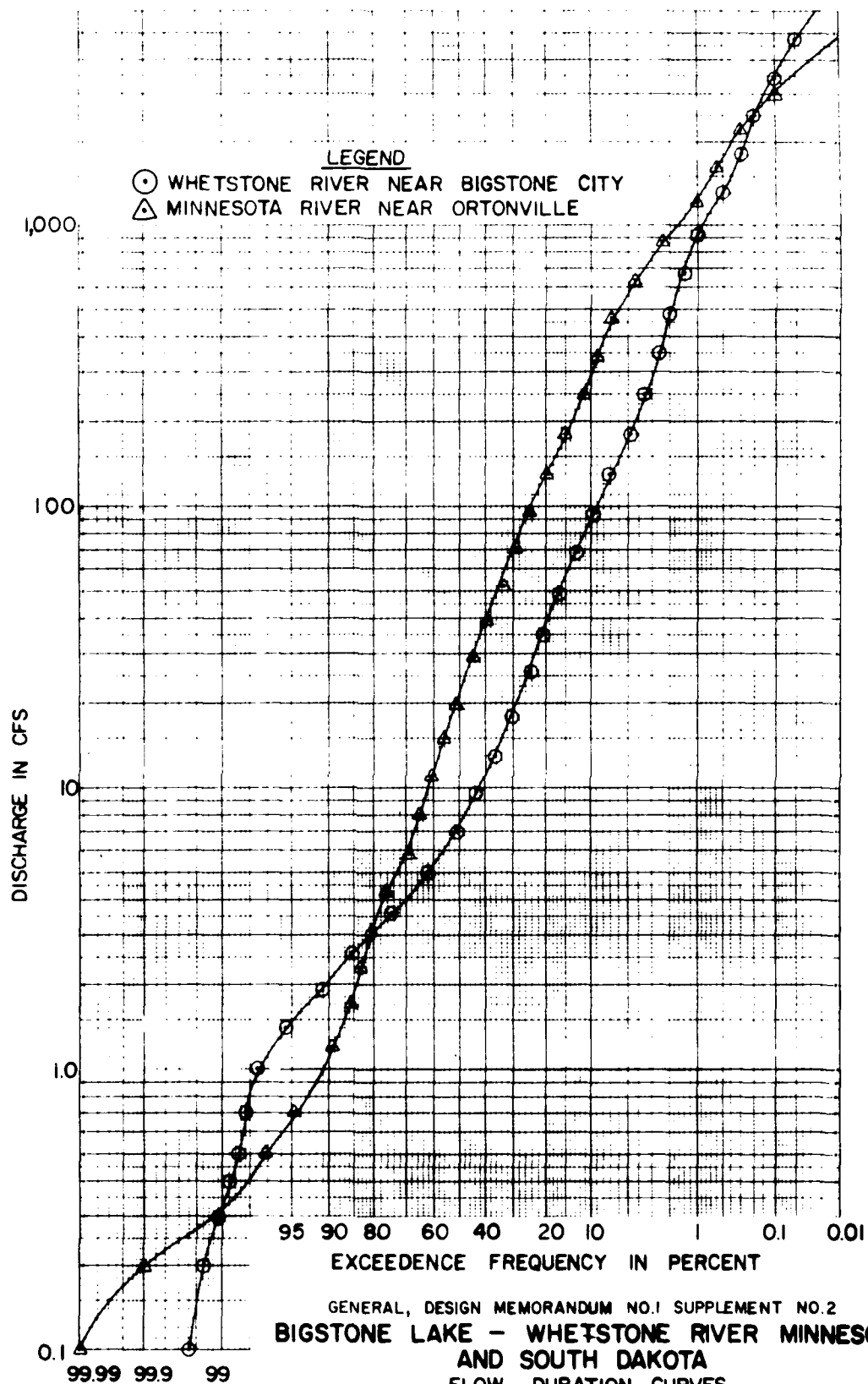
$$\text{Unmeasured correction } 10\% = 1775 \text{ tons/year}$$

$$19525 \text{ tons/year}$$

$$19525 \text{ tons/year} \div 389 \text{ sq. mi} = 45.6 \text{ tons/sq. mi/year} \approx 0.05 \text{ AF/kg. mi./yr}$$

Flood Control, Bigstone Lake - Whetstone River
Minnesota and South Dakota, Design Memorandum
No. 1, General, Supplement No. 2

Sediment Yield Determination Plate 6
Whetstone River



GENERAL, DESIGN MEMORANDUM NO.1 SUPPLEMENT NO.2
**BIGSTONE LAKE - WHETSTONE RIVER MINNESOTA
 AND SOUTH DAKOTA**

FLOW - DURATION CURVES
 PERIOD OF RECORD 1947 - 1969

ST. PAUL, MINNESOTA DISTRICT

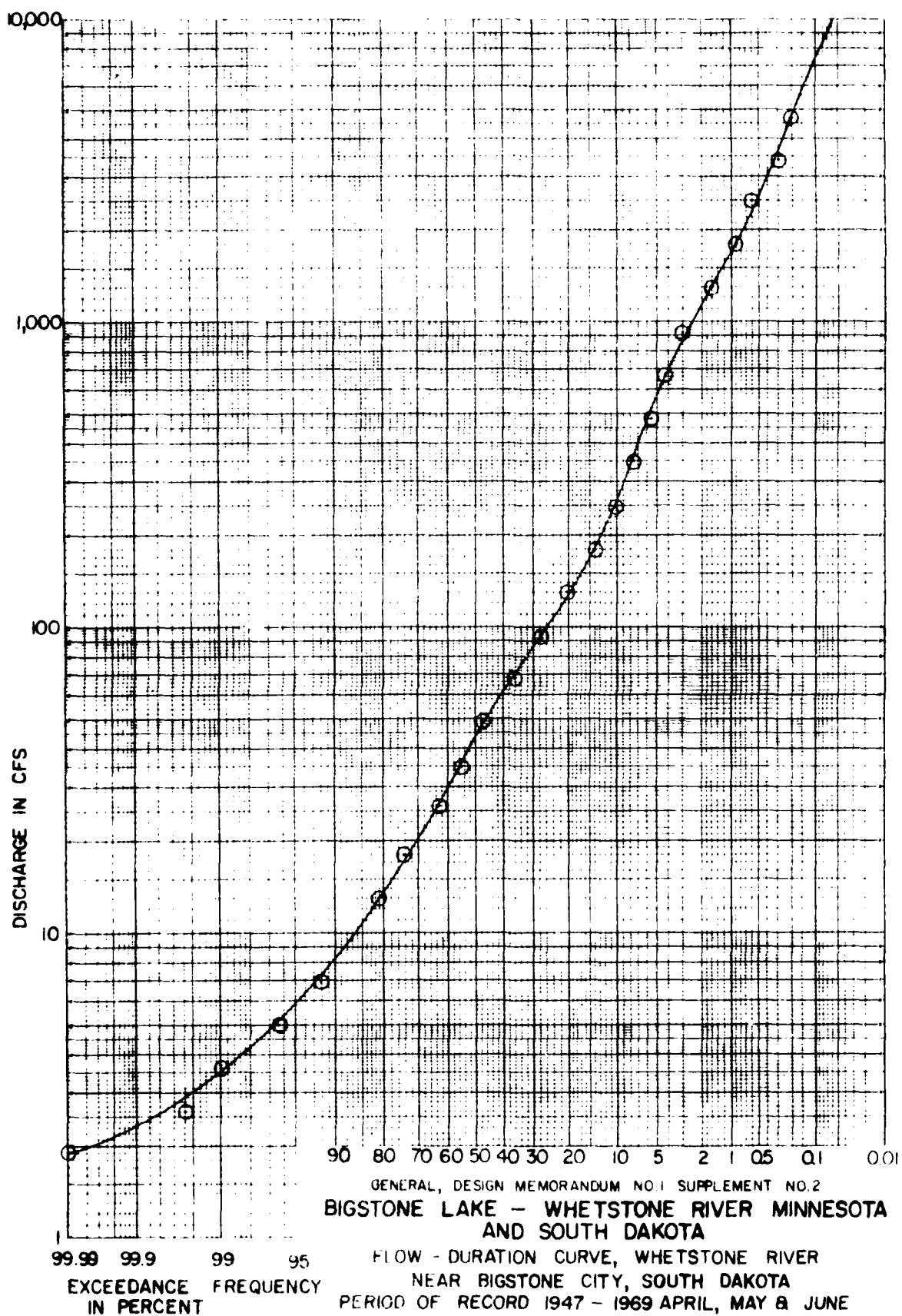
COMPUTATION SHEET

NAME OF OFFICE	COMPUTATION	DATE	PAGE OF PAGES
SUBJECT <u>Big Stone Lake - Highway 75 Reservoir Sediment Study</u>		PRICE LEVEL	
COMPUTED BY	CHECKED BY	APPROVED BY	

① Per Mile Add.	② Cent Increment	③ Qw (cfs)	④ Qs (tons/day)	⑤ Daily Avg Qs Whetstone ② x ④	⑥ Qw Minnesota (cfs)	⑦ % Qw Big Stone L. ⑤ ÷ ⑥	⑧ Daily Avg Qs Big Stone L. ⑤ x ⑦
.02	.02	6100	3500	7.0	4250	30.3	2.12
.04	.02	4950	2350	4.7	3700	25.2	1.18
.06	.02	4300	1800	3.6	3450	20.9	.75
.085	.015	3750	1350	2.03	3150	16.0	.32
.125	.05	3150	1500	4.75	2900	7.9	.38
.17	.04	2800	760	3.04	2700	3.6	.11
83	4.0	2.8	.45	.02	2.4	14.2	.00
87.5	5.0	2.3	.38	.02	1.4	39.1	.01
92.5	5.0	1.8	.31	.02	0.84	53.3	.01
96.5	3.0	1.25	.23	.01	0.54	26.8	.01
98.5	1.0	0.50	.12	.00	0.36		
							4.89
Annual Qs into Big Stone Lake = 4.89 x 365 = 1784 tons/year							
10% unmeasured correction = 178 tons/year							
1962 tons/year							
1962 tons/year diverted under existing conditions (approx. 2 acre-feet)							
4093 tons/year diverted under proposed conditions (approx. 4 acre-feet)							

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1947		96336	96439	96429	96409	96439	96639	96641	96532	96454	96384	96349
48		96336	96338	96310	96279	96255	96414	96549	96471	96393	96277	96382
49		96377	96368	96369	96358	96320	96332	96324	96317	96321	96323	96283
1950		96254	96266	96278	96324	96321	96448	96546	96472	96372	96372	96372
51		96349	96334	96326	96328	96339	96448	96449	96449	96372	96372	96372
52		96358	96358	96358	96358	96358	96358	96358	96358	96358	96358	96358
53		96310	96285	96243	96306	96324	96355	96425	96425	96358	96358	96358
54		96340	96340	96340	96340	96340	96340	96340	96340	96340	96340	96340
55		96350	96350	96350	96350	96350	96350	96350	96350	96350	96350	96350
56		96287	96287	96287	96287	96287	96287	96287	96287	96287	96287	96287
57		96287	96287	96287	96287	96287	96287	96287	96287	96287	96287	96287
58		96441	96441	96441	96441	96441	96441	96441	96441	96441	96441	96441
59		96373	96373	96373	96373	96373	96373	96373	96373	96373	96373	96373
1960		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
61		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
62		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
63		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
64		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
65		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
66		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
67		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
68		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
69		96442	96442	96442	96442	96442	96442	96442	96442	96442	96442	96442
AVG.		96361	96360	96369	96369	96371	96413	96497	96508	96472	96477	96382
STORAGE AVAILABLE (ACRE-FT) 13100												
564.7												
STORAGE AVAILABLE (ACRE-FT) 1100												
963.7												

GENERAL, DESIGN MEMORANDUM NO.1 SUPPLEMENT NO.2
 BIGSTONE LAKE — WHETSTONE RIVER MINNESOTA
 AND SOUTH DAKOTA
 AVERAGE LAKE ELEVATIONS BIGSTONE LAKE
 ST. PAUL, MINNESOTA DISTRICT



Whetstone River near Big Stone City S.D.
April, May, June 1947-1969

Percent				Daily Avg	Daily Avg
Mid-Qd	Increment	Q _w (cfs)	Q _s (tons/day)	Q _w	Q _s
0.2	0.4	4700	21000	18.8	84.0
0.7	0.6	2100	4350	12.6	26.1
3.0	4.0	860	770	34.4	30.8
10	10	215	63	21.5	6.3
20	10	130	28	13.0	2.8
30	10	85	14.8	8.5	1.48
40	10	61	9.4	6.1	.94
50	10	43	6.3	4.3	.63
60	10	30	4.4	3.0	.44
70	10	21	3.05	2.1	.31
80	10	14	2.05	1.4	.21
90	10	8.6	1.27	.86	.13
97	4.0	4.85	.74	.19	.03
99.5	0.9	3.05	.49	.03	.00
99.95	0.1	2.20	.37	.01	.00
				126.79	154.17

$$Q_w = 126.79 \times 91 \times 1.9835 = 23000 \text{ A.F. / season}$$

$$Q_s = 154.17 \times 91 = 14029 \text{ tons / season}$$

$$\text{Unmeasured correction } 10\% = 1403 \text{ tons / season}$$

$$15432 \text{ tons / season}$$

$$\frac{23000}{35000} = 65.7\% \text{ of annual discharge}$$

$$\frac{15432}{19525} = 79.0\% \text{ of annual sediment}$$

Flood Control, Bigstone Lake - Whetstone River
Minnesota and South Dakota, Design Memorandum
No. 1, General, Supplement No. 2

Sediment Yield Determination

Whetstone River

April - June

3-15

Plate 11

APPENDIX 4:
COST ESTIMATE

APPENDIX 4:
COST ESTIMATE

April 1980
(October 1980
Price Level)

BIG STONE LAKE - WHETSTONE RIVER PROJECT

Minnesota River Channel Downstream of Station 60+00
Design Memorandum No. 3 Alternative Alignment (East)

Item (Federal)	Unit	Unit Cost	Quantity	Cost
New Channel				
Excavation	CY	\$1.15	274,250	\$315,388
Spillbank levee	CY	0.25	313,470	78,368
Stripping	CY	2.45	37,420	91,679
Rock excavation	CY	27.00	3,000	81,000
Clearing	A	1,750.00	28	49,000
Topsoil	CY	3.60	36,300	130,680
Seeding	A	800.00	78	62,400
CMP culvert - 24" wall pipe rate	LF	36.00	100	3,600
Upstream channel restriction and weir				
Excavation	CY	1.15	6,390	7,348
Riprap	CY	20.00	890	17,800
Bedding	CY	16.00	475	7,600
Sheet piling	SF	17.00	560	9,520
Gabions	SY	26.00	90	2,340
Levee Crossing				
Excavation	CY	1.15	750	862
Sandfill	CY	10.00	80	800
Concrete	CY	100.00	214	21,400
Gravel surfacing	CY	15.00	20	300
Riprap	CY	20.00	210	4,200
Bedding	CY	16.00	105	1,680
Downstream channel crossing and flow control				
Excavation	CY	1.15	6,260	7,199
Riprap	CY	20.00	2,020	40,400
Bedding	CY	16.00	1,010	16,160
Channel fill	CY	1.00	11,600	11,600
Downstream weir				
Riprap	CY	20.00	455	9,100
Bedding	CY	16.00	360	5,760
Steel piling	SF	17.00	3,640	61,880
Gabions	SY	26.00	410	10,660
Subtotal				1,048,724
Contingencies - 15%				157,276
Total				1,206,000

Indirect Costs

Engineering and Design	96,000
Supervision and Administration	97,000
Total Indirect	193,000

TOTAL ESTIMATED FEDERAL COST 1,399,000

Non-Federal

Land Acquisition	26,000
Engineering	15,000
Administrative and Legal	65,000

TOTAL ESTIMATED NON-FEDERAL COST 106,000

TOTAL ESTIMATED FEDERAL AND NON-FEDERAL COST 1,505,000

Based on estimates provided by the Upper Minnesota River Watershed District.

E Sep 80

APPENDIX 5:
CULTURAL RESOURCES
COORDINATION LETTERS

ASBMD-MR

17 June 1960

Associate Director for Cultural Programs
Heritage Conservation and Recreation Service
Washington, D.C. 20240

Dear Sirs:

Inclosed for your review and comment are two copies of a report entitled "An Archaeological Reconnaissance Survey of the Proposed Channel Realignment Area at Big Stone-Whetstone Flood Control Project, Big Stone and Lac qui Parle Counties, Minnesota." This report was prepared by a qualified archaeologist for the St. Paul District, Corps of Engineers.

In order to maintain our schedule for this project, we request that you submit your comments by 15 July 1960. If you require additional information, please contact Mr. David Serwick, Archaeologist, Environmental Resources Branch at (612) 725-7334 or FTS 725-7334.

Thank you.

Sincerely,

1 Incl
as stated

ROBERT F. POST
Chief, Environmental Resources Branch
Engineering Division

Identical letters to:
Ms. Christy A.M. Caine
State Archaeologist
Dept. of Sociology/Anthropology

Mr. Russell W. Fridley
State Historic Pres. Officer
Minnesota State Hist. Society



MINNESOTA HISTORICAL SOCIETY

690 Cedar Street, St. Paul, Minnesota 55101 • 612-296-274

June 25, 1980

Mr. Robert F. Post
Chief, Environmental Resources Branch
Engineering Division
Department of the Army
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Mr. Post:

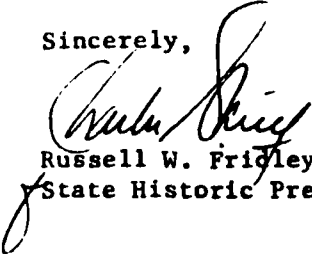
RE: Review of the Archaeological Reconnaissance
Survey of the Proposed Channel Realignment
Area at Big Stone - Whetstone Flood Control
Project, Big Stone and Lac Qui Parle Counties.

MHS Referral File Number: K 763

We have received and reviewed the above referenced survey report. No archaeological sites were discovered during the course of the survey. Consequently there are no sites of historic, architectural, cultural, or archaeological significance listed on the National Register, or eligible for inclusion on the National Register, which will be affected by your proposal.

Thank you for your participation in this important effort to identify and preserve Minnesota's cultural resources.

Sincerely,


Russell W. Fridley

State Historic Preservation Officer

RWF/sl

cc: Kathleen Roetzl
Impact Services, Inc.



United States Department of the Interior
HERITAGE CONSERVATION AND RECREATION SERVICE
INTERAGENCY ARCHEOLOGICAL SERVICES—DENVER
P.O. BOX 25367, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

IN REPLY REFER TO

1201-05(W530)

JUL 1 1980

Mr. Robert F. Post, Chief
Environmental Resources Branch
Department of the Army
St. Paul District
Corps of Engineers
1135 U. S. Post Office and Custom House
St. Paul, MN 55101

Attention: Mr. David Berwick

Dear Mr. Post:

We acknowledge receipt in two copies of the technical report entitled, "An Archaeological Reconnaissance Survey of the Proposed Channel Realignment Area at Big Stone-Whetstone Flood Control Project, Big Stone and Lac Qui Parle Counties, Minnesota." We regret that we are unable to review this report in response to your request of June 17, 1980. The impending regionalization of Interagency Archeological Services has effectively curtailed our capabilities for peer review and coordination activities. Enclosed please find one copy of the subject report.

Sincerely,

Jack R Rudy

Jack R Rudy
Chief, Interagency
Archeological Services - Denver

Enclosures

MEI
-8