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Mission Hill Watershed

Yankton County, South Dakota

FINAL ENVIRONMENTAL IMPACT STATEMENT

V. W. Shally, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations

Mission Hill Watershed District
Mission Hill, South Dakota 57046

Yankton County Conservation District
Volin, South Dakota 57072

Town of Mission Hill
Mission Hill, South Dakota 57046

January 1975

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UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service
Huron, South Dakota 57350

USDA ENVIRONMENTAL IMPACT STATEMENT

Mission Hill Watershed
Yankton County
South Dakota

Prepared in Accordance with
Sec. 102(2) (C) of P.L. 91-190

Summary Sheet

- I. Final
- II. Soil Conservation Service
- III. Administrative
- IV. Description of Action: The purpose of the Mission Hill Watershed Project is for watershed protection and flood prevention on agricultural lands and to homes in the town of Mission Hill. It is located in Yankton County, South Dakota. The planned project measures to be installed include conservation land treatment, one floodwater retarding structure, one grade stabilization structure, and 3.8 miles of channel work.
- V. Summary of Environmental Impacts: The project will reduce flood damages 87 percent on 1,580 acres of crop and pastureland. Nine homes in Mission Hill will be protected from the 100-year frequency flood. The personal safety and well-being of the residents will be enhanced. Damage to other property such as roads, fences, garages, and gardens will also be reduced. Planned land treatment measures will reduce erosion rates 1,500 tons annually. Many of these land treatment measures will provide wildlife food and habitat. Turnrows associated with contour farming and terraces will also provide food and cover.

Sediment concentration of the water leaving the watershed will change from an estimated 510 parts per million to 94 parts per million. Sediment leaving the watershed will decrease from about 125 tons annually without the project to 89 tons annually with the project.

The project will help to stabilize income and improve the area economy.

There will be a periodic inundation of 0.6 mile of ephemeral stream in the 7 acres of the sediment pool which will eventually fill with sediment. There will be a periodic inundation by floodwater of up to 34 acres of cropland and 59 acres of pasture.

There will be a temporary loss of 124 acres of pasture, cropland, herbaceous habitat, and woody habitat during construction. Noise and dust will also increase.

- VI. Alternatives: Alternatives that were considered were: (a) land treatment only, (b) land treatment and the floodwater retarding structure, (c) land treatment and the diversion of floodwaters, (d) land treatment and public acquisition of the agricultural flood plain, (e) land treatment and channel only, (f) no project.
- VII. Written comments were received from: U.S. Department of the Army; U.S. Department of Health, Education, and Welfare; U.S. Department of the Interior; U.S. Department of Transportation; Environmental Protection Agency; Advisory Council on Historic Preservation; and the Governor of South Dakota, represented by the Secretary of the Department of Natural Resource Development.
- VIII. Draft statement transmitted to CEQ on September 6, 1974.

USDA SOIL CONSERVATION SERVICE
FINAL ENVIRONMENTAL IMPACT STATEMENT

Mission Hill Watershed
Yankton County, South Dakota

Installation of this project constitutes an administrative action.

Federal assistance will be provided under authority of Public Law 83-566, 83d Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Mission Hill Watershed District
Yankton County Conservation District
Town of Mission Hill

PROJECT OBJECTIVES AND PURPOSES

Goals of the sponsors and the Soil Conservation Service are to enhance: (1) quality in the natural resource base for sustained use, (2) quality in the environment to provide attractive, convenient, and satisfying places to live, work, and play, (3) quality in family standards of living based on community improvement, economic opportunity, and wholesome leisure opportunities.

Although the goal of the Soil Conservation Service is 100 percent land treatment, the sponsors and the Soil Conservation Service agreed that wind and water erosion losses will be reduced to less than 5 tons per acre per year on at least 75 percent of the land above the floodwater retarding structure. They also agreed that similar reductions will be made on 50 percent of the remaining area. These reductions are to be accomplished during the 5-year installation period as described in the plan.

The sponsors and the Soil Conservation Service agreed that the objectives of the flood prevention measures are to eliminate floodwater damage to homes in Mission Hill (Reach III) for floods up to the 100-year frequency. The objective in Reach II is to reduce crop and pasture damage. Crop and pasture benefits in Reaches I and IV are incidental to the structural works needed for protection in Reaches II and III.

Objectives also include a reduction in damage to roads and bridges in Reaches III and IV.

PLANNED PROJECT

Land Treatment

Most of the flood plain soils have only minor limitation for sustained crop production; however protection from wind erosion is necessary. The areas with erosive soils have limitations for sustained crop production and require more intensive conservation management to reduce erosion.

Land treatment measures will be planned, installed, and maintained on privately owned land by individuals or groups of landowners and operators with the Soil Conservation Service providing technical assistance. Land treatment measures will protect and improve the soil and water resources of individual farms, and, at the same time, provide the highest feasible degree of runoff retardation, sediment control, and water management. Their effectiveness in reducing runoff, erosion, and sedimentation makes it imperative that they are included as an integral part of flood prevention projects. The installation of land treatment measures is essential to an effective watershed protection and flood prevention program. When installed, land treatment measures proposed in this work plan will exceed minimum requirements. Emphasis will be given to the land treatment that will give a measurable reduction of erosion and sediment rates, keep surface runoff at a minimum, and maintain a high level of production. The installation of these practices will be beneficial to the landowner, operator, and to the entire community.

Conservation cropping systems, crop residue use, and contour farming with terraces will give the desired level of treatment to reduce soil losses to levels of less than 5 tons per acre. An alternate to contour farming with terraces is contour stripcropping with a conservation cropping system that includes grasses or legumes. Another alternative is a permanent cover of grass for pasture, hayland, or seed production. Other alternate solutions exist but each problem must be handled independently.

Grassed waterways will convey excess water through cultivated fields without damage by erosion. Alternates to this solution include diverting the water to other areas where damage does not occur or constructing grade stabilization structures to control gullies.

Crop residue use is one of the easiest and most effective ways of reducing wind and water erosion problems. These residues left on the surface will increase the infiltration rate of water into the soil and reduce the erosive effects of the wind.

Pasture and hayland management will decrease the volume of runoff water and increase both the quality and quantity of grass or hay.

Woodland treatment measures will improve hydrologic conditions onsite, help protect water quality offsite, and provide maximum economic return consistent with site capabilities. These include: tree plantings, timber stand improvement, grazing control, proper timber harvesting, and fire control intensification. Technical assistance in fire control and forestry is available to landowners through ongoing programs by the State Forester for South Dakota under cooperative agreement with the U.S. Forest Service.

Other practices such as ponds and pasture and hayland planting will also be used to reduce conservation problems. Farmstead and feedlot windbreaks and wildlife habitat developments are examples of practices which will complement other measures and make up the complete conservation program.

The accelerated land treatment program planned to be installed during the project includes practices which will adequately treat ^{1/} an additional 2,635 acres of cropland, 27 acres of pastureland, and 20 acres of forest land.

A soil survey of all land is underway and will be used for the planning and application of land treatment measures.

Non-Structural Measures

Flood plain zoning: The Yankton County Commissioners are presently developing a comprehensive plan which includes restricting further residential development of the Mission Hill flood plain.

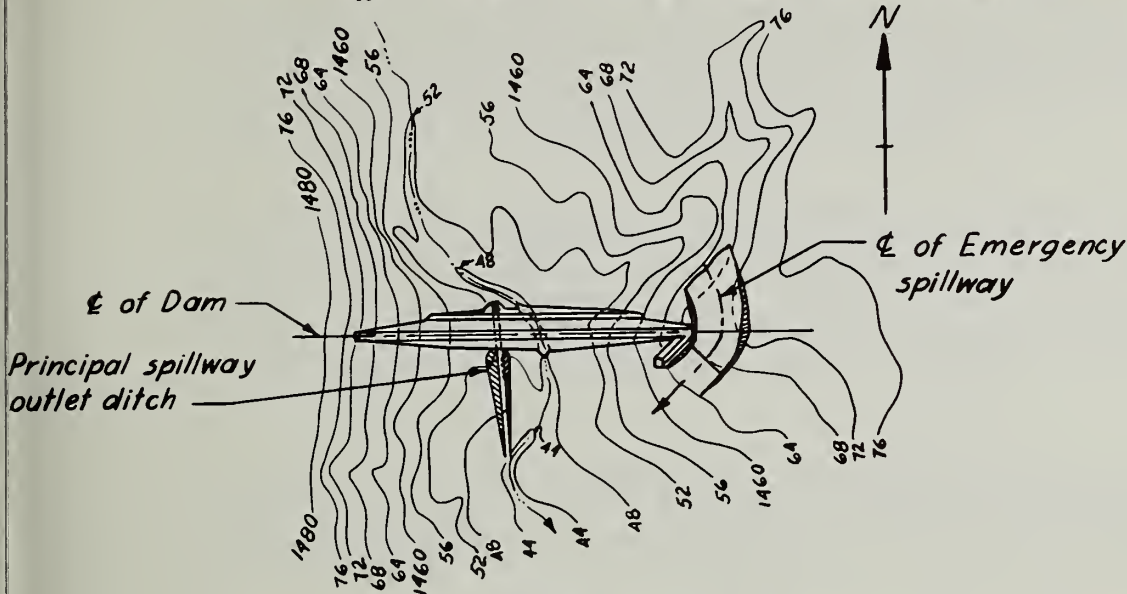
Structural Measures

Floodwater retarding structure: One floodwater retarding structure will be constructed. This will control the runoff from 5.85 square miles which is 94 percent of the watershed above Mission Hill and 44 percent of the total watershed area. The structure will be an earth embankment about 37 feet high. Refer to the typical drawing on the following page.

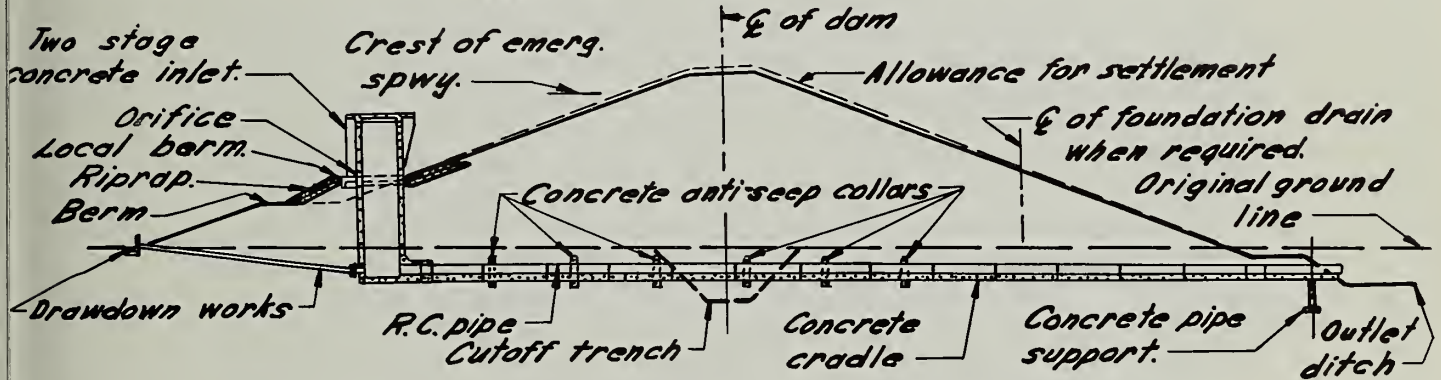
The material in the foundation of this structure is primarily glacial till overlying the Niobrara Formation. This material is capable of withstanding the weight of the embankment and the principal spillway with only minimal consolidation. The fill

1/ Land adequately treated is land used within its capability on which needed conservation practices that are essential to its protection and planned improvement have been applied.

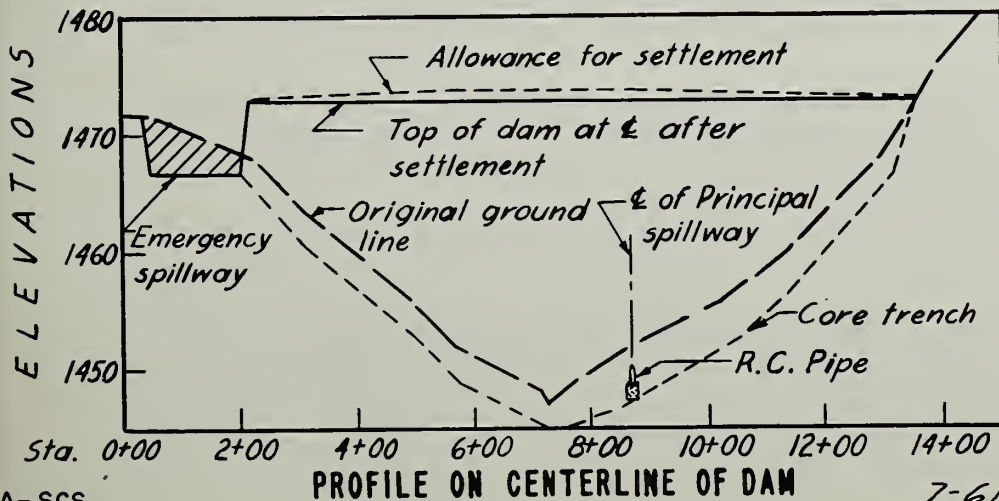
TYPICAL FLOODWATER RETARDING STRUCTURE WITH TWO STAGE PRINCIPAL SPILLWAY



GENERAL PLAN



CROSS SECTION OF DAM ON CENTERLINE OF TWO STAGE PRINCIPAL SPILLWAY



PROFILE ON CENTERLINE OF DAM

7-61

5,L-17,778

materials will be glacial till, sand, clay and silt mixture with some gravels which will be excavated from the emergency spillway area. The principal spillway will be of reinforced concrete. The inlet will be an ungated two stage standard covered riser. The outlet will be a 30-inch diameter conduit.

The first stage of the principal spillway is at the elevation of the top of the sediment pool which is expected to fill with sediment during the first 50-year period following construction. The first stage will have a maximum release rate of about 22 cubic feet per second. Structural modifications will be required to raise the first stage of the principal spillway when sediment fills the initial pool.

Storage for 1 inch of runoff from the drainage area above the structure will be provided between the first and second stages. This approximates the runoff produced by a 10-year frequency 6-hour duration storm.

The second stage of the principal spillway will have a maximum capacity of about 106 cubic feet per second. The total storage capacity of the structure to the emergency spillway crest will be 2.98 inches. This includes 2.71 inches for floodwater retarding storage and .27 inch for sediment storage. This combination of floodwater storage and principal spillway release will prevent emergency spillway flow for all storms of less than a 1 percent chance occurrence. The emergency spillway will be vegetative lined earth. It will have an inlet channel, a level crest section, and an outlet channel. The vertical distance between the top of the dam and the crest of the emergency spillway is about 5.7 feet. Landrights will need to be obtained for 30 acres in the dam and spillway area. This is presently in crop and pasture and no clearing is required.

The designed life of the structure will be 100 years. A drawdown tube will be installed near the bottom of the sediment pool. This will be left open and the pool will drain.

Geologic investigations indicate foundation conditions are such that leakage through the foundation would be high. It is doubtful that a desirable water level in a sediment pool could be maintained.

It is also the desire of the sponsors to maintain a dry pool so the reservoir can be utilized for pasture.

The embankment, emergency spillway, and borrow area will be revegetated with recommended varieties of grass and will be fenced to control grazing.

Scattered clumps or blocks of adapted trees and shrubs totaling not less than 2 acres will be planted in selected areas at the floodwater retarding site. These plantings will be a part of the revegetation measures. They will add beauty to the landscape and provide food and cover for wildlife.

Two farmsteads will be protected from extremely high water in the flood pool of the floodwater retarding structure by the construction of dikes. These dikes will have gated pipes to allow local water to escape.

Channel: There are approximately 3.8 miles of channel work proposed as shown on the project map. The channel in Reach I is approximately 3.0 miles long and in Reach II, it is approximately 0.8 miles in length. The capacity of this channel is based on the low stage release rate from the floodwater retarding structure and the 20 percent chance, 24-hour removal from the uncontrolled drainage area below the structure.

Construction of the channel will require 94 acres of working area during construction. The channel will be constructed in a previously modified ephemeral channel in Reach II and in part of Reach I for a distance of 2.8 miles. The diversion in Reach I from station 385+70 to 439+60 will be new construction for about 1.0 mile. There are permeable fine sands with silts in Reach I. Reach II material consists of silts, clays, and sands. No channel work is planned for Reaches III and IV.

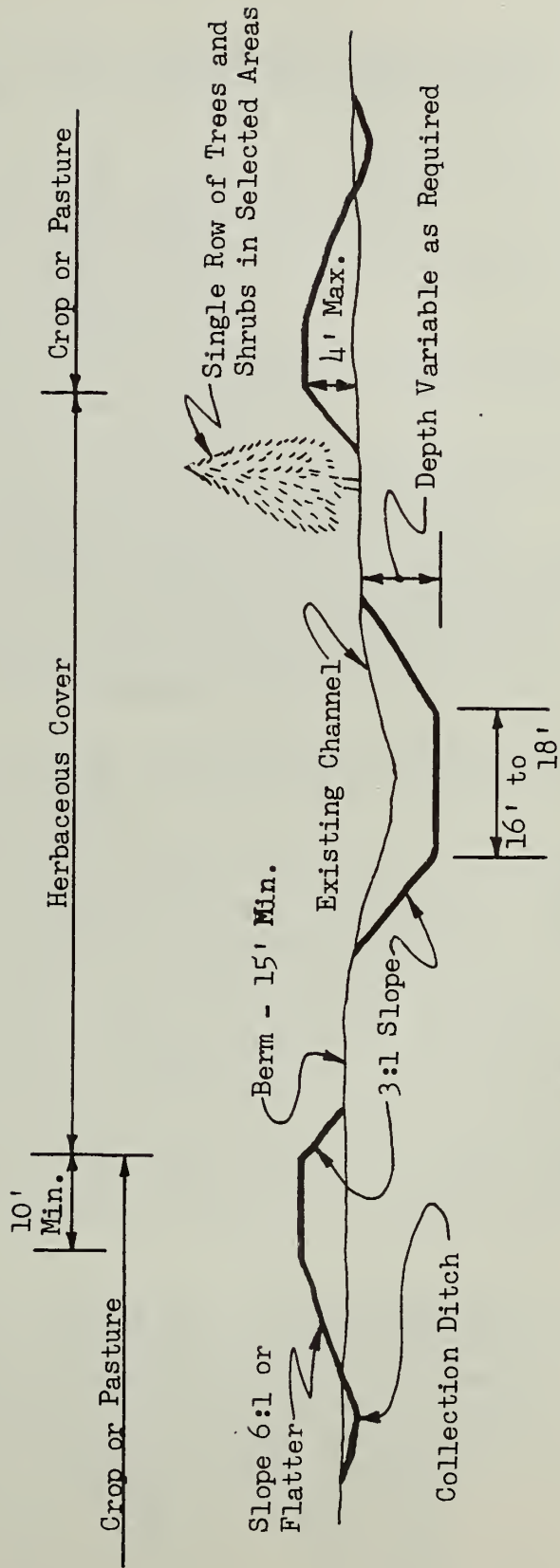
To insure stability in the more erodible materials, the channel will be constructed with 3:1 side slopes and the design velocities will be less than 2 feet per second. Additional maintenance will be needed to remove sediment. The bottom width of the channel varies from 16 feet in Reach I to 18 feet in Reach II. The flow depth for the design capacity varies from 2.6 feet to 3.6 feet in Reach I. The total depth of cut is up to 10 feet in the diversion. The flow depth is 3.4 feet in Reach II for the design capacity. The total depth is less than 5 feet.

A minimum berm width of 15 feet will be maintained. The inside of the spoil area will have a 3 to 1 slope and the height will be about 2 feet. The top width on the spoil area will be not less than 10 feet. The outside slope will be variable but generally 6 to 1 slope, or flatter. Field inlets will be provided to allow surface water to enter the channels. See the following page for typical drawing.

The constructed channel alignment will follow the existing channel as much as possible. Some deviations from the existing channel will be made to satisfy requests from landowners or to minimize woody habitat losses. The channel will be relocated as follows in Reach I:

TYPICAL MISSION HILL WATERSHED

CHANNEL CROSS SECTION



SE $\frac{1}{4}$ sec. 5, T. 93 N., R. 54 W., approximate station 292+90 to station 301+90, right bank construction only to reduce woody habitat loss

NE $\frac{1}{4}$ sec. 8, T. 93 N., R. 54 W., approximate station 301+90 to station 305+90, right bank construction only

W $\frac{1}{2}$ sec. 8, T. 93 N., R. 54 W., approximate station 332+50 to station 367+60, follow field boundary

NW $\frac{1}{4}$ sec. 17, T. 93 N., R. 54 W., approximate station 367+60 to station 385+70, change field boundary

sec. 17, T. 93 N., R. 54 W., approximate station 385+70 to station 439+60. Following the existing channel in this section would require construction in a heavily wooded, brushy area with good wildlife habitat value. To avoid this, a new route was chosen southwest of the existing oxbow as shown on the project map. A pipe outlet will be placed in the channel bank near station 385+70 to allow low flows of water to continue in this abandoned oxbow.

Due to construction and relocation of the channel in Reach II, an area of woody habitat of less than 0.1 acre will be removed just east of the road at station 279+40.

In Reach I, from station 292+90 to 301+90, about 0.5 acre of woody habitat will be removed from the right side of the channel. From station 301+90 to 305+90, less than 0.1 acre of woody habitat will be removed from the right bank. In the NW $\frac{1}{4}$ of section 8, a stringer of trees, which were cut down in 1967, have regrown. About 0.4 acre will be removed. From station 358+30 to station 362+10, 1.1 acres of trees will be removed from a farmstead windbreak. At station 385+70, a new channel will be constructed. The relocated channel will cross cropland until it drops to the Missouri River flood plain through a grade stabilization structure. A new channel will then carry it to the Missouri River. About 1.2 acres of woody habitat will be removed at that point. The total loss of trees and shrubs is 3.4 acres.

The disturbed areas will be revegetated to adapted grasses following construction. After grass is established, trees and shrubs will be scalp planted as part of the revegetation measures. These will be single row plantings in intermittent reaches along the channel. Openings will be left in the plantings to add to the beauty of the landscape. The approximate footage for these plantings is as follows:

sec. 4, T. 93 N., R. 54 W., - 2,000 feet
 sec. 8, T. 93 N., R. 54 W., - 1,500 feet
 sec. 17, T. 93 N., R. 54 W., - 550 feet

These plantings will consist of nonsuckering shrubs and medium sized trees, including conifers. They will be placed in areas adjacent to cropland to avoid grazing by livestock. These plantings will add beauty to the landscape as well as provide habitat and food for wildlife. These single row plantings will replace 1.1 acres of the existing trees and shrubs. An additional 1.1 acres of trees and shrubs will be planted in a block planting in the SW $\frac{1}{4}$ of section 8 for the purpose of mitigating other losses.

The 1.2 acres of trees on the Missouri River bottom near the drop structure will not be replaced. The channel area will be seeded to a mixture of grass dominated by warm season native grasses. In an area of dense river bottom woodland, this narrow strip of herbaceous vegetation will serve to diversify the habitat and benefit wildlife.

The channel will be overexcavated about 4 feet deep and 100 feet in length near these plantings to provide ponded areas. The exact location will be determined after geologic investigations have been made prior to final design. These investigations will be used to help select sites that have the best water-holding capacity. These areas will trap sediment during construction and will be useful for wildlife until they are filled with sediment.

To minimize erosion during construction, the contractor will not be allowed to construct over 2 miles of channel in advance of grass seeding and mulching operations. Also, grass seeding shall be completed within 7 days after completion of construction at each location.

Burning operations shall be in conformance with the Air Pollution Control Regulations (section 4.2.6) for South Dakota as adopted by the South Dakota Air Pollution Control Commission. All applicable federal, state, and local laws shall be complied with. Burial of refuse material is preferable to burning.

To aid in giving proper attention to health protection, the Public Health Monograph entitled, "Prevention and Control of Vector Problems Associated with Water Resources," dated January 1965, will be used.

Although no archeological or historic sites are known to exist, every effort will be made to preserve any sites that may be exposed during construction. All reasonable precautions will be taken to determine whether items of historic and archeological value exist. Archeological and historical surveys will be conducted prior to construction by individuals considered qualified by the South Dakota State Archeologist and the South Dakota State Historical Preservation Officer. If an unknown site of archeological value is discovered during construction, work will cease and the Chief Archeologist of the Midwest Archeological Center, National Park Service, Lincoln, Nebraska, and the State Archeologist, Vermillion, South Dakota, will be notified.

If historical sites are located, the State Historical Preservation Officer will be notified.

Public Laws 86-523 and 89-665 pertaining to historic and archeological materials, data, and properties which are important to American history and culture will be adhered to.

Grade Stabilization: One grade stabilization structure will be constructed in the channel at station 433+00 in Reach I. This structure will allow the water from the channel to enter the Missouri River on a stable grade. This will be a straight drop spillway with a capacity of about 375 cubic feet per second. This capacity is based on a storm that has a 1 percent chance of occurring. The total drop in this structure will be about 9.6 feet. Refer to the typical drawing on the following page.

Operation and Maintenance

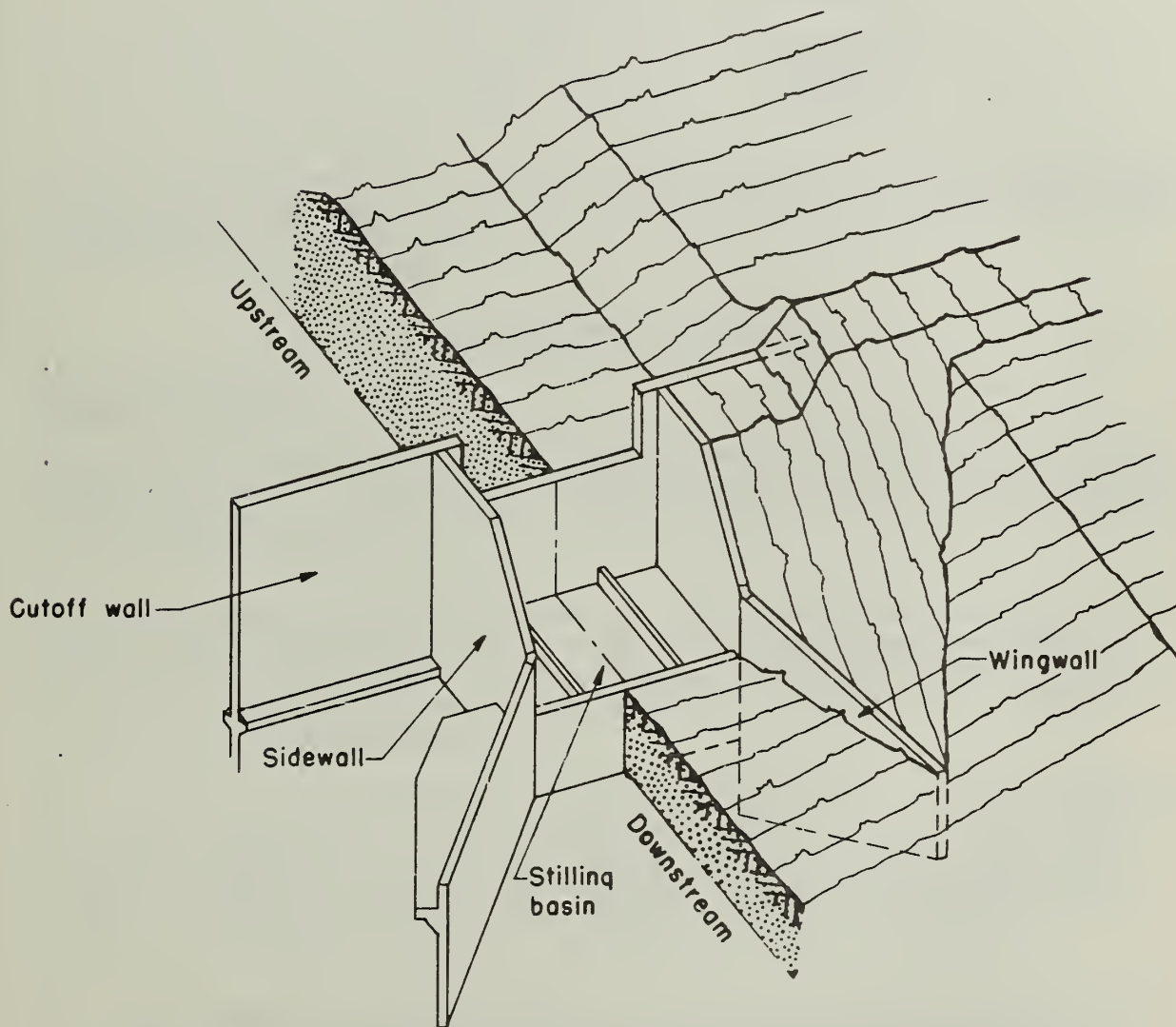
The operation and maintenance of land treatment measures will be performed by the landowners and operators on whose land they are applied in accordance with the Conservation District Agreements. Periodic inspections will be made by personnel of the Yankton County Conservation District, the Mission Hill Watershed District, the Soil Conservation Service, and the Forest Service, in order to determine maintenance needed to keep the land treatment measures effective.

The Mission Hill Watershed District will assume the responsibility for operation and maintenance of structural measures. This responsibility will be outlined in the Operation and Maintenance Agreement that will be executed prior to awarding construction contracts. These agreements will be between the Soil Conservation Service and the Mission Hill Watershed District. Average annual operation and maintenance costs are estimated to be \$1,580.

As the structural measures are constructed, operation and maintenance funds will be collected. When the project is completed, a reserve fund will be available equal to, or greater than, the annual operation and maintenance cost estimated to be \$1,580. An operation and maintenance budget will be developed each year to take care of current needs and to maintain the reserve fund. The Mission Hill Watershed District and the Soil Conservation Service will make a joint operations and maintenance inspection annually, after unusually severe floods, and after the occurrence of other unusual conditions that might adversely affect the structural measures. These inspections will continue for at least 3 years following installation of each structure. Inspections after the third year will be made annually by the Mission Hill Watershed District. They will prepare a report and provide a copy to the Soil Conservation Service employee responsible for operation and maintenance inspections and followup. In situations where conditions indicate need for continued Service assistance, the Service may provide assistance after the third year.

The items of inspection will include, but are not limited to, the condition of the structure and appurtenances, the vegetative cover, the need for control of vegetation to prevent the reduction of channel capacities, and the need for the removal of accumulated sediments in the channel. Other items which may require frequent maintenance are the clearing of trashracks after severe storms and maintaining unrestricted outlets below principal spillways.

TYPICAL GRADE STABILIZATION STRUCTURE CONCRETE DROP SPILLWAY



PERSPECTIVE VIEW

The trees installed as mitigation measures will require cultivation during the establishment period and grazing will be prohibited. The watershed district will be responsible for this maintenance.

Project Costs

A summary of total costs of the project follows:

Land Treatment	\$ 23,400
Structural Measures	
P.L. 566	417,260
Other	100,450
Project Cost	541,110

Of the total project cost, P.L. 566 funds will bear \$425,660; \$115,450 will be other than P.L. 566. These totals include the total construction cost of \$330,300, a P.L. 566 cost.

ENVIRONMENTAL SETTING 1/

Physical Resources

Mission Hill Watershed is in southeastern Yankton County near the southeastern corner of South Dakota. The watershed is about 11 miles long with a maximum width of about 2 miles. The watershed has an area of 8,502 acres, or 13.3 square miles.

The population of the watershed is 279. One hundred and sixty-one persons live in Mission Hill, the only town within the watershed boundaries. Yankton, the county seat of Yankton County, has a population of 11,919 and is 9 miles to the southwest of Mission Hill. Vermillion, population 9,128, is 16 miles southeast. 2/

The watershed is in the Missouri Water Resource Region 10 and the Missouri-Big Sioux Subregion 17. The watershed is similar to much of the subregion in eastern South Dakota with low rolling hills on glacial plains with frequent flooding of lowland agricultural lands. Rainfall is above the region and subregion averages but weather patterns are similar.

1/ All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigation by the Soil Conservation Service and the Forest Service, U.S. Department of Agriculture.

2/ Watershed population is estimated. Other population data is from the "1970 Census of Population" U.S. Department of Commerce, Bureau of Census.

Farming is the main land use in the watershed. The ratio of cultivated cropland to other uses is higher than either the region or subregion.

There is frequent flooding of cropland adjacent to the stream channel. The main flooded area is on the broad Missouri River terrace south of Mission Hill and north of State Highway 50. An average of 536 acres are flooded annually. The 100-year frequency storm floods about 1,680 acres of which 110 acres are outside the watershed.

Sheet erosion and runoff contribute to downstream flooding and sediment deposition. Sediment deposition along about 2.4 miles of channel north of State Highway 50 has reduced the channel capacity and increased flooding frequency. One 48-inch culvert was completely covered by sediment in about 16 years.

Erosion rates exceed acceptable limits for sustained production on about 140 acres of cropland above the floodwater retarding structure.

Most of the drainage area above the floodwater retarding structure is in the Houdek-Prosper soil association and a small part in the Ethan-Clarno-Betts soil association.^{1/} These soils are mainly deep, loamy, well and moderately well drained developed on glacial till. Areas on the flood plain which are damaged and will be benefited are principally in the Albaton-Haynie soil association. The Albaton is a deep, poorly drained soil with very slow to slow permeability. The Haynie is a deep, silty, well to moderately well drained flood plain soil with moderate permeability.

Forty-six percent of the watershed is in Land Capability Class I, 39 percent in Class II, 12 percent in Class III, and 2 percent in Class IV. The remaining 1 percent is Class V.^{2/}

Northwest of the town of Mission Hill the watershed is in low rolling glacial moraine hills. South of the town is a Missouri River terrace, about 10 feet above the Missouri River flood plain.

The upper rolling hills area is Late Wisconsin age glacial till. The bedrock underlying the till is Cretaceous age shales, limestones, and marls of the Carlile and Niobrara Formations. The contact between the Carlile and the younger Niobrara lies somewhere just north of Mission Hill. The Missouri River terrace materials in the southern part of the watershed are fine sands and silt overlying Wisconsin age outwash. Bedrock under the terrace is the Carlile Formation. The creek crosses the terrace and enters an abandoned meander channel on the lower flood plain. It follows

^{1/} "South Dakota Agricultural Experiment Station Information Series No. 3" January 1971.

^{2/} Klingbiel, A.A., and Montgomery, P.H., "1961 Land Classification" USDA Handbook 210, 21 pp., Illus.

this channel to the Missouri River.

The topography is low rolling hills in the north half of the watershed. The southern portion is flat with slight undulations. The high elevation, 1,400 feet above mean sea level, is at the extreme northern end. The elevation at the mouth of the watershed is 1,154 feet above mean sea level. The elevation of the main flooded areas in the watershed is between elevations 1,166 and 1,170.

The average annual precipitation is about 23 inches. Extremes at Yankton, South Dakota, the nearest gage, range from 13 inches to more than 38 inches. Most of the precipitation occurs during the summer months from high intensity, short duration rainstorms. The months of April through September account for more than 75 percent of the total precipitation.

Abrupt changes in weather are common. These changes are often caused by warm, moist air from the south meeting cold, dry air from the north. This combination often produces severe weather with intense precipitation. The maximum recorded 24-hour rainfall at Yankton is 7.52 inches. This occurred July 14, 1900. The seasonal snowfall average is about 30 inches.

The average annual temperature is 48 degrees. The average January and July temperatures are 18 and 76 degrees, respectively. Extreme temperatures in the area range from more than 110 degrees above zero to nearly 40 degrees below zero. The average frost-free period is about 161 days. ^{1/}

The only mineral resources in the watershed are sand and gravel. There are gravel pits near the watershed in the terrace alluviums adjacent to the Missouri River. Sands and gravels are mined from remnants of outwash or terrace deposits in the till within a few miles of the watershed. This material is probably present in the watershed but remains undeveloped.

Ground water is available from shallow alluvial and glacial aquifers and deeper Cretaceous artesian aquifers. Flowing artesian wells tapping the Dakota Aquifer are present on the terrace area in the watershed. The waters of both aquifers are of poor quality for domestic, livestock, and agricultural uses due to their high concentrations of sulfates, calcium, and magnesium ions. High mineral content is reflected in the combination of total hardness, expressed as calcium carbonate (CaCO_3) and total solids. High alkalinity is also indicated by the values for total alkalinity and bicarbonates (HCO_3).

^{1/} All precipitation and temperature data from publication of U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

The following data are chemical analyses available from wells in, or adjacent to, the Mission Hill Watershed.

	Artesian	Alluvial	
	Old Mission Hill well 1937 <u>1/</u>	New Mission Hill well <u>2/</u>	Terrace well <u>3/</u> Adjacent to Watershed
Alkalinity, Total	130.0 p/m	325.0 p/m	212.0 p/m
p ^H	7.3	7.2	-
Total Hardness (CaCO ₃)	1,221.0 p/m	874.0 p/m	696.0 p/m
Calcium (Ca)	377.0 p/m	284.0 p/m	188.0 p/m
Magnesium (Mg)	67.0 p/m	37.0 p/m	55.0 p/m
Bicarbonates (HCO ₃)	146.0 p/m	387.0 p/m	-
Sulfates (SO ₄)	1,137.0 p/m	712.0 p/m	400.0 p/m
Iron (Fe)	3.2 p/m	5.6 p/m	trace
Manganese (Mn)	0.2 p/m	1.9 p/m	1.1 p/m
Sodium (Na)	106.0 p/m	75.0 p/m	43.0 p/m
Potassium (K)	20.8 p/m	15.3 p/m	-
Chloride (Cl)	120.0 p/m	14.0 p/m	31.0 p/m
Fluoride (F)	3.0 p/m	0.5 p/m	0.3 p/m
Nitrates (NO ₃)	0	0	0
Total Solids	2,036.0 p/m	1,534.0 p/m	1,138.0 p/m

1/ "South Dakota Public Waters Supply Data" South Dakota Department of Health, October 1966.

2/ On file - South Dakota Department of Environmental Protection.

3/ Jorgensen, D. G., "1966 Geology and Shallow Ground Water Resources of the Missing Valley Between North Sioux City and Yankton, South Dakota" South Dakota Geological Survey - Report of Investigation No. 86.

Water quality information available on the till aquifers to the east, in Clay County, indicate they generally contain very hard, slightly saline water with iron, manganese, sulfate and dissolved solids in excess of the U.S. Public Health Service (1962) standards. These aquifers may be comparable to the till aquifers in the Mission Hill Watershed.

The use of a particular ground water source generally indicates what is available and not necessarily a good quality source.

The land use in the watershed, with the exception of the town of Mission Hill, is devoted to agriculture. Eighty-five percent, or 7,238 acres, of the total land is cropland. There are 574 acres of grassland and 120 acres of native woodland. The remaining 570 acres include the town, roads and road ditches, farmsteads and windbreaks, feedlots, and various minor uses.

The area subject to flooding is 91 percent cropland. Pasture, woodland, and miscellaneous uses comprise the remainder.

The entire stream is ephemeral (E), flowing only during spring snowmelt runoff and rainstorms. It has a stream gradient of about 25 feet per mile. Agricultural use of the watershed has caused changes in the channel characteristics from the head of the watershed to the town of Mission Hill. Other modifications along the channel upstream from town are at bridge crossings.

Southeast of the town of Mission Hill much of the channel is man-modified (M) to the point where it enters the abandoned meander channel at station 385+70. The channel was aligned to run parallel with the railroad, probably when the railroad was built. This alignment continues to the county road 1 mile east of Mission Hill. Modifications and alignment changes were made at all the bridges downstream. About 1915, a large capstan plow was used to clean and deepen the channel between stations 239+90 and 385+70. In 1952, several reaches in the same area were widened and deepened to release trapped floodwater. About 1.5 miles of channel was affected at that time. Blasting was used to clear sediment from the channel below State Highway 50.

Trees along about 800 feet of channel were removed downstream from station 320+90 in 1967. A few areas of trees and brush occur along the channel but most areas are intensely farmed up to the banks and through the channel in some places. In areas of pasture, the channel is grazed. Aggradation is occurring because of the flat gradient.

At the present time, water from runoff remains ponded for short periods of time in the channel from a point about 1 mile north of State Highway 50 and upstream for a distance of 1.2 miles. Normally this reach is dry. Stream gradient from just east of Mission Hill to the oxbow is nearly level.

The abandoned meander channel is classified natural (N). Agricultural use along the channel has changed its characteristics. Gradient in the oxbow is less than 5 feet per mile.

The stream is in the intermittent stream category according to "Water Quality Standards for the Surface Waters of South Dakota." ^{1/}By the standards' definition, when streams exhibit zero flows they automatically revert to the intermittent stream category.

There are no stream gages in the watershed nor is surface water quality data available.

Individual septic tanks for disposal of sewage serve the homes in Mission Hill. No known problems exist.

Two potholes of about 2 acres each are at the extreme northern end and are the only wetlands in the watershed. They are classified Type III as defined in "Wetlands of the United States" Fish and Wildlife Service, Circular C-39.

^{1/} Adopted by The South Dakota Committee on Water Pollution, February 16, 1967.

Plant and Animal Resources (Flora and Fauna)

Significant wildlife species in the watershed are white-tailed deer, pheasant, bobwhite, gray partridge, cottontail, fox squirrel, and mourning dove. Waterfowl make limited use of the area during the spring and fall migrations. There are also jackrabbit, raccoon, fox, badger, skunk, and other animals and birds.

Brushy draws, vegetated fence rows, road ditches, waterways, field and farmstead windbreaks, and other areas currently provide habitat for wildlife within the watershed.

The two areas considered "most natural" are a woody plant community of about 35 acres just southwest of Mission Hill and a 200-foot wide strip of deciduous woodland along the Missouri River. Both sites have secondary plant succession due to disturbances by man, animals, and fire. Some secondary succession is taking place along the Missouri River because deposition of sediment from Missouri River flooding has been virtually stopped.

A deciduous tree and shrub community, with openings and borders of true prairie, occur on the 35-acre site. Predominant trees are green ash, American elm, and boxelder; shrubs are American plum, chokecherry, currant, smooth sumac, poison ivy, and western snowberry. Kentucky bluegrass and smooth brome grass are invading the grassland. The Missouri River site is dominated by plains cottonwood, peachleaf willow, and green ash, with a sparse understory of American plum, chokecherry, some broad-leaved forbs, and a light scattering of grass.

The floodwater retarding site is located in heavily grazed pasture and cropland and is not used by most kinds of wildlife.

Reach IV provides little cover for wildlife since it is mainly heavily grazed pasture and some cropland.

Reach III through Mission Hill contains grassy areas and trees planted by homeowners. This reach provides some habitat for squirrel, cottontail, mourning dove, and songbirds.

Reaches I and II have a variety of habitat usable by most of the species listed. About 5 acres of herbaceous habitat occur along the proposed channel. A total of about 140 acres of trees in 14 farmstead shelterbelts and in ribbons along the oxbow and the Missouri River occur in that part of the watershed adjacent to the channel in Reaches I and II.

There are no fish within the watershed. All land is in private ownership except public roads, etc.

No plants or animals in the watershed are listed in the "Federal Register" as endangered or threatened species.

Economic Resources

All the land in the watershed is privately owned except for county roads and streets in Mission Hill. Using county census data, which should be representative of the watershed, 44 percent of the farmers own all the land which they farm while another 39 percent own at least a portion of the land farmed. 1/ The majority of residents living in the town of Mission Hill own their homes.

Census data indicate that livestock sales contribute more than 75 percent of the income received by farmers living in the county. Most of the corn, oats, and alfalfa is fed to livestock.

An estimated 80 people own land in the watershed. However, only 31 farmers live in the watershed with a third of the farmers located in the benefited area. The average size of the farms is 275 acres.

The primary crops produced are corn, alfalfa-brome, oats, and some soybeans. The estimated flood free crop yields per acre under "future without project conditions" are: corn, 95 bushels; corn silage, 19 tons; alfalfa-brome mixture, 5.5 tons; and soybeans, 45 bushels. The average crop yields per acre for the entire watershed under "future without project conditions" are: corn, 85 bushels; corn silage, 17 tons; alfalfa-brome mixture, 4 tons; and soybeans, 35 bushels.

The value of cropland in the upland is \$250 to \$375 per acre. Under present conditions, cropland on the flood plain averages about \$325 per acre. The average value of the homes in Mission Hill subject to flooding is about \$5,000.

The watershed is served by U.S. Interstate Highway 29, which is 20 miles east, and U.S. Highway 81, which is 6 miles west. Both U.S. Highways are accessible to the watershed by several east-west, hard-surfaced roads, including State Highway 50. The area is also served by the Burlington-Northern Railroad and by the Chicago, Milwaukee, St. Paul, and Pacific Railroad. Sioux Falls and Sioux City, 60 miles away, and nearby Yankton, provide market alternatives for sale of livestock. Grain is marketed in Mission Hill and several other nearby towns. Some alfalfa is sold to alfalfa processing plants a few miles from the watershed.

The watershed is located in a stable environment, assuming that the county statistical data is representative. The unemployment rate for Yankton County in 1970 was 2.7 percent. The rural farm unemployment rate was 1.7 percent for Yankton County. 2/

1/ "1969 Census of Agriculture" U.S. Department of Commerce.

2/ "1970 Census of Population" U.S. Department of Commerce.

The average market value of all agricultural products sold in the county was \$22,886 per farm. Four percent of the farms hired additional farm labor for more than 150 days. Thirty-two percent of the farmers received income from off-farm sources. ^{1/} This data is probably representative of the watershed. Because there is no opportunity for off-farm employment in the watershed, part-time jobs are sought in Yankton, Vermillion, and other nearby towns.

Although many residents of the watershed are dependent on income from agricultural sources, new programs are being enacted to provide improved economic and social conditions in the area. Examples of such programs are the approved multicounty Lower James Resource Conservation and Development Project and the Third Planning and Development District.

The following table compares the median earnings of several groups of people in the state and in Yankton County. The source of the data is the "1970 Census of Population" Bureau of Census, U.S. Department of Commerce.

	<u>State</u>	<u>Yankton County</u>
Professional, Managerial	\$8,467	\$8,955
Farmers and Farm Managers	4,812	4,575
Labor, Except Farm	3,487	1,535
Farm Labor	1,902	3,145

Recreational Resources

Recreational activities in the watershed are limited to hunting and trapping. There are no fishing opportunities within the watershed. Some fishing is provided by the James and the Missouri Rivers adjacent to the watershed. Hunting of game birds, waterfowl, deer, rabbit, and squirrel provides seasonal recreation. Trapping furbearers provides some income and recreation opportunities.

Water-based recreation in the watershed is limited to the "old swimming hole" in the Mission Hill town park. Sediment and algal bloom reduce the water quality in the pond. Lewis and Clark Lake on the Missouri River, 4 miles west of Yankton, is the main recreational lake in the area. Boating, fishing, swimming, and camping are all available at the lake.

Archeological and Historical Resources

There are no sites in the watershed listed in the "National Register of Historic Places," nor are any historic sites on record with the Director of the South Dakota Historical Society. There are no known archeological or scientific sites in the watershed. The State Historic Preservation Officer and the State Archeological Commissioner have been consulted.

^{1/} "1969 Census of Agriculture" U.S. Department of Commerce.

Soil, Water, and Plant Management Status

There is no significant trend toward change in land use; however future market conditions may influence decisions for land use. Farmers in the flood plain are reluctant to use fertilizers and proper management practices for optimum yield because of the high flood hazard. The land treatment program is lagging in the flood plain area. Conservation practices are needed on about 70 percent of the watershed for the conservation of soil and water, and use within its capability.

The Yankton County Conservation District is active in conservation programs which affect the watershed. They are on record as supporting land use laws and shifts in land use to reduce erosion. The district actively promotes conservation farming. They advertise conservation with paid radio and newspaper spots. They have one full-time employee who promotes conservation through district programs such as conservation tours, high school awards, speech contest, and assists in the Soil Conservation Service field office.

There are 25 cooperators in the watershed and 18 basic farm plans. About 59 percent of the conservation practices needed to reduce runoff and control erosion on cropland have been applied in the upland. Most of the pasture and hayland needs better management for increased production. Seventy-eight percent of the watershed is covered by district cooperator agreements. There are 2,154 acres of cropland, 321 acres of pasture, and 65 acres of woodland that are considered to be adequately treated.

Yankton County is included in the Lower James Resource Conservation and Development Project. The conservation district has requested and received revenue sharing funds from the county to continue its conservation work.

The area is now protected by a rural fire district. Equipment procurement, fire training, and fire prevention education will continue to be developed by the South Dakota State Forester cooperating with the Forest Service through the Cooperative Forest Fire Control Program. Adequate watershed protection can be achieved through this program without acceleration.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

Wind and water erosion of organic matter and topsoil in the uplands has reduced soil fertility and productive capacity. A 5-ton per acre annual loss is that loss which most soils can tolerate without a loss of productive capacity. There are approximately 225 acres above Reach II which have computed soil losses ranging from 5 to 9 tons per acre annually. The loss

of agricultural chemicals, including fertilizers, insecticides, and herbicides is closely associated with sediment production. Phosphorus is fixed to the soil particle and little leaves the field except with the sediment. Much less nitrogen moves with sediment. Certain insecticides and herbicides also attach to soil particles, especially clay colloids, and move into the stream system. Water runoff decreases the amount available for the plants and induces downstream flooding. The need for a more intensive conservation education program is a problem associated with getting conservation on the land.

Floodwater Damage

The flood area is divided into four reaches. (See project map.) Reach IV is between the proposed floodwater retarding structure and the town of Mission Hill. Floodwaters in this reach have high velocities that overtop and wash out roads, flood pastures and cropland, damage crops, and deposit debris on the land. This flood plain is narrow and the duration of flood flows is generally short. Reach III is the area through the town of Mission Hill. The high velocity flows from above cause damage to homes in Mission Hill on the average of once every 5 to 6 years. Nine homes, with an average value of \$5,000, are subject to flooding from the 100-year flood. Floodwaters from intense summer storms overflow the channel, overtop roads and bridges, and damage homes, garages, yards, gardens, fences, and other property. Sediment is deposited in the flood plain and has reduced the channel and bridge capacities. Other debris is also scattered on the flood plain. There is also a possibility of loss of life. Floods from snowmelt runoff in Mission Hill are usually less intense and damages are generally restricted to the overtopping of roads and bridges and flooding of yards.

Reach II is from Mission Hill downstream to the Chicago, Milwaukee, St. Paul, and Pacific Railroad. This is the reach where most serious agricultural damages occur. Some flooding occurs nearly every year on cropland as a result of runoff from summer storms. These storms usually occur in May or June. Sometimes two or more storms each year add to the flooding problems. The depth of flooding is normally shallow but may be several feet in some places. The duration of flooding is often several weeks and will last longer in some areas when followed by above normal precipitation. The long duration of flooding is a result of inadequate channel capacity. The channel capacity has been continually decreasing because of sediment deposition, encroachment by willows, and farming operations.

Wind and waterborne sediments have been deposited along most of the length of the existing channel in Reaches I and II. This sediment deposition, along with willows growing in the channel and downstream farming operations in Reach I, have retarded flows even more. At South Dakota State Highway 50 in Reach I, a culvert about 4 feet in diameter is filled with sediment as is the channel both above and below this point. Flows presently go through a box culvert at a higher elevation.

Problems also result from snowmelt runoff in Reach II. This usually occurs in March or early April. This flooding may also last for several weeks. In severe cases, some land remains wet for much of the season when these floods are followed by unusual spring and summer rains. When the floods occur before the normal planting dates, seeding is usually delayed several weeks and it sometimes becomes too late to plant. Floods occurring later in the season either damage or kill the crops or prohibit cultivation and proper care.

The frequent flooding limits the choice of crops that can be grown to those that are most tolerant of flooding. This makes it more difficult to properly manage the land. The floodwaters also spread weed seeds and hinder control by either cultivation or herbicides. There is a constant threat of livestock disease transported by the floodwaters. Several farmsteads are isolated by large floods and additional travel is necessary. The flood plain is poorly defined in this area.

When snow or debris has reduced the channel capacity, or during extremely high flows, floodwaters overflow the divide and leave the watershed.

Flooding in Reach I is generally infrequent, although a few small areas at the upper end flood almost annually. The flooding is limited to cropland, pasture, and some woodland. There are few limitations of use. Since the channel capacity is restricted due to sediment, there also exists a potential for flooding of large areas from intense storms in the immediate area.

A severe flood in the watershed occurred on May 22, 1966. On that day, 2½ to 5½ inches of rain fell within a few hours.

Ground cover was at a minimum since most of the cropland was in a near fallow condition. This probably increased the runoff from the storm. Floodwaters came rushing out of the hills, overtopping and washing out a road in Reach IV. Nine homes in Mission Hill sustained severe damages to the structures and contents. These homes received about \$10,000 damages from this flood. One of these homes was moved off its foundation from the force of the water. Several garages and other buildings were flooded, as were yards and gardens. An auto repair shop had \$1,700 damage. Four families were rescued from their homes by boat. Roads were overtopped and damaged. After rampaging through Mission Hill, the floodwaters reached the agricultural area identified as Reach II where they spread out inundating 855 acres. Nearly all the crop in that area was destroyed. Some of the area was reseeded with a late crop and some of the area produced no harvest at all in 1966. In addition, debris was scattered on the flood plain. The runoff from the storm that caused the flood in this agricultural area has about an 18 percent chance of occurring in any year.

Most of the water remained in Reach II but some moved slowly downstream into Reach I. Only minor flooding occurred in Reach I.

The principal crops grown in the flood hazard area are corn, alfalfa, oats, and soybeans. Oats is used primarily as a companion crop with alfalfa. Most of the corn, alfalfa, and oats is fed to livestock. About 91 percent of the flood plain is cropland.

About 21 landowners have land in the flood plain. Ten of the operating units are located in the flood plain. The average size of the operating unit is 270 acres. Land values average \$325 per acre.

The average annual flood damages to crop and pasture are \$37,700. Agricultural damages to fences, farm equipment, and other farm losses are \$4,100. Roads, bridges, and railroads have annual damages of \$1,500. Average annual damages to homes in Mission Hill are \$900. Annual sediment damages are \$2,530 and indirect damages are \$4,670. Total average annual damages are \$51,400. The total area subject to flooding from a 100-year frequency storm is 1,680 acres, of which 110 acres are outside the watershed. Based on past trends and continued accumulations of sediments and other blockage of the existing channel, flood conditions will continue to become more severe in Reaches II and III.

Erosion Damage

Gentle slopes throughout the watershed limit the erosion and associated problems. Sheet erosion is low to moderate in most areas. There is almost no sheet erosion due to water on about 1,700 acres south of Mission Hill. Sediment accumulates over much of the flood plain in Reaches I and II. The average annual sheet and rill erosion rate for cropland in the upland is 4.4 tons per acre. The highest rate calculated on cropland on the upland is 8.8 tons per acre. Sheet and rill erosion from pasture in the upland area is calculated at 2.6 tons per acre annually.

The road ditches in the watershed are well grassed and generally act as sediment traps. One gully was observed in the watershed. The gully head has stabilized at a county road culvert just downstream from the planned floodwater retarding structure. The gully is the only reach of channel where erosion is active. Gully, road, streambank, and channel erosion amounts to less than 5 percent of the total erosion in the watershed.

The flood plain soils are generally more susceptible to wind erosion than the upland soils.

There are no critical sediment source areas in the watershed.

Sediment Damage

Sediment deposition occurs in conjunction with flooding in the watershed on about 1,570 acres. About 536 acres receive sediment deposition on an average annual basis. The type of sediment deposited on cropland is fine grained and does no permanent damage to the land. Damage to crops is only

during flooding. Sediment increases damages to hay crops because particles of sediment adhering to the hay make it less desirable for feeding livestock. The total area of hayland and pasture damage from sediment is 297 acres. The average annual damage is \$880.

Sediment derived from sheet erosion is deposited in two areas as shown on the project map. Area A receives large quantities of sediment which is deposited on pasture, hayland, and residential lawns. The town area is about 25 acres, including 4 acres of lawn and garden which receive about \$80 average annual damage. Area B receives sediment damage mainly to the channel where filling is increasing flooding frequency. Sediment has filled bridges and culverts. One 4-foot culvert has been buried and at least 6 feet of sediment has accumulated under some bridges.

Channel blockage was blasted open in the past. This was done during severe flooding and resulted in floodwaters flowing through the breach carrying large amounts of sediment to the Missouri River. Since the blasting, wind and waterborne sediment has blocked the channel causing flood problems again. The average annual damages to roads, bridges, and channel are \$1,570.

There are no downstream reservoirs.

About 125 tons of sediment leave the watershed on an average annual basis. Much of this is from erosion and runoff south of State Highway 50. Sediment leaving the Mission Hill Watershed is dispersed in the Missouri River. The average annual flow in the Missouri River, measured at Yankton for the period 1955 to 1969, was 15,787,000 acre-feet, according to information received from the Corps of Engineers. This compared with a 50 percent chance annual yield of 180 acre-feet from Mission Hill Watershed. Using the estimated 50 percent chance yield, the sediment concentration in the water leaving the watershed is calculated to be about 510 p/m. Sediment concentration in the Missouri River at Yankton averaged 89 p/m between 1955 and 1969, according to information received from the Corps of Engineers. The attachment of pesticides and fixation of phosphorus, and nitrogen to a lesser degree, can make clay size sediment a severe contaminant of surface waters. Monitoring of water has not been done so it is not known what magnitude of agricultural contaminants are leaving the watershed. It is assumed that phosphorus and pesticides are attached to sediment whereas most nitrogen would be in solution in the water. Samples taken of Missouri River water at Yankton, South Dakota, and Omaha, Nebraska, in 1966, showed no measurable level of pesticides. ^{1/}

Drainage Problems

There are no known areas of high water table which require drainage. Wet conditions occur for extended periods because of channel blocks. The fine

^{1/} "Pesticides in Our National Waters" R.S. Green, C.H. Gunnerson, and J. J. Lichtenberg, "Agriculture and the Quality of Our Environment."

grained texture of the affected soils requires long periods of drying before farming operations can be resumed.

Irrigation Problems

There are about 130 acres of irrigation in the watershed at this time. There is potential for additional irrigation on the level lands south of Mission Hill. Wells in the Missouri River alluvium could provide adequate quantities of suitable quality water. Soils are the Albaton-Haynie and the Haynie-Sarpy associations. These soils are suitable for irrigation with few hazards. Corn, soybeans, and alfalfa are the principal crops and would be easily adapted to irrigation. Interest in irrigation development is increasing in the immediate area of the watershed.

Municipal and Industrial Water Problems

The town of Mission Hill has a water system supplied by a shallow well in alluvium which is adequate for the present and near future needs of the town. There is no demand for industrial water at this time.

Recreation Problems

There are no water-based recreation facilities within the watershed with the exception of the town's "swimming pond" which is fed by artesian flow. Boating, fishing, swimming, and camping facilities are available within 15 miles of Mission Hill at Lewis and Clark Lake. The Missouri River provides fishing and limited boating near the outlet end of the watershed.

Because of the excellent existing facilities at Lewis and Clark Lake and the relatively stable population, there is limited interest in future development of recreation resources.

Plant and Animal Resource Problems

Sediment deposition in two Type III wetlands and other water storage areas has reduced the quality and quantity of available wildlife habitat. These wetlands are temporary and need to be developed to provide maximum utilization by wildlife. Frequent flooding along the channel is a threat to nesting game birds. There are no fisheries within the watershed. There are no known pollution problems caused by excess nutrients or pesticides.

Water Quality Problems

Domestic and livestock water is adequately supplied by wells. There are no problems in the watershed pertaining to ground water recharge and water quality management.

Economic-Social Problems

County census statistics reveal that 14 percent of the farmers receive less than \$2,500 annually from the sale of agricultural products. ^{1/} These farms are considered low income producing units. Another indicator of the need to increase farm income is shown by comparing the mean income of farm families, which was \$3,895 in 1969, compared with over \$8,000 for the self-employed or regular wage earner working in town. ^{2/} These data are considered representative of the watershed, although published data is not available to substantiate this assumption. Only 4 percent of the farmers in the county hired more than 1½ man-years of outside help. ^{3/}

The area where the watershed is located is not considered to be economically depressed. However, some people in the watershed need to improve their economic and social environment. Also, census data suggest a need to improve the alternatives for off-farm employment, especially for women seeking such employment.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

The proposed project conforms with and will be complemented by the objectives of the Lower James Resource Conservation and Development Project. Mission Hill Watershed lies within the RC&D project area; therefore lands in the watershed will be eligible for long term cost sharing for conservation practices.

The Lower James Conservancy Sub-District supports the objectives of the proposed project and has given financial support to the watershed district.

The county commissioners, in cooperation with the Third Planning and Development District, are developing land use zoning which will include restrictions on flood plain development in Mission Hill. This will conform with the proposed plan.

ENVIRONMENTAL IMPACTS

Conservation Land Treatment

The conservation cropping systems and crop residue use that will be applied to cropland will reduce wind and water erosion and increase the ability of

^{1/} "1969 Census of Agriculture" U.S. Department of Commerce.

^{2/} "1970 Census of Population" U.S. Department of Commerce.

^{3/} "1969 Census of Agriculture" U.S. Department of Commerce.

the soil to absorb water. This helps to reduce downstream flooding, increases the available soil moisture, and improves and maintains the physical condition of the soil. The primary effects of land treatment are conserving the soil as a productive resource (19.6 percent soil loss reduction), protection of structural measures against sedimentation (17.5 percent reduction), and improved water quality (416 p/m reduction).

Contour farming and terraces delay the downstream movement of the water thereby allowing more water to infiltrate the soil. Terraces carry the excess water at a nonerosive velocity to a grassed waterway which safely disposes of excess water without erosion damage. Also eliminated is the inconvenience and cost of detouring around gullies. The grass turnstrips generally used with contour farming and grassed waterways provide nesting cover, food, and shelter for upland game. The farmstead windbreaks and field windbreak plantings provide cover for upland birds, animals, songbirds, and big game. The ponds for livestock water are used by all forms of wildlife. Pasture and hayland planting and pasture and hayland management provide additional vegetation usable by wildlife.

Pasture and hayland management and pasture and hayland planting will reduce runoff and increase pasture production. Increased pasture production provides economic returns that encourage the use of land as pasture or hayland in contrast to cropland.

The forest land treatment program will make woodlands more effective in holding water, reducing erosion, and reducing downstream sedimentation. Forestry measures maintain and improve the watershed protection benefits of existing tree cover. Farmstead and field windbreaks prevent soil from blowing and protect buildings.

Ponds for livestock water help to properly distribute grazing and enhance the opportunities for higher livestock gains.

The accelerated land treatment measures reduce the volume of sediment deposition in 4 acres of wetlands. Turnrows used with contour farming and terraces are generally seeded to alfalfa or grass. Grassed waterways also create additional vegetated areas by converting raw gullies and waterways to areas of herbaceous cover.

Structural Measures

When the land treatment and structural measures are installed, both agricultural and nonagricultural damages by flooding will be reduced 87 percent. The high degree of damage reduction is due to the favorable location of the floodwater retarding structure relative to the benefit area in combination with channel work.

The 7 surface-acre sediment pool of the floodwater retarding structure is not expected to hold water for long periods of time; however it will provide a small, temporary wet area in which a fringe of aquatic vegetation

will develop. The earth embankment and emergency spillway will be revegetated with grass. Trees and shrubs will also be a part of the revegetation. This will provide 23 acres of herbaceous cover and 2 acres of woody cover. Grazing will be carefully controlled on this area. There are 2.9 miles of channel work in areas that are presently in cropland. These areas will be seeded to grass and will provide additional permanent vegetation. Revegetation of disturbed soils will include woody plantings in selected areas along the channel for esthetic values and wildlife habitat.

The floodwater retarding structure will provide 100-year frequency protection from floodwaters immediately downstream in Reach IV. (See project map.) The county road which has washed out or been damaged many times in the past will be protected from overtopping. Crop and pasture damage will be eliminated for all but the most severe storms and debris will be trapped. The floodwater retarding structure will control 5.85 square miles, or 94 percent, of the drainage area above Mission Hill. The 845.4 acre-feet of flood storage and the principal spillway release of 106 cubic feet per second will control the runoff from a 100-year frequency flood without emergency spillway flow. Flood protection to the existing homes in Mission Hill will exceed 100-year frequency. While the proposed reservoir offers a high degree of protection to existing property, it would still be possible to have flooding and damages in the future if very unusual rainfall amounts occurred. Future flooding may come from the uncontrolled area above town and flow through the emergency spillway. Although the uncontrolled area below the floodwater retarding structure is relatively small and the potential peaks will be reduced, further development of the flood plain for homes or other high value property is discouraged.

Fences, roads, bridges, garages, at least nine houses, and other property in Mission Hill will be protected from flood damage from most floods. The personal safety and well-being of the residents will be improved.

Protection from overtopping of roads and bridges in Mission Hill will also exceed a 100-year frequency storm if debris does not obstruct the bridges.

If the project had been installed prior to the 1966 storm, peak flows in Mission Hill would have been reduced so that no damage would have occurred to nine homes.

The works of improvement will not eliminate flooding in the agricultural area of Reach II but will reduce the damages. Floods of a 5-year frequency summer storm, or smaller, may temporarily inundate cropland but the duration of flooding will be reduced from several weeks to less than 24 hours. Floods greater than a 5-year frequency summer storm will cause flooding for more than 24 hours but damages from these storms will also be reduced by the removal of the floodwater. Floods from snowmelt will also occur but removal of floodwaters will begin as soon as the channel is clear of ice and snow. This will reduce the delay in spring planting from several weeks or more to a few days.

With the project installed, acres flooded more than 24 hours in Reach II from a 100-year storm will be reduced from 1,100 acres to 665 acres and the average annual flooding from 475 acres to 55 acres.

If the project had been installed at the time of the 1966 flood, the flooding of 855 acres for more than 24 hours would have been reduced to 55 acres. This reduction in duration of flooding would have reduced damages to the existing crops and lessened the need for replanting.

The installation of the floodwater retarding structure and the removal of the sediment from the channel will prevent the overflow of floodwater out of the watershed for most storms.

The restoration of the channel in Reach I to its approximate historic grade will remove floodwaters which are currently trapped by the sediment filled channel. It will also reduce flooding from upstream flows and from large rainstorms and snowmelt floods in the adjacent area. Flows will be diverted to the southwest and through the grade stabilization structure where the water will enter the Missouri River at nonerosive velocity.

The project will reduce the area flooded from a 100-year frequency flood from 1,680 acres to 1,055 acres.

Twenty-one landowners in the flood plain will benefit directly from the flood control measures. The remaining landowners will benefit from the acceleration of the planning and application of the soil and water conservation measures. In addition, all taxpayers will benefit from the reduction in road and bridge damage. A more stabilized and better income to farm families will aid in the overall economic development of the area. Local underemployed laborers' income will be increased because of the installation and maintenance of the structural measures. Business will increase as a result of additional services required by farmers living in the watershed. Processing of agricultural products and selling of products used by farmers will be stimulated.

Peak flows in the watershed will change substantially. The estimated 100-year peak flow at the floodwater retarding structure will be reduced from 2,850 cubic feet per second to 106 cubic feet per second. At the lower end of Reach II, where removal of the sediment from the channel is proposed, the existing flows for a 5-year frequency storm are a few cubic feet per second. With the channel restored it will have the capacity to remove the 5-year frequency, 24-hour runoff from the uncontrolled area, plus the release from the low stage of the floodwater structure. This combined flow is 94 cubic feet per second.

Land use in the flood plain with the project is expected to change very little. About 70 percent of the flood plain is used for corn production. Most of this corn is used for livestock feed. Second in importance is

alfalfa-brome grass mixture grown on 26 percent of the flood plain. Soybeans and other uses make up the remaining 4 percent. Future use with the project may depend on market conditions.

Benefits from increased production of surplus crops on new lands are not necessary for economic justification. About 321 acres will receive more intensive use benefits. These benefits will accrue by insuring more efficient use of the flood plain with the flood hazard reduced. Operators will make better use of fertilizers and other management practices which contribute to a stabilized net income for farmers and provide for a better life in rural America.

The 7 acres of pasture in the sediment pool will have a gradual loss of value for grazing as the sediment pool fills over the 100-year period. The construction of the floodwater retarding structure and emergency spillway will result in a change of use of 23 acres of cropland with a resulting annual loss of 1,100 bushels of corn and 17 tons of alfalfa. Change of use of 25 acres of cropland due to channel work will result in an annual loss of 1,500 bushels of corn and 30 tons of alfalfa.

Erosion rates in the watershed will be reduced by land treatment. Sheet and rill erosion will be reduced 1,500 tons annually, or about 20 percent. About 98 percent of the sediment produced and delivered to the floodwater retarding structure will be trapped behind the structure.

Sediment deposition in the channel will be reduced from an estimated 0.15 foot per year to 0.04 foot per year. Sediment damage to roads, bridges, and channel will be reduced 67 percent. Annual nonpermanent sediment damage to cropland and hayland will be reduced coincidental with flooding.

The reduction in sediment, through improved land management and flood control, will reduce the sediment concentration and associated agricultural chemical contaminants. Fertilizers, particularly phosphorus, become fixed to clay particles and are moved from the croplands when the soil is eroded. Herbicides and insecticides also attach to some soils and move when the "host" particle is eroded. The sediment is moved into the stream system with the associated contaminants, increasing turbidity and generally decreasing the water quality.

Average annual sediment yield from the watershed will be reduced to about 89 tons after the project has been installed. The average annual sediment rate without the project is estimated at 125 tons. This is a reduction of 36 tons annually. Conservation practices installed in the watershed, plus the sediment trapped behind the floodwater retarding structure, will reduce gross sediment rates. Based on estimated gross erosion rates, sediment delivery ratios, and average annual yield, it is determined that the sediment concentration of water leaving the watershed will be reduced to

about 94 p/m. This compares with the sediment concentration of 89 p/m measured in the Missouri River during the period of 1955 to 1969, according to information received from the Corps of Engineers.

The project will modify the channel characteristics of 2.8 miles of channel by deepening, widening, and relocating. This will remove the obstructions that have formed due to wind and waterborne sediments and farming operations and will allow floodwaters to move downstream. A total of 94 acres of cropland, pasture, herbaceous habitat, and woody habitat will be disturbed during construction of the channel. Use by wildlife and agriculture will be interrupted. Sixteen acres of the disturbed area is adjacent to cropland and presently provides herbaceous habitat. These areas receive little or no grazing use. With the project, 42 acres of channel berm and spoil area adjacent to cropland will be seeded to grass and will provide herbaceous habitat for wildlife. This is a habitat gain of 26 acres. Little or no grazing use is expected on this area. There will be a loss of 25 acres of cropland. Areas presently pastured along the channel are expected to remain in pasture as they are associated with the farmstead livestock operation. About 30 acres of cropland and pasture will be disturbed by construction of the floodwater retarding structure. Agricultural and wildlife uses will be interrupted. Maintenance measures necessary to remove accumulated sediment will cause a periodic disturbance of vegetation in the channel.

Seven acres of pasture and about 0.6 mile of ephemeral stream will be temporarily inundated when the sediment pool is full of water. Its use for grazing will be reduced. When the flood pool is full of water it will draw down in approximately 13 days. A 10-year frequency storm will inundate less than 50 acres for about 10 days. About 10 acres of cropland in the 10-year pool will be converted to pasture. Agriculture or wildlife use will be interrupted during inundation. The floodwater structure and associated emergency spillway will occupy about 2 acres that are presently pasture and 23 acres that are now cropland. Agricultural and wildlife use will be interrupted during construction. Upon completion of construction these acres will be revegetated. This area will be fenced and protected from grazing during the period of grass establishment. Because of the critical nature of this site, grazing, if it is permitted, will be limited. The vegetation that protects these soils will provide habitat for upland game.

The net change in land use expected as a result of the project are a loss of 58 acres of cropland. There will be a gain of 1 acre of woody habitat, 8 acres of pasture, and 49 acres of herbaceous habitat that will receive no, or light, grazing.

Changes from private to public ownership of land are not anticipated.

There are no wetlands that will be affected by the project except two areas previously described that will benefit from reduced sediment due to land treatment.

Economic and Social

The economy of the watershed is dominated by agriculture. Opportunities for employment within the boundaries of the watershed are limited. However, an unemployment rate of less than 3 percent for Yankton County suggests that alternative opportunities for employment are available nearby.

The opportunity for increasing agricultural efficiency and income stability from supplemental sources is limited. A more stabilized income is expected for farm families living in the flood plain. Business will improve as a result of additional services required by farmers. Processing of more agricultural products and increased sales of production inputs, such as fertilizer, will stimulate the local economy.

Secondary effects of the project will result in increased income earned by the locally underemployed laborers resulting from installation and maintenance of the structural measures. This will provide a stimulus to the local economy and help make rural America a better place in which to live. The installation of the project will result in no change of available open space.

Refer to Appendix A for summary of annual project costs, benefits, and benefit-cost ratio.

FAVORABLE ENVIRONMENTAL EFFECTS

1. Reduce sediment production by 1,500 tons annually.
2. Reduce downstream sediment damages to roads, bridges, and channel by 67 percent.
3. Reduce sediment damage to farm ponds, wetlands, cropland, and pasture.
4. Reduce floodwater damage on 1,680 acres of cropland and pasture.
5. Reduce flood damage to nine homes and other yards, gardens, fences, roads, and bridges in the town of Mission Hill.
6. Provide more and better wildlife habitat through increased and improved vegetative cover on the watershed due to land treatment. This includes grassed waterways, turnrows used in contour farming and terraces, tree planting, pasture and hayland management, conservation cropping systems, and farm ponds.
7. Monetary benefits will provide a better life for owners and operators of farms in the benefit area and improve the area economy.

8. The stabilized income will help to reduce the outmigration from the area.
9. Runoff of water from cropland and pasture will be decreased.
10. The natural resources of the area will be enhanced through soil building techniques to be applied.
11. The personal safety and well-being of the residents of the flood prone homes in Mission Hill will be enhanced.
12. There will be a net increase of 49 acres of herbaceous cover.
13. There will be a net increase of 1 acre of woody cover.
14. Sediment concentration in the water leaving the watershed will be reduced from 510 p/m to 94 p/m.
15. There will be a decrease of 36 tons of sediment leaving the watershed.
16. There will be a change of 1.2 acres of woody habitat to herbaceous vegetation which serve to diversify the habitat along the Missouri River.

ADVERSE ENVIRONMENTAL EFFECTS

1. About 0.6 mile of ephemeral stream channel will be temporarily inundated by the 7-acre sediment pool and will eventually fill with sediment.
2. Agricultural and upland wildlife use of the 7 acres of pasture in the sediment pool will be reduced.
3. Agricultural and upland wildlife use of up to 34 acres of cropland and 59 acres of pasture in the flood pool will be periodically interrupted by floodwaters.
4. There will be a temporary loss of 2.2 acres of woody habitat due to channel construction until replacement is made after completion of construction.
5. There will be a temporary loss of use during construction by agriculture and wildlife of 105 acres of cropland and pasture.
6. There will be a temporary loss of use by wildlife during construction of 16 acres of herbaceous habitat.
7. There will be an increase in the noise level and in dusty conditions during construction.

ALTERNATIVES

Alternatives to the proposed plan that were considered are:

a. Accelerated land treatment only

This alternative would have the same beneficial effect in upland areas as in the proposed plan, but floodwater damages would be reduced by only about 6 percent. This reduction would not be sufficient to permit efficient utilization of the flood plain areas, nor would adequate protection be given to the homes in Mission Hill. Adverse effects of inundation by the sediment pool and the reduction in agricultural use during construction, and the temporary loss of wildlife habitat, would be avoided. Most of the downstream sediment damage would continue. The cost of this alternative would be \$23,400.

b. Accelerated land treatment and the floodwater retarding structure

This would adequately protect the homes in Mission Hill and would trap sediment. Channel work would be eliminated and the temporary loss of woody and herbaceous cover could be avoided. Without the channel, the floodwater structure would have only minor beneficial effects as the water would still be trapped on the flood plain after passing through the floodwater structure. The cost of this alternative would be \$212,650.

c. Accelerated land treatment and the diversion of floodwaters

The possibility of diverting the floodwaters around Mission Hill directly into the James River was also investigated. This would involve construction out of the watershed and there would be strong objections from landowners along the diversion. Deep cuts would be needed, along with several grade stabilization structures and larger amounts of land for the diversion. Waterborne sediments would be carried into the James River. Adverse effects of the floodwater structure would be avoided. Serious floodwater problems would still exist on the agricultural flood plain from uncontrolled water and there would still be a need for channel improvement to remove these floodwaters. The level of protection would be about the same. The cost of this alternative would be \$835,830.

d. Accelerated land treatment and public acquisition of the flood plain in the agricultural area

Purchase of the land would cost \$546,000, not including relocation and other severance costs, at the estimated value of \$325 per acre. Several farm families would be displaced resulting in further decline of population in the rural area. In addition, there would be a loss of income from cash crops on the 1,680 acres of flood plain land and the loss due to damage of roads, bridges, homes, fences, and yards would continue. Purchase of lesser amounts of the most frequently flooded areas would be less costly but damages to other property would continue. Adverse impacts would be avoided.

e. Accelerated land treatment with channel only

Consideration was given to land treatment together with channel extending through Mission Hill and the agricultural flood plain with no floodwater retarding structure. This would provide adequate reduction in floodwater damages to both the town of Mission Hill and to the agricultural flood plain. However, most of the sediment moving downstream is presently deposited on the flood plain, pasture, road ditches, and in the channel. Without the floodwater retarding structure to trap the sediment, much of it would be carried downstream. The adverse effects of inundation by the sediment pool would be avoided. The estimated cost of this alternative is \$642,100.

f. No project

If the proposed project were not installed it is estimated that approximately \$32,280 in average annual net benefits would be foregone. In addition, flood problems and future damages will become more severe as sediment continues to fill the existing channel. Improvements in wildlife habitat, quality of the environment, and quality of life will also be foregone. Adverse effects of the project would be avoided.

SHORT-TERM VS. LONG-TERM USE OF RESOURCES

Lands in the watershed are devoted to agricultural production, except for the town of Mission Hill, and are expected to remain essentially in that use for the life of the project. The results of planned action will stabilize eroding land and reduce floodwater and sediment damages thus preserving the total area for use by future generations while maintaining and improving current productivity. The project is designated to be fully effective for 100 years. After that the land treatment measures will continue to be effective and the structural measures will continue to provide water and related land resource benefits.

The watershed is in the Missouri Water Resource Region 10, Missouri-Big Sioux Subregion 17. It is a part of the Missouri River Basin Comprehensive Framework Study area.

The status and number of other P.L. 566 watersheds in South Dakota in that subregion is as follows:

Completed Pilot	1
Completed Construction	1
Approved for Operations	6
Approved for Operations (inactive)	3
Approved for Planning	1
Applications	8

These watersheds comprise about 21 percent of the subregion in South Dakota.

The watershed is a tributary of the Missouri River. There will be no measurable effect on Missouri River flows as a result of this project.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Agricultural and upland wildlife use of cropland and grassland will be reduced in the 7 acres of the sediment pool. Flooding of the 59 acres of grassland and 34 acres of cropland in the flood pool will periodically interrupt upland wildlife and agricultural use of these areas. An estimated 0.6 mile of intermittent stream will be filled by sediment. Two acres of pasture and 23 acres of cropland will be used for the floodwater structure and associated spillway. It will be usable by wildlife and for limited grazing by livestock.

Twenty-five acres of cropland will be committed for purposes of the channel, maintenance berm, and spoil area. This will be usable by wildlife and for limited grazing by livestock.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

General

Because of severe flood damages to homes in Mission Hill and to cropland in the area, the local people sought assistance from the Yankton County Soil Conservation District to reduce their flooding problems. This resulted in a watershed information meeting held March 31, 1967, with written invitations to 150 landowners to attend. This meeting was held in Yankton, South Dakota, a few miles from the watershed. Representatives of the Soil Conservation Service explained the P.L. 566 watershed program. An application to the Secretary of Agriculture was submitted in September 1967, by the Yankton County Conservation District and the town of Mission Hill, for planning assistance on the Mission Hill Watershed under P.L. 566. This application was endorsed by Mission Hill Township.

On October 16 and 17, 1967, the watershed staff of the Soil Conservation Service conducted an investigation of the problems in the watershed and some possible solutions. This information was given to the South Dakota Soil and Water Conservation Committee for assistance in conducting the field examination.

On November 7 and 8, 1967, the South Dakota Soil and Water Conservation Committee conducted a public field examination. In addition to the committee, the following organizations were represented: Lower James Conservancy Sub-District; U.S. Fish and Wildlife Service; South Dakota Cooperative Extension Service; Mission Hill Town Board; South Dakota Department of Game, Fish and Parks; Yankton County Extension Agent; Soil Conservation Service; Mission Hill Watershed Steering Committee; and other interested residents of the watershed.

On January 15, 1968, the South Dakota Soil and Water Committee recommended to the South Dakota Water Resources Commission that the application be approved on behalf of the Governor of the State of South Dakota. This was done on March 21, 1968.

On April 11, 1968, the application for planning assistance was forwarded to the Administrator of the Soil Conservation Service.

On May 15, 1969, the South Dakota Conservation Commission (previous title, South Dakota Soil and Water Conservation Committee) designated the Mission Hill Watershed as number one priority for preliminary investigation by the Soil Conservation Service in South Dakota.

On August 27, 1969, and again on December 3, 1969, the current status of planning was discussed at a joint agency meeting of the Soil Conservation Service personnel and representatives of the U.S. Fish and Wildlife Service and the South Dakota Department of Game, Fish and Parks. Maps and other information used in planning were supplied to these agencies.

On December 30, 1969, the Yankton County Conservation District held public hearings and officially organized the Mission Hill Watershed District as prescribed by South Dakota law.

On March 12, 1970, the Mission Hill Watershed District held their annual meeting and invited the watershed staff of the Soil Conservation Service to attend. A progress report on the preliminary investigation was given to the Mission Hill Watershed District Board of Managers at that time indicating that a favorable project could be developed. They asked that the Soil Conservation Service complete the preparation of the preliminary investigation and give assistance in the preparation of the work plan.

The Soil Conservation Service assisted the sponsors in the completion and publication of the preliminary investigation report in March 1970, and requested planning authorization from the Administrator of the Soil Conservation Service. That authorization was received on July 27, 1970. Notification of this authorization was mailed to about 70 local, state, and federal agencies.

In March 1971, correspondence with the South Dakota Department of Game, Fish and Parks indicated that they did not have a forestry interest in the watershed but would contribute information for inclusion in the work plan.

On April 8, 1971, a public annual meeting of the watershed district was held in the Mission Hill town hall with the board of managers, representatives of the South Dakota Water Resources Commission, Yankton County Conservation District, county Extension Service, and

interested landowners attending. The watershed staff explained the current status of planning, discussed the proposals, and presented cost estimates on the proposed works of improvement. The Mission Hill Watershed District Board of Managers was in agreement that development of a final work plan should continue. No opposition of the plan was expressed.

On June 22, 1971, the current status of planning was discussed at a joint agency meeting of SCS personnel with representatives of the U.S. Fish and Wildlife Service and the South Dakota Department of Game, Fish and Parks. Information on planning progress and available details of the structural works were supplied on request.

In February 1972, a review draft report of the U.S. Fish and Wildlife Service was received by the Soil Conservation Service and comments were returned. This resulted in a draft report and further comments by the Soil Conservation Service, dated May 8, 1972.

On March 1, 1972, the annual meeting of the Mission Hill Watershed District was held in Yankton, South Dakota. By newspaper notices and special mailings, the public was invited to attend. The draft plan was discussed at that time. A number of interested landowners attended. Concern about the project was expressed by the landowner on whose land the proposed floodwater retarding structure is located. Questions concerning the sediment pool and flood pool were discussed and information given on depth and size. Additional information has been supplied periodically since that time. It was also explained that the use of several smaller upstream structures had been considered. Suitable locations that would control an adequate area could not be found. Less area controlled would require channel construction in Mission Hill and a larger channel in downstream areas.

The possibility of diverting the floodwaters out of the watershed at a point south of Mission Hill was also discussed and examined. This study was abandoned when it became obvious that extensive channel work was needed, local objections were strong, and an adequate outlet was not available.

Other landowners in the uplands were concerned that they might be required to apply land treatment against their wishes if the project were approved. It was explained that land treatment is a voluntary application of conservation practices installed by the landowner with technical assistance provided by the Soil Conservation Service. It was further explained that the goal of the Soil Conservation Service is 100 percent of the land properly treated but that 75 percent of the needed treatment must be installed above the floodwater retarding structure before installation and 50 percent of the remainder of the watershed must be properly treated.

On April 6, 1972, information on the current plan was submitted to the U.S. Fish and Wildlife Service. This included: (1) aerial photos showing location and stationing of proposed channel, (2) information showing the areas where the channel location was changed to avoid habitat losses and also to show the location of proposed tree plantings, (3) topographic maps of the floodwater structure with related storage information, (4) channel plan and profile sheets with channel detail, and (5) SCS biologist wildlife evaluation report.

The 1973 annual meeting was held on March 7, in Yankton. In addition to newspaper notices, letters were sent to landowners in the watershed informing them of the meeting. Members of the Mission Hill Watershed District Board of Managers also made some telephone calls to be sure residents knew of the meeting and were invited to attend. Newspaper articles concerning the discussions and results of the annual meetings are usually published in the local newspaper shortly after the meetings.

During the planning process, other periodic contact and communications were maintained with the U.S. Forest Service; South Dakota Department of Game, Fish and Parks; U.S. Fish and Wildlife Service; South Dakota Department of Highways; Corps of Engineers; and the local people.

Inquiries concerning the possibilities of historic or archeological sites in the watershed were made in May 1973. Agencies, organizations, and individuals contacted include: the National Park Service, USDI, Lincoln, Nebraska; and in South Dakota, the State Historic Preservation Officer, Vermillion; State Archeologist, Vermillion; and the South Dakota State Historical Society, Pierre.

On August 10, 1973, copies of the revised draft of the work plan and environmental statement were sent to the U.S. Forest Service, U.S. Fish and Wildlife Service, and the South Dakota Department of Game, Fish and Parks for comments.

Announcements of a meeting to be held in Yankton on October 16 and 17, 1973, were sent about the middle of September to the U.S. Fish and Wildlife Service, South Dakota Department of Game, Fish and Parks, and the Environmental Protection Agency. The plan was explained and questions were answered. A field trip to the watershed was made by interested individuals.

The 1974 annual meeting was held March 22 in Yankton. Notice of the meeting was sent to all landowners and also appeared in the local newspaper. Information on the work plan was presented and questions were answered.

On March 29, 1974, the watershed district notified the State Planning Agency of its intention to request the Soil Conservation Service to enter into a work plan agreement for the installation of the project measures.

The informal field review was conducted by mail in April of 1974. Copies of the preliminary draft work plan and environmental impact statement were sent to 18 local, state, and federal agencies. Suggestions for improving the plan and remarks on impacts not adequately treated were requested.

A public information meeting was held June 12, 1974, in Yankton. Notices of this meeting were sent to 34 local, state, and federal agencies, legislators and local groups. In addition, notices were mailed to about 30 local people and announcements were published in the local newspaper.

Discussion and Disposition of Each Comment on Draft Statement

Written comments were requested from:

- U.S. Department of the Army
- U.S. Department of Commerce
- U.S. Department of Health, Education, and Welfare
- U.S. Department of the Interior
- U.S. Department of Transportation
- Environmental Protection Agency
- Advisory Council on Historic Preservation
- Office of Equal Opportunity
- Federal Power Commission
- Governor of South Dakota, represented by the Secretary of the
Department of Natural Resource Development
- South Dakota Department of Game, Fish and Parks
- Dakota Environmental Council, Inc.

Those responding were U.S. Department of the Army; U.S. Department of Health, Education, and Welfare; U.S. Department of the Interior; U.S. Department of Transportation; Environmental Protection Agency; Advisory Council on Historic Preservation; and the Governor of South Dakota represented by the Secretary of the Department of Natural Resource Development.

The following is a summary of environmental issues raised by those commenting on the draft impact statement and the response to those comments.

Department of the Army (Corps of Engineers)

The following comment refers to the work plan.

Comment:

The hydrologic design of this dam is based on storing the one percent flood event with a maximum release of 106 cubic feet per second through the principal spillway. Events comparable to the standard project flood and probable maximum flood were used for the emergency spillway and freeboard designs respectively. Flow velocities in the grass-lined emergency spillway channel during the spillway design flood would be in excess of 6 feet per second and would be higher if pool elevations were in the freeboard zone.

Although the Corps of Engineers uses comparable hydrologic events in designing dams located above urban areas, our application and application sequence of these events to specific project features is quite different and results in a much more conservative design. Justification for using the more rigid criteria is based on preventing even the remotest chance of a dam failure. It is apparent that a failure of the Mission Hill Watershed dam could have a disastrous effect.

Response:

The application and application sequence of hydrologic events and the design of the emergency spillway will be reviewed in detail during final design. The criteria selected will preclude the remotest chance of a dam failure.

The remainder of the comments are on the environmental impact statement.

Comment:

The summary sheet mentions a temporary loss of woody habitat. Page 7 confirms that some of this loss would be permanent since mitigation measures will gain 2.2 acres while 3.4 acres will be lost. This results in a net loss of 1.2 acres of woody habitat that should be recognized as an adverse effect. However, on page 30, the loss of 1.2 acres of woody habitat is listed as a favorable environmental effect. We feel that loss of any woody habitat in the plains states should be viewed as an adverse effect. On page 7 the disposal of refuse material is discussed. We concur that burial of refuse material is more preferable than burning.

Response:

Item 13, page 30, of the draft environmental impact statement indicates that there will be a net increase of 1 acre of woody cover. This results from the 2.2 acres cited on page 7 in addition to not less than 2 acres additional plantings described in the first paragraph on page 5 of the environmental impact statement.

U.S. Department of the Interior

Comment:

From this review, it is our conclusion that channelization of the subject stream has a substantial adverse impact to the recreational resources of the project area that was not pointed out by the impact statement. Otherwise, the statement appears to adequately deal with the impacts upon the recreational aspects of the area.

Response:

On page 13 of the draft impact statement, the description of the present channel shows the area being modified is ephemeral and has been previously modified by the activities of man. On page 14, it is shown that the reaches affected by channel work contain about

5 acres of herbaceous habitat along the proposed channel and 140 acres of trees in 14 farmstead shelterbelts and in ribbons along the oxbow and the Missouri River.

On page 16, under "Recreational Resources" the draft states, "Recreational activities in the watershed are limited to hunting and trapping. There are no fishing opportunities in the watershed."

On page 22 of the draft impact statement, it is shown that the only water-based recreation in the watershed is an "old swimming hole" fed by an artesian well and that there is no local interest in developing water-based recreation within the watershed because of the excellent facilities at Lewis and Clark Lake.

On page 28, it shows the expected land use changes to be a reduction of cropland by 58 acres, gains of 1 acre of woody habitat, 8 acres of pasture, and 49 acres of herbaceous habitat. These figures show an increase in woody and herbaceous cover after the project is installed. Since losses during construction are temporary, the increase in cover should enhance the recreation potential for hunting upland game birds.

Comment:

The statement does indicate consultation with the National Register of Historic Places. However, because all properties on the National Register of Historic Places are published in the Federal Register, the statement should reflect consultation with the issue for February 19, 1974, and all subsequent monthly supplements. If a National Register listing or a potential National Register site falls within the project area, the statement should also establish whether the proposed project will have an effect upon it. Where this is found to be the case, the statement should reflect compliance with Section 106 of the National Historic Preservation Act of 1966 (P.L. 89-665) and Executive Order 11593.

Response:

The issue of February 4, 1975, has been reviewed. There are no listings within the project area.

Comment:

The statement is made that there has been consultation with the State Historic Preservation Officer for the state involved. The final environmental statement should contain a copy of his response.

Response :

The latest response from the Cultural Preservation Director (Historic Preservation Officer in South Dakota) is included. The archeological survey will be completed prior to construction.

Comment :

In general, the draft statement and work plan provide an adequate description of the floodwater retarding structure, grade stabilization structure, land treatment measures, and the channel improvements within the project area. However, the statement fails to describe and assess the effects the project will have on the existing wildlife habitat and the environmental degradation with respect to the channel improvements.

Response :

The effects of the project are discussed on pages 2 through 8 of the draft and also on page 28.

Comment :

In paragraphs 3 and 4, page 2 of the comments, it states that the indirect losses of habitat and esthetics would constitute a greater loss to wildlife than the direct losses because farmers would be encouraged to put more land into production.

Response :

On page 12 of the draft statement it shows 85 percent, or 7,238 acres of the watershed, are in cropland, 574 acres in grassland, 120 acres in native woodland, and 570 acres include Mission Hill roads, road ditches, farmsteads, and windbreaks. The grasslands are adjacent to farmsteads, heavily grazed, and usually used in connection with the feedlot or dairy operation. On page 13, it states 91 percent of the area subject to flooding is in cropland. This is an intensively farmed area and land use changes are unlikely. On page 6 of the draft impact statement, "A pipe outlet will be placed in the channel bank near station 385+70 to permit the low flows to continue into the abandoned oxbow." This will discourage clearing of the trees and encourage the preservation of the habitat.

Comment :

In the last paragraph on page 2, concern is expressed that the local organizations may not maintain the wildlife habitat plantings and that the plan should contain provisions for a performance bond or other formal guarantee to insure that measures relative to fish and wildlife resources will be carried out.

Response:

As there are no opportunities for fishing at the present time and the project does not provide for a fishery, no maintenance is required for a fish resource. In regard to the maintenance of wildlife habitat plantings, the plan states on page 63 that the watershed district will assume responsibilities for operation and maintenance as outlined in the Operation and Maintenance Agreements for structural and land treatment measures which must be executed prior to the signing of the project agreement for installation of structural or land treatment measures. These agreements are approved by the Board of Managers at a regular meeting. After approval they are signed by the Chairman of the Board and the Soil Conservation Service.

The Board agrees to operate and maintain, without cost to the Service, all measures in compliance with any applicable federal, state, and local laws, in a manner that will assure that the measures will serve the purpose for which installed, as set forth in the work plan.

Environmental Protection AgencyComment:

The absence of any assessment of the short and long-term changes in the riparian habitat as the result of stream channelization and diversion is a significant omission.

Response:

Present conditions are discussed on pages 13 and 14 of the environmental impact statement and on page 28 there is a discussion of the effects of construction along the channel with plans for reseeding the channel and berm. Additional information is on page 6.

Comment:

The draft statement recognizes only the temporary loss of habitat during construction with no assessment of the effect of this loss on the wildlife of the area. In addition to this adverse impact there will be a more lengthy period of disruption due to the time period involved in revegetation. This revegetation period will be longer and therefore will have its most adverse effect on the disrupted woody habitat. Also the wildlife and native plants will be affected by a permanent change in the stream's geomorphology and hydrology along the channelized reach. The continual maintenance operations on the channel will also adversely disrupt the habitat.

Response:

There are 207 acres of woody habitat within a radius of 1 mile. Most of the woody habitat to be removed has limited value to wildlife and will be replaced with species of higher value to wildlife.

Construction in the existing channel is in a previously man-modified area. Vegetation is described on page 13 and includes grazed pasture and land that is cropped. Maintenance measures are described on page 28.

Comment:

The draft statement does not assess any impact to the lower stream reach resulting from the proposed water diversion. The diversion structure could result in significant dewatering of the downstream reach during normal rainfall and snowmelt events. Besides altering the type of habitat in this reach, such a diversion structure may induce encroachment on this land by farming and ranching activities.

Response:

This is discussed on page 6 of the statement. A pipe outlet will be placed in the channel bank near station 385+70 to allow low flows of water to continue in this abandoned oxbow. Local inflows below the point of diversion will also continue flowing into the abandoned oxbow.

Comment:

The proposed diversion channel will require the removal of 1.2 acres of trees along the Missouri River. The environmental statement indicates that this area will be revegetated with grasses "to diversify the habitat and benefit wildlife." This statement should be further supported by examples and any other justification for such reasoning.

Response:

The following statement from the "Manual of Wildlife Conservation" was published in 1971 by the Wildlife Society. The author of the statement is Leonard E. Foote, Southeastern Field Representative, Wildlife Management Institute.

"A habitat element important for most kinds of wild game is 'interspersions.' It is the positioning, configuration, and size of the kinds of vegetation needed to sustain the species. Numbers of wild game usually depend on the interspersions of habitat types and their relation to the species cruising radius. Bobwhite quail ordinarily

require woodland, brushland, grassland, and cultivated land, which illustrates the principle that game depends on 'edges', for it is the edges of vegetative types that are most used for feeding, loafing, resting, calling, and nesting. The abundance of nonmigratory wildlife depends on the degree of interspersion of essential habitat types because this determines the amount of edges."

Comment:

In the discussion of alternatives, very little attention is given to the potential environmental impact of each alternative or a comparison of relative impact. For example, alternative (b) would not have the impact on wildlife which will result from the stream channelization and diversion of the proposed plan. Although agricultural flooding would be controlled less under alternative (b), the areal extent of the flooding is not given nor are the benefits quantified to allow comparison of cost-benefit ratios. Consistent with the Council on Environmental Quality guidelines on the National Environmental Policy Act, a comparison of the environmental impacts, benefit-cost ratios and all other tradeoffs should be included in the statement for each alternative to the proposed plan.

Response:

Alternate (b) was not given further consideration when it became apparent that it did not have a favorable benefit-cost ratio. The primary problem in the main benefit area (Reach II) is the long duration of flooding. This long duration results from sediment deposition blocking the channel as described on page 18. Since the floodwater structure stores the water only temporarily, the volume of water reaching this damage area is the same with or without the floodwater structure. Therefore, for the 80 percent chance storm event, the area flooded is 115 acres under both conditions.

Advisory Council on Historic Preservation

Comment:

It states in paragraph 2 that SCS is required to comply with the provisions of Executive Order 11593, "Protection and Enhancement of the Cultural Environment" of May 13, 1971, with respect to this undertaking.

Response:

None of the land affected by the planned structural measures is under the control or jurisdiction of the Federal Government. There are no known archeological or historical values that will

be affected by the proposed action. However, as indicated on page 7, additional studies will be conducted and if such resources are discovered, appropriate action will be taken. In this respect, the plan includes provisions for preserving cultural values.

South Dakota Department of Natural Resource Development

Comment:

It should be noted that the present watershed district boundaries do not include those lands and landowners located along the lower portions of both the oxbow and the proposed channel areas. It may be desirable to consider including such lands into the watershed district.

Response:

We concur.

LIST OF APPENDIXES

- Appendix A - Comparison of Benefits and Costs for Structural Measures
- Appendix B - Project Map
- Appendix C - Letters of comment received on the draft environmental statement
- Appendix D - Letter from Director of Historical Preservation Center

APPROVED BY

V.W. Shally
V.W. Shally
State Conservationist

DATE

7/16/75

APPENDIX A

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Mission Hill Watershed, South Dakota
(Dollars)

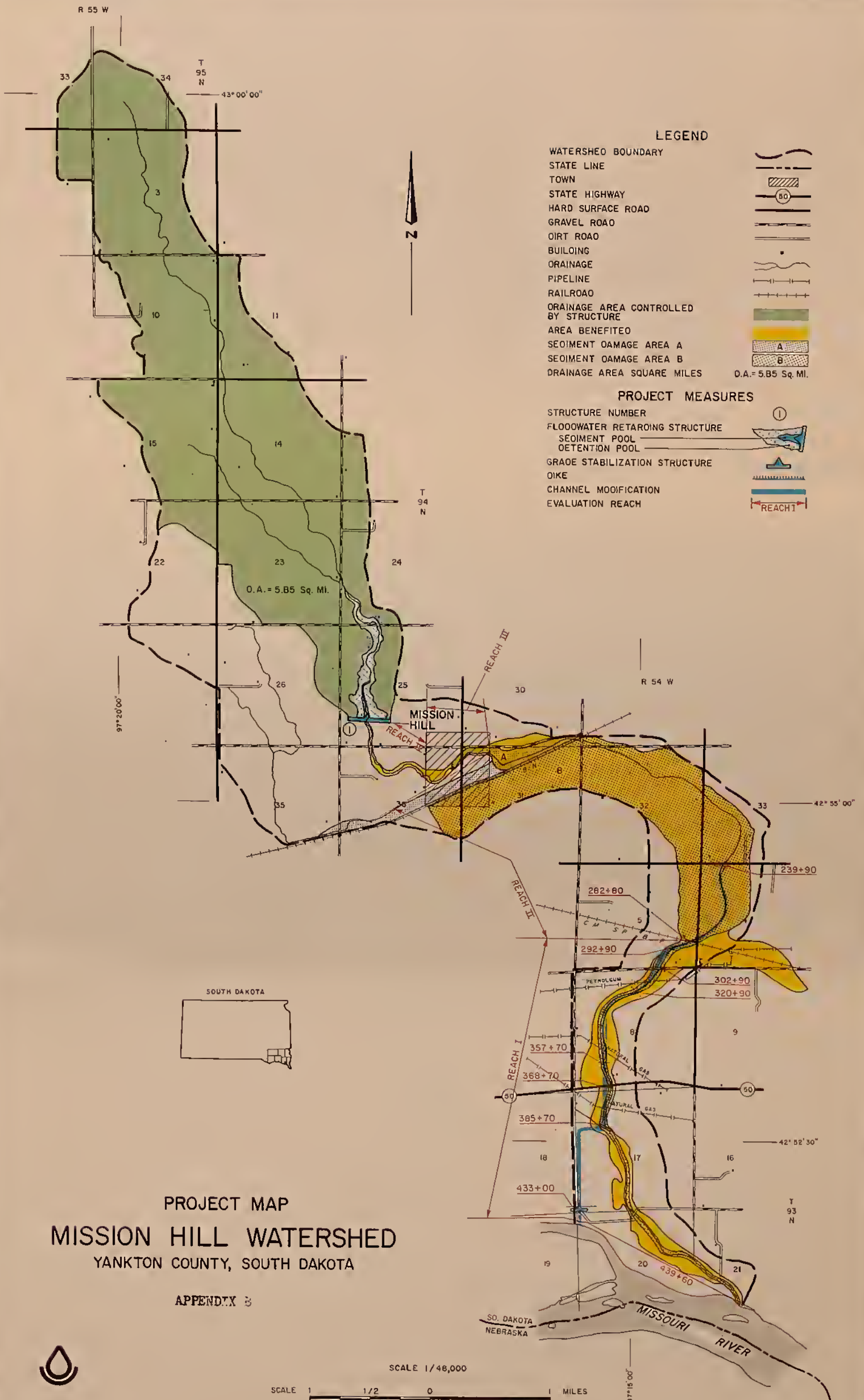
Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/ Flood Prevention						Total	3/ Average Annual Cost	Benefit Cost Ratio
	More Intensive Land Use		Changed Land Use		Secondary	Total			
	Damage Reduction	Land Use	Agr.	Urban					
Flood Retarding Structure #1									
Grade Stabilization Structure #2	42,800	2,800	-0-	-0-	23,900	69,500	33,110	2.1:1.0	
Channel Work									
Project Administration							4,110		
GRAND TOTAL	42,800^{2/}	2,800	-0-	-0-	23,900	69,500	37,220	1.9:1.0	

1/ Price Base 1973

2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$2,300 annually.

3/ The project was evaluated at 6-7/8 percent interest rate for a 100-year period. The average annual cost includes the cost of operation and maintenance.

Date: July 1974





DEPARTMENT OF THE ARMY
 OMAHA DISTRICT, CORPS OF ENGINEERS
 6014 U. S. POST OFFICE AND COURT HOUSE
 OMAHA, NEBRASKA 68102

MROPD-P

1 November 1974

Mr. V. W. Shally, State Conservationist
 U. S. Department of Agriculture
 Soil Conservation Service
 Post Office Box 1357
 Huron, South Dakota 57350

ACTION	Shally	11/1/74
RECEIVED		
DATE		
BY		
INITIALS		

Dear Mr. Shally:

This is in response to your letter dated 6 September 1974 requesting our review and comments on the draft watershed work plan and draft environmental impact statement for the Mission Hill Watershed, South Dakota.

Our review of the draft work plan indicates that one flood water retarding structure is being considered in the watershed plan. The proposed dam site is located about 3/4 mile west and 1/4 mile north of the town of Mission Hill, South Dakota, and will control runoff from 5.85 square miles.

The hydrologic design of this dam is based on storing the one percent flood event with a maximum release of 106 cubic feet per second through the principal spillway. Events comparable to the standard project flood and probable maximum flood were used for the emergency spillway and freeboard designs respectively. Flow velocities in the grass-lined emergency spillway channel during the spillway design flood would be in excess of 6 feet per second and would be higher if pool elevations were in the freeboard zone.

Although the Corps of Engineers uses comparable hydrologic events in designing dams located above urban areas, our application and application sequence of these events to specific project features is quite different and results in a much more conservative design. Justification for using the more rigid criteria is based on preventing even the remotest chance of a dam failure. It is apparent that a failure of the Mission Hill Watershed dam could have a disastrous effect.

MROPD-P

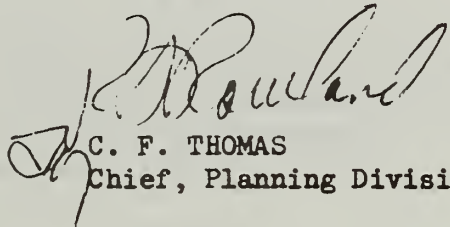
Mr. V. W. Shally

1 November 1974

A review of the draft environmental impact statement resulted in several comments you may wish to consider in the final EIS. The summary sheet mentions a temporary loss of woody habitat. Page 7 confirms that some of this loss would be permanent since mitigation measures will gain 2.2 acres while 3.4 acres will be lost. This results in a net loss of 1.2 acres of woody habitat that should be recognized as an adverse effect. However, on page 30 the loss of 1.2 acres of woody habitat is listed as a favorable environmental effect. We feel that loss of any woody habitat in the plains states should be viewed as an adverse effect. On page 7 the disposal of refuse material is discussed. We concur that burial of refuse material is more preferable than burning.

We appreciate the opportunity to comment on your proposed PL-566 project. It will have no effect on any authorized or planned Corps of Engineers' projects.

Sincerely yours,


C. F. THOMAS
Chief, Planning Division



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
 REGION VIII
 FEDERAL OFFICE BUILDING
 1944 AND STOUT STREETS
 DENVER COLORADO 80202

OCT 17 1974

OFFICE OF THE REGIONAL DIRECTOR

ACTION		DATE
Shally		
Neckgrabe		
Rees		
Takach		
Yuz		
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Aut		

PRR

Mr. V. W. Shally
 State Conservationist
 Soil Conservation Service
 U. S. Department of Agriculture
 P. O. Box 1357
 Huron, South Dakota 57350

Dear Mr. Shally:

The Department of Health, Education, and Welfare (DHEW) has completed its review of the Draft Environmental Impact Statement for the Mission Hill Watershed Project at Yankton County, South Dakota.

We have carefully compared your Draft Environmental Impact Statement to the DHEW Environmental Impact Criteria. It appears to us that the impacts of the proposed action and the reasonable alternatives in the specific areas of concern to this Department have been adequately addressed. We therefore concur with the document as written.

Sincerely,

Rulon R. Garfield
 Rulon R. Garfield
 Regional Director

cc: Phyllis Hayes
 Office of Environmental Affairs
 Warren Muir (2 copies)
 Council on Environmental Quality



United States Department of the Interior

OFFICE OF THE SECRETARY MISSOURI BASIN REGION

BUILDING 67, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

ACTION	
Shally	<input checked="" type="checkbox"/>
Blackburn	<input checked="" type="checkbox"/>
Boyd	<input checked="" type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>

PLY REFER TO:
ER 74/1149

201 7 1974

Dear Mr. Shally:

In response to your letter of September 6, 1974, we have reviewed the draft Environmental Impact Statement on Mission Hill Watershed, South Dakota. We offer these comments for your consideration.

General Comments

From this review, it is our conclusion that channelization of the subject stream has a substantial adverse impact to the recreational resources of the project area that was not pointed out by the impact statement. Otherwise, the statement appears to adequately deal with the impacts upon the recreational aspects of the area.

Review of the subject impact statement indicates this proposed action will have no immediate or long range effects on Indian people or Reservation lands.

No established or studied units of the National Park System appear to be adversely affected by the proposal. The proposal also does not appear to adversely affect any site registered as a National Historic, Natural, or Environmental Education Landmark, or any site listed as eligible for such registration.

The statement does indicate consultation with the National Register of Historic Places. However, because all properties on the National Register of Historic Places are published in the Federal Register, the statement should reflect consultation with the issue for February 19, 1974, and all subsequent monthly supplements. If a National Register listing or a potential National Register site falls within the project area, the statement should also establish whether the proposed project will have an effect upon it. Where this is found to be the case, the statement should reflect compliance with Section 106 of the National Historic Preservation Act of 1966 (P.L. 89-665) and Executive Order 11593.

The statement is made that there has been consultation with the State Historic Preservation Officer for the state involved. The final environmental statement should contain a copy of his response.

We are pleased to note that coordination with the proper authorities with respect to cultural resources has been effected.

It is our understanding from page 7 of the draft statement that an archeological and historical survey will be conducted of the project area. This area should include the dam site, all channel improvements, the area to be planted with trees, the grade stabilization structure, the tree clearing site and any other affected lands such as construction roads.

In general, the draft statement and work plan provide an adequate description of the floodwater-retarding structure, grade stabilization structure, land treatment measures, and the channel improvements within the project area. However, the statement fails to describe and assess the effects the project will have on the existing wildlife habitat and the environmental degradation with respect to the channel improvements.

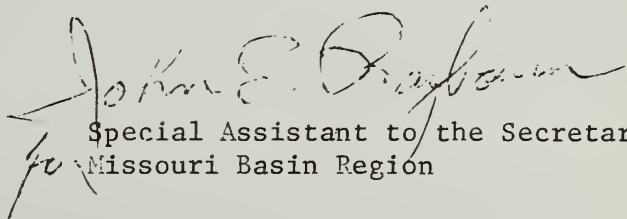
Channel improvements will result in direct and indirect losses to wildlife resources and the environment. Direct habitat losses will be on lands converted to the channel and on associated lands disturbed by the dredging operation. Diverting the channel in Reach I at 385+70 will minimize the damage to existing woody habitat between 385+70 and 439+60. In spite of the efforts to avoid losses by direct channel improvement, which is superior to replacement of a loss, there is no assurance that there will be no indirect losses. Flood protection provided will encourage farmers to put more land into production thus removing more habitat. Clearing woody habitat in the lower reaches of the existing channel would constitute a greater loss to wildlife than the direct losses.

Effects to wildlife and its habitat indicate only a portion of the environmental losses associated with the channelization. The continuing loss of woody and herbaceous cover in the watershed from intensified farming practices makes the remaining tree stands and herbaceous cover as valuable from the aesthetic standpoint as its value to the game resource. Some of the aesthetic value will recover after construction; however, periodic maintenance and increased agricultural activities will be damaging factors throughout the project life.

Construction of the project will provide water and related land resource benefits for 100 years. Such benefits will not occur without periodic maintenance. Even though nonsuckering shrubs and medium-sized trees will be planted adjacent the channel to replace wildlife habitat destroyed through project construction, there is no assurance that the local sponsoring organizations will maintain wildlife habitat plantings. Therefore, we believe that the plan should contain provisions for a performance bond or other formal guarantee by local interests to insure that compensatory measures relative to fish and wildlife resources will be carried out.

The project map does not show the existing Bureau of Reclamation's Sioux Falls-Gavins Point 115-kv wood-pole or the Utica Junction-Sioux City 230-kv steel-tower transmission lines that traverse through the area.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "John E. Dwyer".

Special Assistant to the Secretary
Missouri Basin Region

Mr. V.W. Shally
State Conservationist
Soil Conservation Service
P.O. Box 1357
Huron, South Dakota 57350



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

9 1 OCT 1974

ACTION	INITIALS
Shally	
Prochaska	
West	
Lebach	
Yonk	
Winstler	
Smith	

Mr. V. W. Shally
State Conservationist
Soil Conservation Service
P. O. Box 1357
Huron, South Dakota 57350

Dear Mr. Shally:

This is in response to your letter of 6 September 1974 addressed to Commandant, U. S. Coast Guard concerning a draft environmental statement for the Mission Hill Watershed Project, Volin, Yankton County, South Dakota.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

The draft statement does not assess any impact to the lower stream reach resulting from the proposed water diversion. The diversion structure, could result in significant dewatering of the downstream reach during normal rainfall and snowmelt events. Besides altering the type of habitat in this reach such a diversion structure may induce encroachment on this land by farming and ranching activities.

The proposed diversion channel will require the removal of 1.2 acres of trees along the Missouri River. The environmental statement indicates that this area will be revegetated with grasses "to diversify the habitat and benefit wildlife." This statement should be further supported by examples and any other justification for such reasoning.

In the discussion of alternatives very little attention is given to the potential environmental impact of each alternative or a comparison of relative impact. For example, alternative (b) would not have the impact on wildlife which will result from the stream channelization and diversion of the proposed plan. Although agricultural flooding would be controlled less under alternative (b), the areal extent of the flooding is not given nor are the benefits quantified to allow comparison of cost-benefit ratios. Consistent with the Council on Environmental Quality guidelines on the National Environmental Policy Act, a comparison of the environmental impacts, benefit-cost ratios and all other tradeoffs should be included in the statement for each alternative to the proposed plan.

Finally, there appear to be several significant environmental benefits which will be achieved under the proposed plan. The most significant benefits will result from the proposed land and water management practices proposed for upper portion of the watershed. Reduced erosion, greater water infiltration, and more wildlife habitat in this area are significant improvements. Under the existing organization of the draft statement, however, it is difficult to evaluate these beneficial changes against the potential adverse impacts caused by channelization and diversion of the lower stream reach. It would be helpful if all impacts could be summarized by categories; e.g. habitat disrupted, habitat lost, habitat gained, etc. and by land classes; e.g., flood plain, wetlands, pasture, etc.

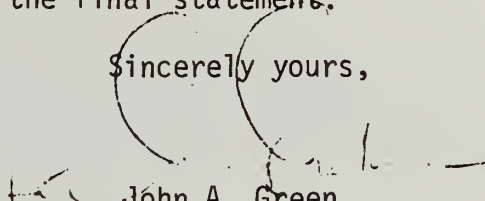
In accordance with current guidelines of the Environmental Protection Agency, the proposed watershed work plan for the Mission Hill Watershed and

Page 3 - Mr. V. W. Shally

the environmental impact statement will be categorized in the Federal Register as LO-2. A copy of the rating system is enclosed.

Please send us five copies of the final statement.

Sincerely yours,


John A. Green
Regional Administrator

Enclosure

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.



Department of Natural Resource Development

OFFICE OF THE SECRETARY

Office Building Number 2, Pierre, South Dakota 57501

Phone 605/224-3151

October 31, 1974

ACTION	DATE
Shally	10/31/74
Secretary	

Mr. V. W. Shally
 State Conservationist
 Soil Conservation Service
 P. O. Box 1357
 Huron, South Dakota 57350

Dear Mr. Shally:

We have reviewed the draft of both the Mission Hill Environmental Impact Statement and the Mission Hill Watershed Work Plan.

It is felt that the Environmental Impact Statement reflects both the adverse and beneficial environmental aspects of the work plan.

This Department recognizes that in some instances implementation of the work plan will cause a negative impact on the environment; however, long-range benefits to wildlife habitat seem to exceed these adverse affects.

It should be noted that the present watershed district boundaries do not include those lands and landowners located along the lower portions of both the oxbow and the proposed channel areas. It may be desirable to consider including such lands into the watershed district.

It is anticipated that the proposed 3.8 miles of channelization will be controversial locally; however, it should be noted that the proposed channel will follow an existing channel for 2.8 of these 3.8 miles; except where relocation is necessary to avoid destruction of woody habitat.

The opportunity to review and comment upon the Environmental Impact Statement and Watershed Work Plan is greatly appreciated.

Sincerely,

Vern W. Butler
Secretary

OFFICE OF
CULTURAL
PRESERVATION
State Capitol
Pierre, S.D. 57501
Phone (605) 224 3458

APPENDIX D

SOUTH
Dakota Department of
Education and Cultural Affairs

April 7, 1975

Mr. Vince M. Shally
State Conservationist
U.S. Department of Agriculture
P. O. Box 1357
Huron, SD 57350

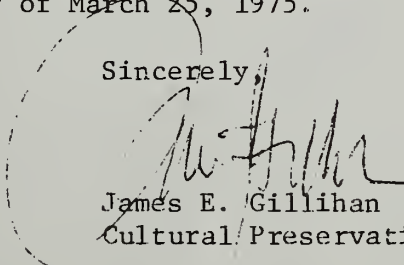
Re: Mission Hill Watershed

Dear Mr. Shally:

On March 6, John Little, Historical Preservation Director, sent an EIS report to Paul Nielsen for the Mission Hill Watershed project. In his cover letter, he sent a billing in the amount of \$65.50 to cover the historical cost of this survey. Therefore, we are returning your Purchase Order 141-SD-SCS-75 in the amount of \$200.00 for cancellation so a new one can be issued for the \$65.50, or whatever procedure is required for payment. Mr. Little's letter of March 6, will serve as the billing for the \$65.50.

Upon review of Edith French's EIS report, it is determined that there will be no effect insofar as the historical aspect is concerned. However, an archaeological survey of this area will still be required, and we will await any action in this respect until we hear further from you, as you have stated in your letter of March 25, 1975.

Sincerely,


James E. Gillihan
Cultural Preservation Director

cc: John Little
John Sigstad
JEG:lr

