AGREEMENT
BETWEEN
THE GOVERNMENT OF CANADA
AND
THE GOVERNMENT OF THE UNITED STATES OF AMERICA
FOR WATER SUPPLY AND FLOOD CONTROL
IN THE SOURIS RIVER BASIN

The Government of Canada and the Government of the United States of America, hereinafter referred to as "the Parties;"

DESIRING to provide for development of the Souris River Basin to increase the general welfare of the people of the United States and Canada;

NOTING that significant benefits will accrue to the Parties by construction, operation, and maintenance of reservoir projects in the Souris River Basin in Canada for the purposes of flood control in the United States of America and for water supply in Canada;

FURTHER NOTING that the Government of the United States of America and the Government of Canada are parties to the Treaty between the Government of the United States of America and the Government of the United Kingdom Concerning Boundary Waters and Questions Arising Along the Boundary between the United States of America and Canada, signed on January 11, 1909, hereinafter referred to as the "Boundary Waters Treaty", and to the Convention Between the Government of the United States of America and the Government of the United Kingdom for the Protection of Migratory Birds in the United States of America and Canada, signed on August 16, 1916, hereinafter referred to as the "Migratory Birds Convention", and desire in connection with the development contemplated in this Agreement to fulfill their rights and obligations under these instruments, and any agreements or orders which implement them;

INTENDING that the Souris River Basin be developed for flood control benefits in the United States of America and water supply benefits in Canada in a manner that is consistent with the Boundary Waters Treaty and the Migratory Birds Convention;

NOW, THEREFORE, hereby agree to the following plan for development of the Souris River Basin:

ARTICLE I

1. In this Agreement, the term:

a. "Alameda Dam" means the dam which will be constructed on Moose Mountain Creek in the Province of Saskatchewan approximately four kilometers upstream from its confluence with the Souris River;

b. "Boundary Dam" means an existing dam located on Long Creek approximately seven kilometers in a southwesterly direction from the City of Estevan in the Province of Saskatchewan;

c. "Boundary Diversion Channel" means a channel that will be constructed in the Province of Saskatchewan with a maximum capacity of 60 cubic meters per second (2,100 cubic feet per second) to allow the conveyance of water from the Boundary reservoir to the impoundment behind Rafferty Dam;

d. "Boundary Reservoir" means the impoundment of water behind Boundary Dam;

e. "construction costs" means expenditures made by Canada for construction of Rafferty Dam and Alameda Dam and reservoirs. Such costs shall include expenditures for engineering, design, construction, land acquisition, and operation and maintenance prior to completion of construction;

f. "flood control storage" means the volume below the maximum allowable water level in a reservoir to store flood event runoff;

g. "improvement" means a dam, reservoir or related facility to which this Agreement applies;

h. "Lake Darling Dam" means an existing structure which is part of the Upper Souris National Wildlife Refuge located on the Souris River approximately 25 kilometers in a northwesterly direction from the city of Minot in the State of North Dakota;

i. "maintenance curtailment" means an interruption or curtailment of operations under the Operating Plan which is necessary for purposes of repairs, replacements, installation of equipment, performance of other maintenance work, investigations, or inspections;

j. "Operating Plan" means the plan of operation which is attached to this Agreement as Annex A and which is an integral part of this Agreement, for certain dams, reservoirs, and related works on the Souris River;

k. "Rafferty Dam" means the dam which is under construction at a location on the Souris River approximately six kilometers upstream in a northwesterly direction from the City of Estevan in the Province of Saskatchewan;

l. "Reservoir Regulation Manual" means a document which is used as a guide in the day-to-day operation of a reservoir by the agency responsible for the operation of the reservoir. The manual shall contain a description of the project and its history, and discuss watershed characteristics, data collection and communication networks, hydrologic forecasts, the water control plan, and water control management;

m. "substantially destroyed" means when the cost of repairs or rehabilitation to an improvement to rectify damages to that improvement would exceed 50 percent of the replacement value of the improvement at the time the damage is sustained;

n. "uncontrollable force" means any force or cause beyond the control of the party affected, including, but not limited to, war, riot, civil disturbance, sabotage, earthquake, catastrophic storm event, and restraint by court order, which by exercise of due care and foresight, such party could not reasonably have been expected to avoid;

o. "useful life" means the time remaining until an improvement is permanently retired from service because it no longer effectively serves its intended purpose, as defined in this Agreement and the Operating Plan, notwithstanding good maintenance, or because it is substantially destroyed by uncontrollable force;

p. "water quality monitoring" means the collection, analysis and interpretation of water quality conditions, whether obtained through systematic surveys or special studies;

q. "water quality objective" means a concentration level, other measure, or narrative goal which is intended to support the designated uses of water at a specific site; and

r. "water supply in Canada" means the use of reservoir storage in Canada for the purposes of: cooling water for electric generating plants, irrigation, domestic use, municipal and industrial use, agricultural use, recreation, conservation, flood protection in Canada, or such other uses as the Government of Canada shall designate.

2. Both the United States of America system of measurement and the Système international (metric system) are equally valid where used in this Agreement. The conversion table in the Operating Plan shall be used to convert values in one measurement system to values in the other measurement system.

3. The terms defined in this Agreement shall have the same meaning when used in the Operating Plan.

ARTICLE II

1. The Government of Canada shall expeditiously provide the Government of the United States of America with a minimum of 466,000 cubic decameters (377,800 acre-feet) of flood storage by:

   a. Completing construction of Rafferty Dam and including in that improvement a minimum of 327,100 cubic decameters (265,200 acre-feet) of flood control storage; and

   b. Constructing Alameda Dam and including in that improvement a minimum of 138,900 cubic decameters (112,600 acre-feet) of flood control storage.

2. The Government of Canada shall design and construct Rafferty Dam and Alameda Dam in accordance with accepted engineering standards. Before the Government of the United States of America shall make any payment pursuant to Article IV of this Agreement, the Government of Canada shall ensure, to the satisfaction of the Government of the United States of America, that Rafferty Dam and Alameda Dam will be designed to have a 100-year project life, and will be capable of operation in accordance with the Operating Plan.

ARTICLE III

1. The Government of Canada shall operate and maintain Rafferty Dam and Alameda Dam at no cost to the Government of the United States of America, except for those costs referred to in Article IV of the Agreement, in accordance with the Operating Plan or in accordance with any subsequent mutually agreed upon change to the Operating Plan for the term of this Agreement. Operation and maintenance of Rafferty Dam and Alameda Dam in accordance with the Operating Plan shall commence immediately upon completion of construction of each dam.

2. The Government of Canada shall operate and maintain the Boundary Reservoir at no cost to the Government of the United States of America in accordance with the Operating Plan or in accordance with any subsequent mutually agreed upon change to the Operating Plan for the remainder of the useful life of the Boundary Reservoir. Operation and maintenance of the Boundary Reservoir in accordance with the Operating Plan shall commence immediately upon entry into force of this Agreement.

3. The Government of Canada shall operate the Boundary Diversion Channel and any future water resources development or flood control projects constructed after entry into force of this Agreement for the term of this Agreement at no cost to the Government of the United States of America in a manner which will not adversely affect the stream flow in the Souris River so as to reduce the flood control benefits provided by the Rafferty Dam and Alameda Dam and the Operating Plan;

4. The Government of the United States of America shall operate and maintain the improvements located in the United States for the remainder of their useful life at no cost to the Government of Canada and in accordance with the Operating Plan or any subsequent mutually agreed upon change to the Operating Plan.

5. The Parties shall notify one another of any maintenance curtailment that is proposed at any project addressed in the Operating Plan and the probable duration thereof, and take such action as is appropriate to minimize the effects of such maintenance curtailments on operations under the Operating Plan, to include providing one year's notice of such maintenance curtailments when possible.

ARTICLE IV

1. The Government of the United States of America shall pay the Government of Canada $26.7 million (United States currency, based on October 1985 price levels) for the flood control storage provided at Rafferty Dam.

2. The Government of the United States of America shall pay the Government of Canada an additional $14.4 million (United States currency, based on October 1985 price levels) for the flood control storage provided at Alameda Dam.

3. The amount of the contributions specified in Paragraphs 1 and 2 were determined by an allocation of construction costs based on the proportionate use of the Rafferty Dam and Alameda Dam for flood control in the United States of America and water supply in Canada. Such contributions shall be subject to adjustment for cost changes by the United States of America pursuant to Section 902(2) of Public Law 99-662 and shall fluctuate to reflect changes in the rate of exchange for currency between the United States of America and Canada that occurred between October 1985 and the time such contributions are made.

4. At the end of each calendar month, the Government of Canada shall issue a progress billing to the Government of the United States of America for its share of project construction costs, which shall be determined by an allocation of joint construction costs to flood control and water supply purposes. The Government of the United States of America shall review such billing and, if not disputed, make payment of the amount billed within thirty days of receipt of the bill for the amount due. If the Government of the United States of America disputes any billing or portion of such billing, it shall specify its reasons for disputing the billing and pay any undisputed amount. Disputed billings or disputed portions of billings shall be discussed by the Parties. Disputes concerning amounts billed that are not resolved by discussion may be settled in accordance with Article XII.

5. Records shall be established and maintained to permit identification of the exact nature and amounts of costs of the Rafferty Dam and Alameda Dam. The records established and maintained pursuant to this paragraph shall be subject to audit at the request of the Government of the United States of America at any reasonable time during the construction of the dams and for five years thereafter, following reasonable notice to the Government of Canada.

6. The Government of Canada shall furnish quarterly status reports to the Government of the United States of America on the progress of construction on the Rafferty Dam and Alameda Dam, the total amount of funds expended on the dams at the time of the report, and the anticipated costs to be billed to the United States for the remainder of the United States of America Government fiscal year, which ends on September 30, and for each following United States of America Government fiscal year.

ARTICLE V

1. The Parties shall cooperate and consult on the matters addressed in this Agreement. The Parties shall exchange such information as is appropriate to ensure timely and beneficial fulfillment of obligations under this Agreement.

2. The Parties shall prepare the Reservoir Regulation Manuals required by the Operating Plan. In preparing such Manuals, the Parties shall consult with interested states and provinces.

3. The Parties shall jointly review the Operating Plan at five-year intervals, or as mutually agreed, in an effort to maximize the provision of flood control and water supply benefits that can be provided consistent with the terms of this Agreement. The Parties shall cooperate and consult, as necessary, with interested states, provinces, and agencies on the review of the Operating Plan and recommended changes in the Operating Plan.

4. Subject to the consent of the Government of Canada, officials of the Government of the United States of America may enter on lands in Saskatchewan acquired for construction of Rafferty, Alameda, and Boundary Dams for the purpose of inspection to ensure that such improvements are being constructed, operated, and maintained in accordance with the terms of this Agreement.

5. The Parties shall consult with interested states and provinces upon request, as appropriate, and so far as is practicable, concerning the supply of water throughout the Souris River Basin.

ARTICLE VI

1. The Parties shall ensure that all activities pursued under the terms of this Agreement are consistent with applicable provisions of the Boundary Waters Treaty, particularly those of Article IV, paragraph two.

2. The Parties shall establish a Joint Water Quality Monitoring Program ("the Program") in the relevant portions of the Souris River Basin.

3. The Parties shall establish, within six months of the entry into force of this Agreement, a Bilateral Water Quality Monitoring Group ("the Group"). The Group shall be composed of six members, three appointed by each Party, and be co-chaired by a Canadian and a United States of America member. Each Party may also identify advisors to the Group to assist its respective members.

4. The initial United States of America members of the Group shall include a representative of each of the United States Environmental Protection Agency, the North Dakota Department of Health and Consolidated Laboratories, and the United States Geological Survey. A representative of the United States Fish and Wildlife Service, the United States Department of the Army, and the North Dakota State Engineer shall serve as the initial advisors to the United States of America members of the Group.

5. The initial Canadian members of the Group shall include a representative of each of the Government of Canada, the Government of Saskatchewan, and the Government of Manitoba.

6. The Group shall:

a. develop recommendations for the Parties on the Program and on water quality objectives;

b. on a regular basis, exchange data provided by the Program;

c. collate, interpret, and analyze the data provided by the Program;

d. review the Program and the water quality objectives at least every five years and recommend to the Parties, as appropriate, any modifications to improve the Program and the water quality objectives; and

e. prepare an annual report to be submitted to the Parties containing:

i. a summary of the principal activities of the Group during the year;

ii. a summary of the principal activities affecting water quality in the Souris River Basin during the year;

iii. a summary of the collated, interpreted, and analyzed data provided by the Program;

iv. a summary of the water quality of the Souris River at the two locations at which it crosses the International Boundary between Canada and the United States;

v. a section summarizing any definitive changes in the monitored parameters and the possible causes of such changes;

vi. a section discussing whether the water quality objectives as established pursuant to Paragraph 7 have been attained;

vii. a section summarizing other significant water quality changes and the possible causes of such changes; and

viii. recommendations on new water quality objectives or on how existing water quality objectives can be met, including suggestions on water quality as it relates to water quantity during periods of low flow, in the event that the annual report indicates that the water quality objectives have not been attained as a result of activities pursued under this Agreement.

7. The Parties shall, by April 1, 1991, establish water quality objectives for the Souris River at the Saskatchewan/North Dakota boundary and at the North Dakota/Manitoba boundary.

8. The Parties shall make reasonable efforts, consistent with then existing legal authorities, to implement the recommendations of the Group and, where reasonably practicable, to improve water quality in the Souris River Basin.

9. If the annual report of the Group indicates that the water quality objectives are not being attained, the Parties shall commence consultations to determine how the water quality objectives can be met, revised or otherwise addressed. Such consultations shall include participation by interested states, provinces, and agencies.

ARTICLE VII

The Parties agree that paragraph 1 of the 1959 Interim Measures, which were approved by the Government of the United States of America and the Government of Canada, shall be modified as shown in Annex B attached hereto.

ARTICLE VIII

1. Should operation of any improvement result in flood damages in either the United States of America or Canada in excess of the flood damages that would have occurred had the improvement not been in operation, the Parties shall, upon the request of either Party, commence consultations on how such flood damages can be avoided in the future and what mitigation and compensatory measures may be appropriate, including possible changes to the Operating Plan. Such consultations shall include participation by interested states, provinces and agencies.

2. Notwithstanding Article XI, paragraph 2, nothing in this Article shall preclude either Party from asserting any rights it may have against the other Party for flood damages resulting from the actions of the other Party.

ARTICLE IX

All obligations of the Government of the United States of America to be carried out under the terms of this Agreement shall be subject to the laws and regulations of the United States of America. All obligations of the Government of Canada to be carried out under the terms of this Agreement shall be subject to the laws and regulations of Canada.

ARTICLE X

1. The Government of Canada designates the Government of Saskatchewan as the Canadian entity responsible for the construction, operation, and maintenance of the improvements mentioned in this Agreement and located in Canada. Such entity shall issue the progress billings and receive the payments referred to in Article IV.

2. The Government of the United States of America designates the Department of the Army as the entity responsible for receiving billings and making the payments for flood control storage referred to in Article IV and for operating the improvements mentioned in this Agreement and located in the United States of America in accordance with the Operating Plan during periods of flood. The Government of the United States of America designates the Department of the Interior as the entity responsible for operating the improvements mentioned in this Agreement and located in the United States of America in accordance with the Operating Plan during non-flood periods.

ARTICLE XI

1. The Parties shall be liable to each other and, shall make appropriate compensation to each other with respect to any act, failure to act, omission or delay amounting to a breach of this Agreement. For the purposes of this Agreement, any act, failure to act, omission or delay occurring by reason of uncontrollable force shall not constitute a breach of this Agreement.

2. The Parties do not intend to create in this Agreement any private right of action. Except as provided by Paragraph 1 of the Article, neither Party shall be liable to the other or to any person in respect of any injury, damage, or loss occurring in the territory of the other caused by an act, failure to act, omission or delay under this Agreement whether the injury, damage, or loss results from negligence or otherwise.

3. Neither Party shall have any obligation under this Agreement to rebuild or further operate or maintain any improvement to be constructed under this Agreement that is destroyed by uncontrollable force.

4. Neither Party shall have any obligation under this Agreement to take any act to extend the life of any improvement mentioned in this Agreement beyond its normal useful life.

ARTICLE XII

1. The Parties shall seek to resolve any dispute concerning the interpretation or application of this Agreement through consultations undertaken in good faith. As part of this consultation process, the Parties may refer any dispute concerning the interpretation or application of this Agreement to the International Joint Commission for advice and recommendations if mutually agreed. In making such a referral, the Parties shall request that the International Joint Commission provide its advice and recommendations within 90 days of the referral.

2. Any dispute concerning the interpretation or application of this Agreement which cannot be resolved through good faith consultations shall, upon the request of either Party, be referred to a neutral tribunal for review and examination and issuance of advice and recommendations. The tribunal shall consist of two members appointed by the Government of Canada, two members appointed by the Government of the United States of America, and a member jointly appointed by the Parties, who shall be chairman of the tribunal.

3. The Parties shall give prompt and sympathetic consideration to the advice and recommendations of the International Joint Commission and the tribunal.

4. The expenses of the International Joint Commission and the tribunal shall be shared equally by the Parties.

5. These procedures may be supplemented or modified by mutual agreement of the Parties.

ARTICLE XIII

1. This Agreement shall enter into force upon signature.

2. This Agreement may be amended by mutual agreement of the Parties.

3. This Agreement shall remain in force for a period of one hundred years or until the Parties agree that the useful life of the Rafferty and Alameda Dams has ended, whichever is first to occur.

4. If either Party fails to receive appropriations or other revenues in amounts sufficient to meet anticipated obligations under this Agreement, that Party shall so notify the other Party. Ninety calendar days after providing such notice, either Party may elect to terminate this Agreement or to defer future performance under this Agreement. Termination or deferral of future performance shall not affect existing obligations of the Parties under this Agreement or relieve the Parties of liability for any obligation previously incurred. In the event that either Party terminates or suspends future performance under this Agreement pursuant to this provision, the Government of the United States of America and the Government of Canada shall make appropriate adjustments in the Operating Plan to maximize the flood control and water supply benefits that can be obtained in the United States of America and Canada from the construction accomplished at the time of termination or suspension.

IN WITNESS WHEREOF the undersigned, duly authorized by their respective Government, have signed this Agreement.

DONE at Washington D.C. in duplicate, this 24th day of October, 1989 in the English and French languages, each text being equally authentic.

For Canada:

For the United States of America:

ANNEX A

OPERATING PLAN

FOR

RAFFERTY, ALAMEDA, BOUNDARY, AND LAKE DARLING RESERVOIRS

OPERATING PLAN FOR
RAFFERTY, ALAMEDA, BOUNDARY, AND LAKE DARLING RESERVOIRS

TABLE OF CONTENTS

List of Tables

List of Figures

List of Plates

INTRODUCTION

Purpose:

This Operating Plan was developed pursuant to the Agreement between the Government of the United States of America and the Government of Canada for water supply and flood control in the Souris River Basin (hereinafter referred to as "the subject Agreement.")

It provides for operation of the Souris Basin Project and sets forth a framework for completing project specific Reservoir Regulation Manuals.

Scope:

The Operating Plan is limited to the operation of the Souris Basin Project in the Souris River Basin in Saskatchewan, Canada, and North Dakota, United States of America, in accordance with the subject Agreement.

Objectives:

The objectives of the Operating Plan are:

- To provide 1-percent (100-year) flood protection at Minot, North Dakota;

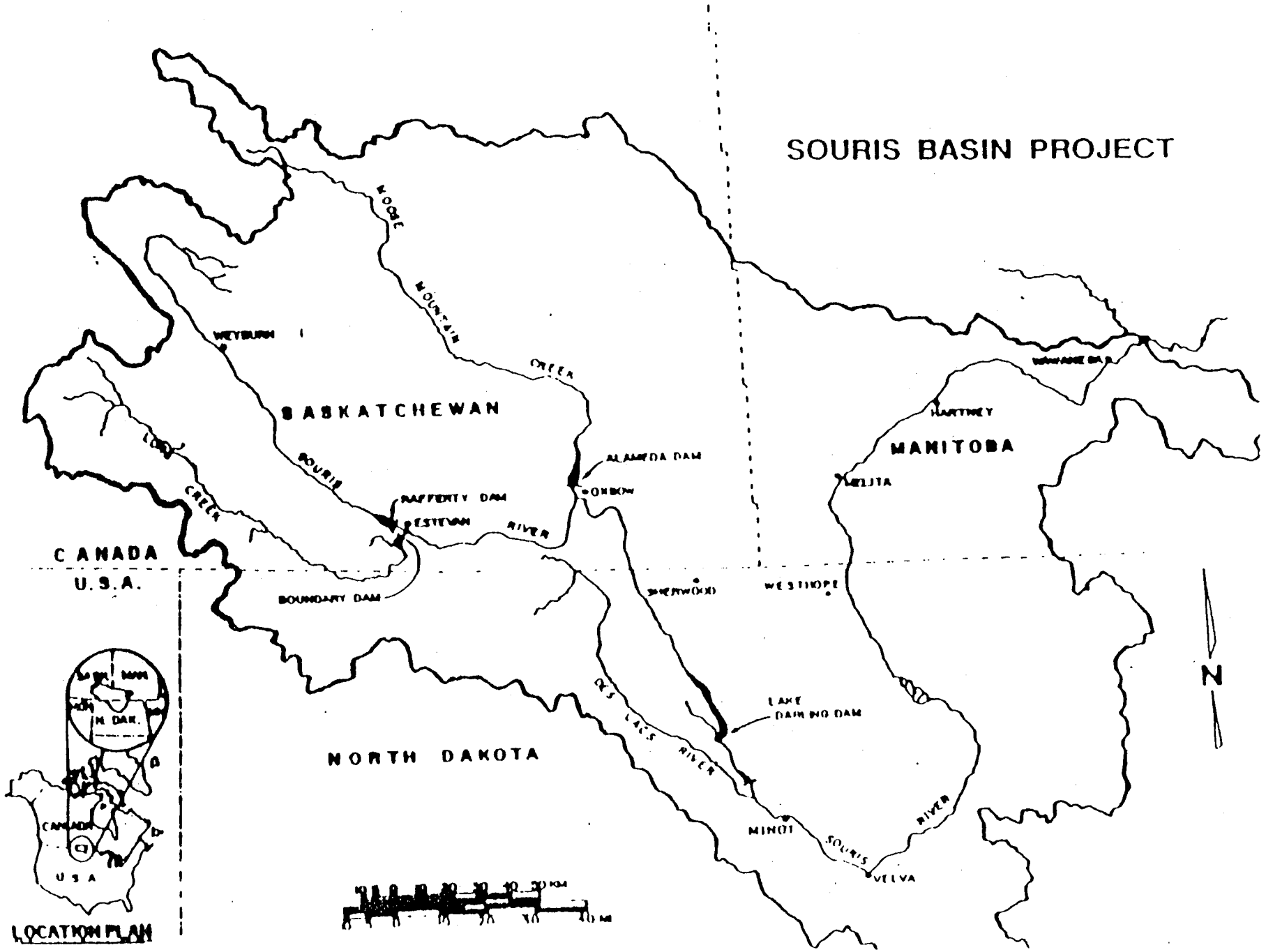
- To provide flood protection to urban and rural areas downstream from Rafferty Dam, Alameda Dam, and Lake Darling Dam;

- To ensure, to the extent possible, that the existing benefits from the supply of water in the Souris River Basin and the supply of water to the Souris Basin Project are not compromised.

Document:

This Operating Plan establishes guidelines for operation of the Souris Basin Project. It also includes the following information on the operation of the Souris Basin Project: data on the physical characteristics of the dams and reservoirs, rules for flood and non-flood operation, and procedures for communication and exchange of information. This Operating Plan was developed based on computer simulation of floods having temporal and spatial characteristics of those actually experienced in floods of 1969, 1974, 1975, 1976, 1979, and 1982. It is recognized that this Operating Plan may not cover all possible flood circumstances, and it may be necessary to jointly agree on changes to the Operating Plan. It will be necessary for agencies directly responsible for the daily operation of each improvement covered by this Operating Plan to develop detailed Reservoir Regulation Manuals to operate the reservoirs in accordance with the terms of the subject Agreement. A Basin map is shown in figure A-1.

Forecasting: The ability to provide increased flood protect' (including the ability to limit flows at Minot 5,000 cfs for floods up to the 1-percent even.., while optimizing the potential supply of water in the Souris River Basin is dependent upon the accuracy of the estimates of runoff provided to the agencies responsible for the daily operation of each improvement (Section 4.3.1). The runoff estimates used in this Operating Plan are: runoff volume, 30-day; runoff volume, 90-day; Sherwood Crossing uncontrolled runoff volume; and runoff volume, 90-percent, 90-day. Data used to develop the runoff estimates are gathered by Environment Canada and Saskatchewan Water Corporation in Canada and the National Weather Service in the United States. As noted in Section 2.4, new estimating techniques will be developed. If the new estimating techniques cannot be developed for the four items listed above, (with sufficient accuracy to meet the dual objectives of flood control and water conservation), then the Operating Plan will be modified to use existing methods of estimating runoff.


SOURIS BASIN PROJECT
SASKATCHEWAN
MANITOBA
NORTH DAKOTA
CANADA
U.S.A.
MOOSE MOUNTAIN CREEK
WEYBURN
LODGE CREEK
SOURIS RIVER
RAFFERTY DAM
ESTEVAN
BOUNDARY DAM
ALAMEDA DAM
GORDON
SHERWOOD
WESTHOPE
HARTNEY
MELITA
DES LACS RIVER
LAKE DARLING DAM
MINOT
SOURIS RIVER
VELVA
N
LOCATION PLAN

1.0 TERMINOLOGY

1.1 Glossary of Terms and Definitions

Alameda Dam	The dam which will be constructed on Moose Mountain Creek in the Province of Saskatchewan approximately four kilometres upstream from its confluence with the Souris River.
Authority	The Souris Basin Development Authority.
Bankfull capacity	The maximum flow that a given watercourse can convey in a specified reach without the water level rising above the level of either bank.
Boundary Dam	An existing dam located on Long Creek approximately seven kilometres in a southwesterly direction from the City of Estevan in the Province of Saskatchewan.
Boundary Diversion Channel	A channel that will be constructed in the Province of Saskatchewan with a maximum capacity of 60 m^3/s (2,100 cfs) to allow the conveyance of water from the Bound Reservoir to the impoundment behind Raffe. Dam.
Canadian reservoirs	A collective term for Rafferty Reservoir, Boundary Reservoir, and Alameda Reservoir.
Control point	A streamflow gaging station or dam which is used to develop operating decisions for Rafferty Reservoir, Alameda Reservoir, Boundary Reservoir, and Lake Darling Reservoir.
Controlled volume	The volume of runoff that can be controlled by using available flood control storage.
Drawdown	The physical act of lowering the pool level of a reservoir through controlled releases.
Estimate	A value based on the best judgment of qualified personnel using all available data.

Flood control storage	The volume below the maximum allowable water level in a reservoir to store flood event runoff.
Full Supply Level	The maximum elevation that the reservoir (FSL) pool is allowed to attain when operations are not directed at achieving flood control benefits.
Lake Darling Dam	An existing structure which is part of the Upper Souris National Wildlife Refuge located on the Souris River approximately 25 kilometres in a northwesterly direction from the City of Minot in the State of North Dakota.
Local flow	The runoff that occurs between two given locations.
Maximum allowable flood level	The highest level a reservoir is allowed to reach while storing water for flood control purposes. When a reservoir reaches this level, any flows into the reservoir must be spilled.
Maximum level prior to spring runoff	The reservoir level which must not be exceeded prior to the spring runoff, regardless of the predicted volume of runoff.
Minimum supply level	The lowest level at which water can be released from a reservoir (invert of conduits).
Natural flow	The volume of runoff determined by the International Souris River Board of Control.
1-percent flood (100-year flood)	A runoff event which is estimated to generate a total 30-day continuous flow volume equal to 721,000 cubic decametres (584,500 acre-feet) as determined at Sherwood Crossing based on data recorded at that station prior to 1986.
Rafferty Dam	The dam which is under construction at a location on the Souris River approximately six kilometres upstream in a northwesterly direction from the City of Estevan in the Province of Saskatchewan.
Releases	The controlled discharge of water from a reservoir other than spills.

Reservoir level	The static water surface elevation of a reservoir.
Reservoir Regulation Manual	A document which is to be used as a guide by the responsible agency in the day to day operation of a reservoir. The manual shall discuss the following topics: description of the project, history of the project, watershed characteristics, data collection and communication networks, hydrologic forecasts, the water control plan, and water control management.
Runoff	The flow of water in a watercourse in response to rainfall or snowmelt or a combination of rainfall and snowmelt.
Runoff volume, 30-day (30-day volume)	Maximum 30-consecutive-day runoff volume that occurs in any water year.
Runoff volume, 90-day (90-day volume)	Maximum 90-consecutive-day runoff volume that occurs in any water year.
Runoff volume, 90-percent, 90-day	The estimated 90-day volume unregulated runoff with a 90-percent probability of being equalled or exceeded by the actual runoff.
Saskatchewan works	The works described in Article III of the subject Agreement in Saskatchewan, Canada, to include Rafferty Dam, Alameda Dam, and the Boundary Diversion Channel.
Sherwood Crossing	The International gaging station, number 05114000 (05ND007), latitude 48:59:24, longitude 101:57:28, on the Souris River, 0.8 mile downstream of the International boundary.
Sherwood Crossing uncontrolled runoff volume	The uncontrolled volume from the Canadian Reservoirs, if any, and the local flow between the Canadian Reservoirs and Sherwood Crossing.
Souris Basin Project (Project)	The development and operation of the Saskatchewan works in Canada; the operation of the existing Boundary Reservoir in Saskatchewan and the operation of the existing Lake Darling Reserve in North Dakota in the United States.
Spills	The uncontrolled discharge of water from a reservoir.

Target drawdown level	A pool level to which a reservoir should be lowered in response to estimated spring runoff so that the desired level of flood protection will be provided.
Target flow	The instantaneous flow at a given location that should not be exceeded during a given flood event as a result of releases from a reservoir or reservoirs.
Temporary target flow	A target flow at Sherwood Crossing that has been modified to take into account available storage in Lake Darling.
Uncontrolled volume	The volume of runoff that cannot be controlled by the available flood control storage.
Unregulated flow at Sherwood Crossing	That flow that would occur at Sherwood Crossing if Rafferty Dam and Alameda Dam were not in place.
Water year	October 1 to September 30.
Westhope Crossing	The International gaging station, number 05NF012 (15124000), latitude 48:59:47, longitude 100:57:29, on the Souris River 1.6 kilometres upstream of the International boundary.

1.2 Abbreviations and Symbols

Following is a list of abbreviations and symbols used in this Operating Plan:

ac-ft	-	acre-feet
cfs	-	cubic feet per second
dam^3	-	cubic decametre
ft	-	feet
m	-	metre
m^3/s	-	cubic metres per second
km	-	kilometre

1.3 Conversion Factors

As provided in the subject agreement, the following table may be used to convert measurements in the English (United States) system of units to the SI or metric (Canadian) system of units.

Multiply English Units	by	To obtain SI Units
	Length	
inch (in)	25.4	millimetre (mm)
foot (ft)	0.3048	metre (m)
mile (mi)	1.609344	kilometre (km)
	Area	
square mile (mi^2)	2.590	square kilometre (km^2)
acre (ac)	4046.9	square metre (m^2)
	Flow	
cubic foot per second (cfs)	0.02831685	cubic metre per second (m^3/s)
	Volume	
acre-foot (ac-ft)	1.233482	cubic decametre (dam^3)
	Velocity	
foot per second (ft/s)	0.3048	metre per second (m/s)
	Slope	
foot per mile (ft/mi)	0.1894	metre per kilometre (m/km)

1 ha = 10,000 m^2 == ha x 2.471054 = acre

1 dam^3 = 1,000 m^3 == dam^3 x 0.811 = ac-ft

2.0 HYDROMETEOROLOGICAL DATA NETWORK

2.1 General

The collection and distribution of hydrologic and meteorological data in the Souris River basin involves government agencies in the United States and Canada. The data collection network is vital to the successful operation of Rafferty Reservoir, Boundary Reservoir, and Alameda Reservoir in Canada and Lake Darling in the United States. The network may be modified from time to time. The data collection network is operated by the following agencies.

Canada

In Canada, the Water Resources Branch operates and maintains a network of hydrometric stations to record streamflow and water levels and the Atmospheric Environment Service operates and maintains a network of meteorological stations. Both the Water Survey of Canada and the Atmospheric Environment Service are part of Environment Canada, a Federal government agency. In addition, the Saskatchewan Water Corporation, a Provincial Crown Corporation, operates a number of snow course stations in the basin. The purpose of the snow course measurements is to provide additional data for estimating spring runoff.

United States

In the United States, the U.S. Geological Survey operates and maintains a network of hydrometric stations to record streamflow and water levels, and the National Weather Service operates and maintains a network of meteorological stations. Both organizations are Federal agencies. In addition to the meteorological stations, the National Weather Service undertakes aerial gamma surveys to provide additional snow data for estimating spring runoff.

The networks operated by these agencies are shown on the map in figure A-2 and are described in the following section.

2.2 Station Networks

The existing hydrometric station networks are shown on Table 2.1 for Canada and on Table 2.2 for the United States.

The existing meteorological station networks are shown on Table 2.3 for Canada and on Table 2.4 for the United States.

2.3 Additional Stations

Gages and methods will be established to measure inflow, pool levels, and downstream flows for Rafferty Reservoir and for Alameda Reservoir. Additional gaging stations may be added to ensure the appropriate operation of the Project.

2.4 Data Collection, Estimating, and Coordination

Close coordination and exchange of data will be maintained by the Government of the United States and the Government of Canada to facilitate Project operation, with particular reference to pre-flood drawdown. Other items will be detailed in the Reservoir Regulation Manual.

Improved estimating techniques will be developed by the Parties to the subject Agreement. These estimating techniques will be based on the mutual agreement of the Parties and will be included as part of the Reservoir Regulation Manuals, which will be written at a later date.

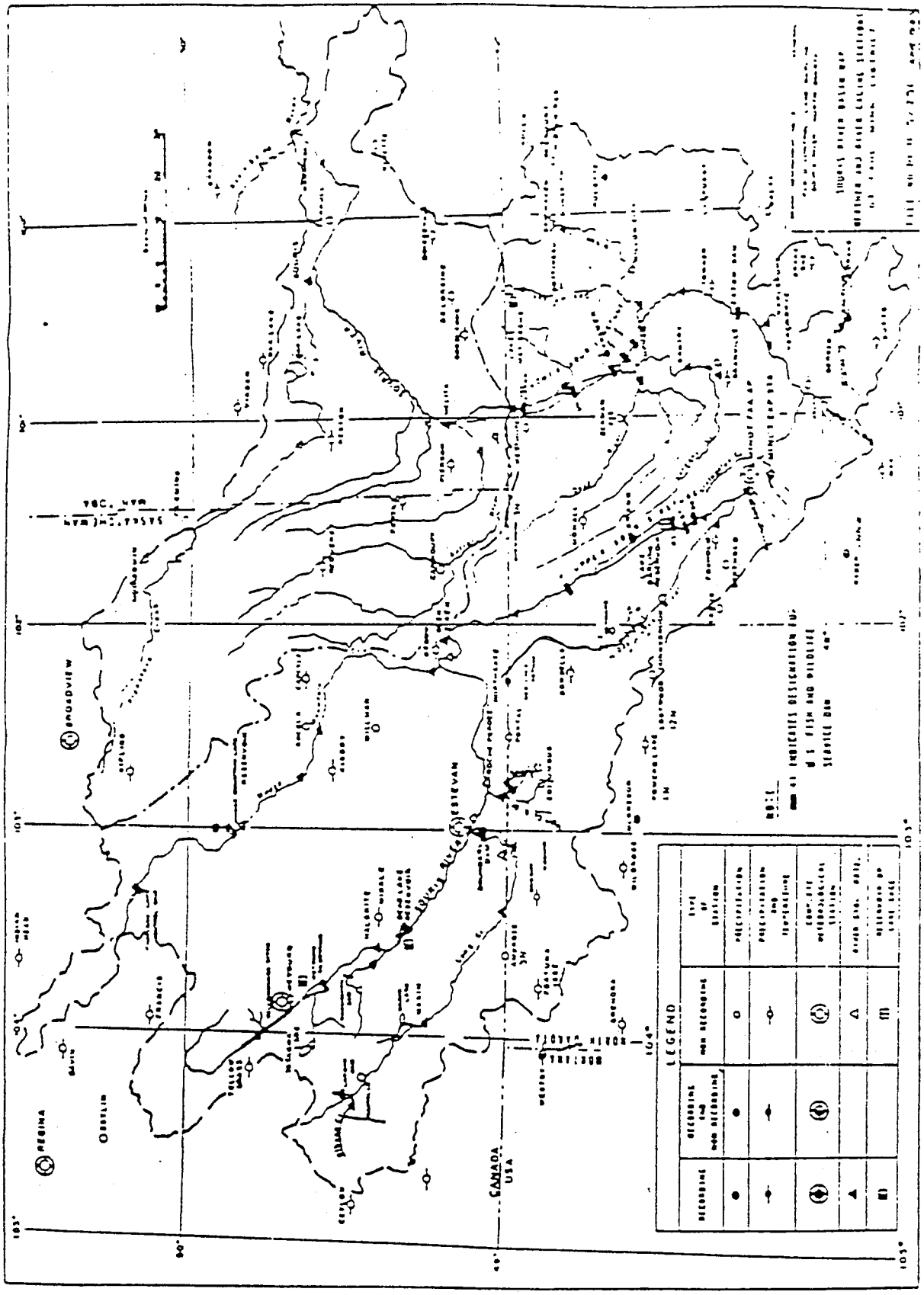


FIGURE A-2

30 July 1987

Revised 24 Sep 1987

TABLE 2.1
HYDROMETRIC STATION NETWORK FOR SOURIS BASIN IN SASKATCHEWAN

Station No.	Station Name	Location Latitude	Location Longitude	Type
05NA003 (05113360)	Long Creek at Western Crossing	49 00 01	103 21 08	Flow; auto recorder; Telemark
05NA004	Long Creek near Maxim	49 15 32	103 57 22	Flow; auto recorder; seasonal
05NA005	Gibson Creek near Radville	49 29 02	104 20 11	Flow; auto recorder; seasonal
05NA006	Larson Reservoir near Radville	49 28 30	104 16 50	Water level; auto recorder
05NB001	Long Creek near Estevan	49 06 15	103 00 48	Flow; auto recorder
05NB009	Souris River nr. Roche Percee	49 04 34	102 45 53	Flow; auto recorder
05NB011	Yellow Grass ditch near Yellow Grass	49 47 11	104 02 16	Flow; auto recorder; seasonal
05NB012	Boundary Res. near Estevan	49 05 49	103 01 28	Water level; auto recorder
05NB014	Jewel Creek nr. Goodwater	49 23 10	103 42 42	Flow; auto recorder; seasonal
05NB016	Roughbark Res. near Weyburn	49 30 08	103 43 07	Water level; auto recorder
05NB017	Souris River nr. Halbrite	49 29 37	103 39 44	Flow; auto recorder; seasonal
05NB018	Tatagwa Lake Dr. near Weyburn	49 35 58	103 56 50	Flow; auto recorder; seasonal
05NB020	Nickle Lake nr. Weyburn	49 36 33	103 47 28	Water level; auto recorder
05NB021 (05113800)	Short Creek nr. Roche Percee	49 01 52	102 50 57	Flow; auto recorder
05NB022	Dead Lake Res. near Midale	49 17 23	103 26 40	Water level; auto recorder
05NB025	Souris River near Lewvan	49 58 37	104 04 33	Flow; auto recorder; seasonal

TABLE 2.1 (cont.)
HYDROMETRIC STATION NETWORK FOR SOURIS BASIN IN SASKATCHEWAN

Station	Station Name	Location Latitude	Location Longitude	Type	No.
05NB029	Dead Lake - Souris River	49 17 23	103 26 40	Water level; auto recorder	
05NB030	Souris River near McTaggart	49 46 10	104 00 54	Flow; auto recorder seasonal	
05NB031	Souris River near Bechard	49 59 20	104 11 24	Flow; auto recorder seasonal	
05NC001	Moose Mountain Creek below Moose Mountain Lake	49 52 23	103 00 54	Flow; auto recorder seasonal	
05NC002	Moose Mountain Reservoir nr. Corning	49 53 29	103 01 58	Water level; auto recorder	
05ND001	Souris River nr. Glen Ewen	49 11 02	102 01 42	Flow; auto recorder	
05ND004	Moose Mountain Creek nr. Oxbow	49 13 58	102 13 41	Flow; auto recor seasonal	
05NF006	Lightning Creek near Carnduff	49 13 17	101 43 06	Flow; auto recorder seasonal	
05NF010	Antler River near Wauchope	49 35 03	101 50 52	Flow; auto recorder seasonal	
05NF013	Gainsborough Creek near Starthoaks	49 24 51	101 31 36	Flow; auto recorder seasonal	
24-131	Souris River at #18 Highway	49 07 42	103 01 17	Flow; manual recorder; Extreme flow only	
24-132	Souris River at #47 Highway	49 07 11	102 59 32	Flow; manual recorder; Extreme flow only	
24-133	Souris River at Oxbow	49 13 04	102 11 08	Flow; manual recorder; Extreme flow only	
	Souris River at Pulfer's Farm	49 40 50	103 54 09	Flow; manual recorder; Extreme flow only	

TABLE 2.2
HYDROMETRIC STATION NETWORK FOR SOURIS BASIN IN NORTH DAKOTA

Station No.	Station Name	Location		Type
		Latitude	Longitude	
05114000	Souris River nr. Sherwood	48 59 24	101 57 28	Flow; auto recorder; Telemark
05115500	Lake Darling near Foxholm	48 27 27	101 35 14	Water level; auto recorder
05116000	Souris River near Foxholm	48 22 20	101 30 18	Flow; auto recorder; Telemark
05116500	Des Lacs River near Foxholm	48 22 14	101 34 11	Flow; auto recorder; Telemark
05117500	Souris River above Minot	48 14 45	101 22 15	Flow; auto recorder; Telemark
05120000	Souris River near Verendrye	48 09 35	100 43 45	Flow; auto recorder
05120500	Wintering River near Karlsruhe	48 10 14	100 32 20	Flow; auto recorder
05122000	Souris River near Bantry	48 30 20	100 26 04	Flow; auto recorder; Telemark
05123000	Lake Metigoshe near Bottineau	48 59 05	100 20 52	Water level; auto recorder
05123400	Willow River near Willow City	48 35 20	100 26 30	Flow; auto recorder
05123500	Deep River near Upham	48 35 03	100 51 44	Flow; auto recorder; Telemark
05123900	Boundary Creek near Landa	48 48 46	100 51 46	Flow; auto recorder
05124000	Souris River near Westhope	48 59 47	100 57 29	Flow; auto recorder

TABLE 2.3
METEOROLOGICAL STATION NETWORK FOR SOURIS BASIN IN SASKATCHEWAN

Station Name	Station	Location		Observing Programs *									
		Latitude	Longitude	TE	PR	HW	RR	ST	EV	SU	SS	NS	WS
Alameda		49 24	102 16								X		
Amulet	4010150	49 37	104 44	X	X								
Arcola COA	4010240	49 38	102 32		X								
Bechard	4010540	50 03	104 13	X	X								
Broadview	4010879	50 23	102 35	X	X	X	X	X	X	X	X	X	
Carlyle	4011160	49 38	102 17	X	X								
Carlyle		49 39	102 16								X		
Carlyle C-7		49 39	102 20								X		
Carnduff	4011250	49 13	101 45		X								
Ceylon	4011441	49 24	104 39	X	X								
Davin	4012162	50 24	104 11		X								
Davin	4012165	50 22	104 09		X								
Davin	4012166	50 23	104 10	X	X		X		X				
Estevan		49 05	102 59								X		
Estevan A	4012400	49 04	103 00	X	X	X	X	X	X	X	X	X	
Estevan C-9		49 08	102 56								X		
Fertile	4012485	49 20	101 27	X	X								
Fleming S.	4012525	50 02	101 35		X								
Francis	4012720	50 07	103 55	X	X								
Frobisher		49 13	102 09								X		
Gainsborough	4012790	49 18	101 32		X								
Glenavon		50 12	103 08								X		
Handsworth	4013098	48 51	102 52	X	X								
Handsworth		49 53	103 02								X		
Heward	4013221	49 45	103 09	X	X								
Hitchcock		49 15	103 10								X		
Hume		49 40	103 37								X		
Indian Head CDA	4013480	50 32	103 40	X	X			X				X	
Indian Head PFRA	4013490	50 31	103 41	X	X			X	X	X			X
Kipling	4014040	50 12	102 44	X	X								
Kisbey		49 40	102 45								X		

*TE - Temperature
PR - Precipitation
HW - Hourly Weather
RR - Rate of Rainfall
ST - Soil Temperature
EV - Evaporation
SU - Sunshine
SS - Snow Survey
NS - Nipher Snow Measurements
WS - Windspeed

TABLE 2.3 (cont.)
METEOROLOGICAL STATION NETWORK FOR SOURIS BASIN IN SASKATCHEWAN

Station Name	Station	Location		Observing Programs *								
		Latitude	Longitude	TE	PR	HW	RR	ST	EV	SU	SS	NS	WS
Macoun	4014870	49 14	103 14		X								
Maryfield	4015045	49 50	101 32	X	X								
Maxim		49 19	103 57								X		
Midale	4015160	49 24	103 25	X	X								
Moose Mountain Reservoir	4015344	49 53	103 02	X	X				X				
Moosomin	4015360	50 09	101 40	X	X								
Neptune		49 22	104 06								X		
Neptune S.		49 19	104 02								X		
Noonan N.D.		48 57	103 03								X		
Odessa	4015648	50 20	103 41	X	X								
Oungre		49 09	103 45								X		
Oxbow	4015800	49 19	102 07	X	X								
Oxbow		49 14	102 07								X		
Radville CDA	4016400	49 30	104 17			X							
Redvers	4016522	49 32	101 42	X	X								
Torquay	4018105	49 05	103 30		X								
Trossachs N.E.		49 36	104 11								X		
Trossachs S.		49 34	104 17								X		
Wapella - Newfinland	4018508	50 27	101 56	X	X								
Wawota	4018678	49 56	101 58	X	X			X	X	X			X
Weyburn		49 40	103 53								X		
Weyburn 2	4018762	49 40	103 51		X								
Willmar	4018960	49 25	102 30		X								
Yellow Grass	4019040	49 48	104 10	X	X								

*TE - Temperature
PR - Precipitation
HW - Hourly Weather
RR - Rate of Rainfall
ST - Soil Temperature
EV - Evaporation
SU - Sunshine
SS - Snow Survey
NS - Nipher Snow Measurements
WS - Windspeed

TABLE 2.4
METEOROLOGICAL STATION NETWORK FOR SOURIS BASIN IN NORTH DAKOTA

Station Name	Location		Observing Programs *					
	Latitude	Longitude	PR	TE	SS	HW	SU	E
Ambrose	49 00	103 28	X		X			
Belcourt	48 50	99 45	X	X	X			
Berthold	48 19	101 44	X		X			
Bottineau	48 50	100 27	X	X	X			
Bowbells	48 48	102 15	X	X	X			
Butte	47 50	100 40	X	X	X			
Columbus	48 55	102 50	X		X			
Crosby	48 54	103 18	X	X	X			
Drake 8NE	48 02	100 17	X	X	X			
Fortuna 1W	48 55	103 49	X	X	X			
Foxholm 7N	48 20	101 33	X	X	X			
Granville	48 16	100 51	X	X	X			
Kenmare	48 40	102 06	X	X	X			
Lake Metigoshe	48 59	100 21	X		X			
Max	47 49	101 18	X	X	X			
Minot FAA	48 16	101 17	X	X	X	X		
Minot Exp. St.	48 11	101 18	X	X	X		X	X
Mohall	48 48	101 31	X	X	X			
Rolla 3NW	48 54	99 40	X	X	X			
Rugby	48 21	100 00	X	X	X			
Sherwood 3N	49 00	101 38	X		X			
Tagus	48 20	101 56	X		X			
Tower NE	48 21	100 24	X	X	X			
Upham 3N	48 37	100 44	X	X	X			
Westhope	48 55	101 22	X	X	X			

*PR - Precipitation
TE - Temperature
SS - Snow Survey
HW - Hourly Weather
SU - Sunshine
EV - Evaporation

3.0 CONTROL POINTS

3.1 Rafferty Dam

The relevant data for this control point are presented on Tables 3.1 and 3.2. The elevation-area-capacity curves are shown on Plate A-7. In the event of a discrepancy, the tabulated values will be used.

Table 3.1
DATA FOR RESERVOIRS

Description	Elevation	Total Storage
Rafferty Reservoir		
Maximum allowable flood level	554.00 m (1817.59 ft)	633,000 dam^3 (513,000 ac-ft)
Full supply level	550.50 m (1806.10 ft)	439,600 dam^3 (356,400 ac-ft)
Normal level prior to spring runoff	549.50 m (1802.82 ft)	394,000 dam^3 (319,000 ac-ft)
Minimum supply level	537.50 m (1763.45 ft)	13,000 dam^3 (10,000 ac-ft)
Boundary Reservoir		
Full supply level	560.83 m (1840.00 ft)	61,500 dam^3 (49,800 ac-ft)
Minimum supply level	553.21 m (1815.00 ft)	24,900 dam^3 (20,800 ac-ft)
Alameda Reservoir		
Maximum allowable flood level	567.00 m (1860.24 ft)	189,600 dam^3 (153,710 ac-ft)
Full supply level	562.00 m (1843.83 ft)	105,500 dam^3 (85,530 ac-ft)
Normal level prior to spring runoff	561.00 m (1840.55 ft)	94,245 dam^3 (76,400 ac-ft)
Minimum supply level	555.85 m (1823.65 ft)	50,700 dam^3 (41,100 ac-ft)
Lake Darling Reservoir		
Maximum allowable flood level	1601.00 ft (487.98 m)	158,600 ac-ft (195,630 dam^3)
Full supply level	1597.00 ft (486.77 m)	110,000 ac-ft (136,000 dam^3)
Minimum supply level	1577.00 ft (480.67 m)	3,500 ac-ft (4,300 dam^3)

Table 3.2
SUMMARY OF RAFFERTY ELEVATION-AREA-CAPACITY DATA

Elevation		Storage		
metres	feet	dam^3	ac-ft	
547.5	1796.26	305287	247500	Maximum required drawdown (1)
549.5	1802.82	392371	318100	Normal drawdown (2)
550.5	1806.10	439613	356400	FSL
554.0	1817.59	632776	513000	Maximum storage level

Elevation		Surface Area		Storage	
metre	feet	ha	acres	dam^3	ac-ft
535.0	1755.25	0	0	0	0
537.0	1761.81	807	1992	4737	3840
538.0	1765.09	1464	3614	16159	13100
540.0	1771.65	2495	6159	56370	45700
545.0	1788.06	3574	8822	209075	169500
546.0	1791.34	3795	9367	245833	199300
547.0	1794.62	4022	9928	284811	230900
547.5	1796.26	4134	10205	305287	247500
549.0	1801.18	4480	11060	369675	299700
549.5	1802.82	4599	11353	392371	318100
550.0	1804.46	4719	11649	416547	337700
550.5	1806.10	4881	12048	439613	356400
551.0	1807.74	5045	12454	464406	376500
551.5	1809.38	5212	12866	490062	397300
552.0	1811.02	5407	13347	516582	418800
552.5	1812.66	5605	13836	543966	441000
553.0	1814.30	5807	14334	572459	464100
553.5	1815.94	6012	14841	602063	488100
554.0	1817.59	6222	15360	632776	513000
555.0	1820.87	6651	16418	697041	565100

1. Assuming starting elevation of 547.5 metres, flood control storage available would be 632,776 (513,000) - 305,287 (247,500) = 327,489 dam^3 (265,500 ac-ft) (FSL = 550.5(.

2. Assuming starting elevation of 549.5 metres, flood control storage available would be 632,776 (513,000) - 392,371 (318,100) = 240,405 dam^3 (194,900 ac-ft) (FSL = 550.5(.

3.2 Boundary Dam

The relevant data for this control point are shown on Tables 3.1 and 3.3.

Table 3.3
SUMMARY OF BOUNDARY ELEVATION-AREA-CAPACITY DATA

Elevation		Storage		
metre	feet	dam^3	ac-ft	
557.8	1830.0	44725	36259	Max required drawdown (1)
560.8	1840.0	61480	49845	FSL, Normal, & Max.

Elevation		Surface Area		Storage	
metre	feet	ha	acres	dam^3	ac-ft
554.7	1820.0	407	1005	30691	24882
555.5	1822.5	425	1049	33970	27540
556.3	1825.0	445	1098	37400	30320
557.0	1827.5	486	1200	41000	33240
557.8	1830.0	506	1249	44725	36259
558.5	1832.5	546	1348	48625	39420
559.3	1835.0	547	1350	52670	42700
560.1	1837.5	607	1498	56910	46140
560.8	1840.0	688	1698	61480	49845

1. At maximum required drawdown level of 557.8 metres (1830 feet), storage available would be 61,480 (49,845) - 44,725 (36,259) = 16,755 dam^3 (13,586 == 13,600 ac-ft). This necessary storage may also be obtained by drawing Rafferty below required levels and diverting the 16,755 dam^3 (13,600 ac-ft) to Rafferty Reservoir.

3.3 Alameda Dam

The relevant data for this control point are shown on Tables 3.1 and 3.4. The elevation-area-capacity curves are shown on Plate A-8.

Table 3.4
SUMMARY OF ALAMEDA ELEVATION-AREA-CAPACITY DATA

Elevation metres	Elevation feet	Storage dam^3	Storage ac-ft	
555.85	1823.65	50700	41100	Maximum required drawdown (1)
561.0	1840.55	94245	76400	Normal drawdown (2)
562.0	1843.83	105500	85530	FSL
567.0	1860.24	189600	153710	Maximum storage level

Elevation metres	Elevation feet	Surface Area ha	Surface Area acres	Storage dam^3	Storage ac-ft
528.0	1732.28	0	0	0	0
530.0	1738.84	11	27	110	90
532.0	1745.41	27	67	490	400
534.0	1751.97	41	101	1170	950
536.0	1758.53	58	143	2160	1750
538.0	1765.09	77	190	3500	2840
540.0	1771.65	93	230	5200	4215
542.0	1778.21	124	306	7370	5975
544.0	1784.78	156	385	10170	8245
546.0	1791.34	200	494	13700	11110
548.0	1797.90	253	625	18260	14805
550.0	1804.46	318	785	23970	19430
552.0	1811.02	386	953	31000	25130
554.0	1817.59	495	1222	39800	32265
555.85	1823.65	624	1540	50700	41100
556.0	1824.15	635	1567	51100	41425
558.0	1830.71	770	1900	65160	52825
560.0	1837.27	1010	2493	82990	67280
561.0	1840.55	1125	2777	94245	76400
562.0	1843.83	1240	3061	105500	85530
564.0	1850.39	1520	3752	133200	107990
566.0	1856.96	1940	4789	167800	136040
567.0	1860.24	2180	5381	189600	153710
568.0	1863.52	2420	5974	211400	171385
569.0	1866.80	2660	6566	236800	191980

1. Assuming starting elevation of 555.85 metres, flood control storage available would be 189,600 (153,710) - 50,700 (41,100) = 138,900 dam 3 (112,608 ac-ft) (FSL = 562.0(.

2. Assuming starting elevation of 561.0 metres, flood control storage available would be 189,600 (153,710) - 94,245 (76,400) = 95,355 dam^3 (77,305 ac-ft) (FSL = 562.0(.

3.4 Lake Darling Dam

The relevant data for this control point are shown on Tables 3.2 and 3.5. The elevation-area-capacity curves are shown on Plate A-9.

Table 3.5
SUMMARY OF LAKE DARLING ELEVATION-AREA-CAPACITY DATA

Elevation		Storage		
feet	metres	ac-ft	dam^3	
1591	484.94	53,000	65,375	Maximum drawdown (1)
1596	486.46	99,000	122,115	Normal drawdown (2)
1597	486.77	110,100	135,800	Normal pool
1601	487.98	158,600	195,063	Existing maximum

Elevation		Surface Area		Storage	
feet	metres	acres	ha	ac-ft	dam^3
1591.0	484.94	7,431	3,010	53,000	65,375
1592.0	485.24	8,200	3,322	60,800	75,000
1593.0	485.55	8,910	3,610	69,400	85,600
1594.0	485.85	9,650	3,910	78,600	96,950
1595.0	486.16	10,220	4,140	88,600	109,290
1596.0	486.46	10,800	4,375	99,000	122,115
1597.0	486.77	11,270	4,566	110,100	135,800
1598.0	487.07	11,750	4,760	121,600	150,000
1599.0	487.38	12,150	4,922	133,600	164,790
1600.0	487.68	12,550	5,084	145,900	179,965
1601.0	487.98	12,900	5,226	158,600	195,630

Service spillway crest at 1598.0 feet.

1. Assuming a starting elevation of 1591 feet, flood control storage available would be 158,600 (195,630) - 53,000 (65,375) = 105,600 ac-ft (130,255 dam^3)

2. Assuming a starting elevation of 1596 feet, flood control storage available would be 158,600 (195,630) - 99,000 (122,115) = 59,600 ac-ft (73,515 dam^3)

3.5 Souris River near Sherwood Crossing

This control point is the International gaging station, number 05114000, latitude 48:59:24, longitude 101:57:28, on the Souris River, 0.8 mile downstream of the International boundary.

3.6 Souris River above Minot

The control point, Souris River above Minot, is a flow gaging station operated by the U.S. Geological Survey and maintained by the North Dakota State Water Commission. The station number is 05117500.

The station is located approximately 3.5 miles (5.8 km) west of Minot, North Dakota, and approximately 7 miles (11 km) downstream from the confluence of the Souris and Des Lacs Rivers. The coordinates of the station are latitude 48:14:45, longitude 101:22:15.

3.7 Souris River near Westhope Crossing

This control point is the International gaging station, number 05NF012, latitude 48:59:47, longitude 100:57:29, on the Souris river 1.6 kilometres upstream of the International boundary near Westhope, North Dakota.

3.8 Boundary Diversion Channel

Boundary Diversion Channel may be used for flood control provided that storage is available in Rafferty Reservoir in excess of the amount required to meet United States flood control requirements in that year, by the amount of volume to be diverted.

3.9 Other Considerations

This Operating Plan for the Canadian reservoirs and Lake Darling Reservoir requires that flood protection be provided for urban and rural downstream areas. The operation of the Project for flood

flows will consider the approximate bankfull channel capacities of urban and rural reaches. Release rates will be based on reducing flood damages as much as possible. An indication of the flows at which flooding occurs is provided in Table 3.6, for various reaches of the Souris River, Long Creek and Moose Mountain Creek. These flows should be considered as approximate only.

Table 3.6
APPROXIMATE BANKFULL CHANNEL CAPACITY

Description of Reach	Bankfull Capacity
Long Creek	
Boundary Dam to Souris River	25 m^3/s (900 cfs)
Moose Mountain Creek	
Alameda Dam to Souris River	50 m^3/s (1,800 cfs)
Souris River	
Rafferty Dam to Long Creek	14 m^3/s (500 cfs)*
Long Creek to Shand	85 m^3/s (3,000 cfs)
Shand to Moose Mountain Creek	60 m^3/s (2,000 cfs)
Souris River at Oxbow	90 m^3/s (3,200 cfs)
Souris River at Sherwood Crossing	90 m^3/s (3,200 cfs)
Sherwood to Upper Souris Refuge	60 m^3/s (2,000 cfs)
Upper Souris Refuge to Lake Darling Dam	Reservoir pool
Lake Darling Dam to Minot	2,500 cfs (70 m^3/s)
Souris River at Minot	5,000 cfs (215 m^3/s)
Minot to Logan	2,500 cfs (70 m^3/s)
Logan to Velva	1,400 cfs (40 m^3/s)
Velva to Verendrye	1,400 cfs (40 m^3/s)
Verendrye to Wintering River	1,500 cfs (42 m^3/s)
Wintering River to Towner	600 cfs (17 m^3/s)
Towner to Coulter	200 cfs (6 m^3/s)
Coulter to Melita	600 cfs (17 m^3/s)
Melita to Hartney	1,100 cfs (31 m^3/s)

*With proposed channel improvements.

4.0 PROJECT OPERATION

4.1 Objectives and Procedures

The objectives to be implemented by this Operating Plan include the following: (1) provide 1-percent (100-year) flood protection at Minot, North Dakota; (2) provide flood protection to urban and rural areas downstream from Rafferty Dam, Alameda Dam, and Lake Darling Dam; and (3) ensure, to the extent possible, that the existing benefits from the supply of water in the Souris River Basin and the supply of water to the Souris Basin Project are not compromised.

In order to ensure that these objectives are met, it is necessary to distinguish between flood and nonflood operation. To meet the flood and nonflood Operating Plan objectives, the following procedure will be used to identify the proper mode of operation while complying with the terms of the 1959 Interim Measures as modified.

Flood Operation

If a February 1 or subsequent spring runoff estimate shows a reasonable chance (50 percent) of a runoff volume at Sherwood Crossing being equal to or greater than a 10-percent (1 in 10 years) flood, then operations will proceed on the basis of the flood Operating Plan. Flood operation will cease when flood volumes have been discharged and streamflows are at or below 500 cfs at Minot.

Nonflood Operation

If a February 1 or subsequent spring runoff estimate shows a reasonable chance (50 percent) of a runoff event less than a 10-percent (1 in 10 years) flood, then operations will proceed on the basis of the nonflood Operating Plan.

4.2 Consistency with Interim Measures

As set out in the 1959 Interim Measures as modified, under certain conditions, a portion of the North Dakota share will be in the form of evaporation from Rafferty Reservoir and Alameda Reservoir. During years when these conditions occur, the minimum amount of flow actually passed to North Dakota will be 40 percent of the natural flow at Sherwood Crossing. This lesser amount is in recognition of Saskatchewan's agreement to operate both Rafferty Dam and Alameda Dam for flood control and for evaporation as a result of the Project. Therefore, this is deemed to be in compliance with all applicable obligations. The volume of natural flow will be determined by the International Souris River Board of Control ("the Board").

The following rules determine the percentage of the natural flow at Sherwood Crossing which is to be passed to North Dakota.

a. If the level of Lake Darling Reservoir is below an elevation of 1592.0 feet (485.24 metres) on October 1 in any calendar year, Saskatchewan will pass 50 percent of the natural flow at Sherwood Crossing in that year and in succeeding years until the level of Lake Darling Reservoir is above an elevation of 1593.0 feet (485.55 metres) on October 1.

b. If the natural flow at Sherwood Crossing is equal to or less than 20,000 acre-feet (24,700 cubic decametres) prior to October 1 of that year, then Saskatchewan will pass 50 percent of that natural flow to North Dakota in that calendar year.

c. If the conditions specified in subparagraphs 4.2(a) and 4.2(b) do not appply, then Saskatchewan will pass at least 40 percent of the natural flow at Sherwood Crossing to North Dakota.

d. If releases are delayed, they may be called for at any time before October 1. If they are not called for before October 1, the water may be retained for use in Saskatchewan.

Lake Darling Reservoir and the Canadian reservoirs will be operated (insofar as is compatible with the Project's purposes and consistent with past practices) to ensure that the pool elevations, which determine conditions for sharing evaporation losses, are not artificially altered. The triggering elevation of 1592.0 feet (485.24 metres) for Lake Darling Reservoir is based on existing water uses in North Dakota, including refuges operated by the U.S. Fish and Wildlife Service. Each year, operating plans for the refuges on the Souris River will be presented to the Board. Barring unforeseen circumstances, operations will follow said plans during each given year. Lake Darling Reservoir will not be drawn down for the sole purpose of reaching the elevation of 1592.0 feet (485.24 metres) on October 1.

Late season releases will not be made by Saskatchewan Water Corporation from the Canadian reservoirs for the sole purpose of raising the elevation of Lake Darling Reservoir above 1593.0 feet (485.55 metres) on October 1.

Flow releases to the United States should occur (except in flood years) in the pattern which would have occurred in a state of nature. To the extent possible and in consideration of potential channel losses and operating efficiencies, releases from the Canadian dams will be scheduled to coincide with periods of beneficial use in North Dakota. Normally, the period of beneficial use in North Dakota coincides with the timing of the natural hydrograph, and that timing should be a guide to releases of the United States portion of the natural flow. The flow release to the United States may be delayed when the State of North Dakota determines and notifies Saskatchewan through the Board that the release would not be of benefit to the State at that time. The delayed release may be retained for use in Saskatchewan, notwithstanding the minimum release limits, unless it is called for by the State of North Dakota through the Board before October 1 of each year. The delayed release shall be measured at the point of release and the delivery at Sherwood Crossing shall not be less than the delayed release minus the conveyance losses that would have occurred under natural conditions between the point of release and the Sherwood Crossing. Prior to these releases being made, consultations shall occur between the Saskatchewan Water Corporation, the U.S. Fish and Wildlife Service, and the State of North Dakota. All releases will be within the specified target flows at the control points.

4.3 Flood Operation

General

This section sets forth the Operating Plan for Rafferty Reservoir, Alameda Reservoir, Boundary Reservoir, and Lake Darling Reservoir for flood control. In general, the purpose is as follows: the three reservoirs in Canada are to be operated in such a manner so that, along with Lake Darling Reservoir, it will be possible to obtain 1-percent (100-year) level of protection at Minot. The 1-percent level of protection at Minot allows a maximum discharge of 5,000 cfs. After the spring estimate of streamflow is received, if a 1-percent or greater flood volume is anticipated, it will be necessary to draw Lake Darling Reservoir down to an elevation of 1591.0 feet, to draw Rafferty Reservoir down to an elevation of 547.5 metres, to draw Alameda Reservoir down to an elevation of 555.85 metres, and to draw Boundary Reservoir down to an elevation of 557.8 metres given that the estimated 90-day volume as set forth in Plates A-1 to A-3 and the estimated 30-day volume in Plate A-4 will require the maximum required drawdown levels. As discussed in Section 3.2, additional drawdown in Rafferty Reservoir may be used in lieu of drawdown of Boundary Reservoir. The manner in which this is to be accomplished and the reasons for doing so are presented in the following sections. In those cases where the flood event is greater than a 1-percent (100-year) event, the Project will be operated as set forth in the Reservoir Regulation Manuals to attempt to reduce downstream damages without endangering the structures themselves. This may require flows greater than 5,000 cfs at Minot for the period before June 1, and may also require flows greater than 500 cfs (which could also exceed 5,000 cfs) after June 1.

The Canadian reservoirs will be operated for Sherwood Crossing giving due consideration to the level at Lake Darling Reservoir and the flow at Minot. It is not possible to obtain 1-percent (100-year) flood protection at Minot unless Rafferty Reservoir, Alameda Reservoir, Boundary Reservoir, and Lake Darling Reservoir are operated as a complete system.

This section will be used when the estimated 30-day unregulated volume at Sherwood Crossing equals or exceeds a 10-percent (10-year) event, which is equal to 175,200 ac-ft (216,110 dam^3); and/or when the local 30-day volume at Sherwood Crossing is expected to equal or exceed 30,000 acre-feet (37,000 dam^3). From the period of record at Sherwood Crossing, 1930 to 1988, 58 years, the Operating Plan would have been used approximately 6 times, or about 10 percent of the time.

The flood Operating Plan is divided into four separate phases in accordance with the annual hydrograph. These phases relate to:

a. Operations to lower reservoirs prior to spring runoff.
b. Operations during spring runoff.
c. Operations after runoff to restore reservoirs to full supply level.
d. Operations during the summer, fall, and winter.

4.3.1 Drawdown Prior to Spring Runoff

The drawdown of Rafferty Reservoir, Boundary Reservoir, Alameda Reservoir and Lake Darling Reservoir in response to a given predicted flood event is an integral part of the Operating Plan. The extent of drawdown will depend on the estimated spring runoff volume for each as shown on the curves in Plates A-1 to A-4.

Any releases from Lake Darling Reservoir must take into consideration inflows resulting from releases from the Canadian reservoirs and any local inflow between the Canadian reservoirs and Lake Darling Reservoir.

Regardless of the estimated volumes of runoff, the reservoirs will be operated to ensure that each is at or below the following pool levels by February 1.

a. Rafferty Reservoir - 549.50 m. (1802.82 ft.)
b. Alameda Reservoir - 561.00 m. (1840.55 ft.)
c. Lake Darling Reservoir - 1596.00 ft. (486.46 m.)

The reservoirs will be drawn down, as appropriate, over the summer, fall, and winter months, and release rates will take into consideration channel and ice conditions. Release rates will be set to ensure that the maximum controlled flow at Sherwood Crossing will not exceed the following rates, provided Lake Darling Reservoir is at or below full supply level:

a. June 1 to August 31 - 11 m^3/s (400 cfs)
b. September 1 to January 31 - 14 m^3/s (500 cfs)
c. February 1 to March 15 - 60 m^3/s (2,120 cfs)
d. March 16 to May 31 - 90 m^3/s (3,200 cfs; up to 50-yr)
   113 m^3/s (4,000 cfs; over 50-yr)

Estimates of spring runoff will be made initially on February 1 and thereafter on the 15th and last day of each month until runoff occurs. The target drawdown levels will be as shown on Plates A-1 through A-4. For the Canadian reservoirs, these levels are based on the 90-percent 90-day spring runoff volume for each reservoir. Using this parameter will ensure that operating the Canadian reservoirs for flood control will not compromise the potential for the supply of water. For Lake Darling Reservoir, the target drawdown level is based on the estimated Sherwood Crossing uncontrolled runoff volume and a sliding scale relating the runoff volume to a Lake Darling Reservoir level as shown on

Plate A-4. As the estimated spring runoff volume is updat during the spring, the Lake Darling Reservoir target level will al change.

Should the level of any reservoir on February 1 be higher than its target drawdown level, releases will be made as described below. Should the level for a reservoir on February 1 be equal to or lower than the target drawdown level, no releases need be made from that reservoir.

Channel Ice Effects

The Reservoir Regulation Manuals will include features that will directly address the ice problems that may occur.

Rafferty Reservoir and Alameda Reservoir

The drawdown of Rafferty Reservoir and Alameda Reservoir will be the responsibility of the Saskatchewan Water Corporation. Releases from each reservoir will be made to achieve its target drawdown level. While the reservoirs are being drawn down, the total flow at Sherwood Crossing should not exceed the peak target flow from Plate A-5.

The release rate will take into consideration ice and channel conditions between the Canadian reservoirs and Lake Darl Reservoir. Such releases will be reviewed and adjusted as necessary on a regular basis, at a minimum after each estimate of the spring runoff volume.

Releases will be established to achieve the target drawdown levels prior to the occurrence of spring runoff to the reservoirs.

Boundary Reservoir and Boundary Diversion Channel

Boundary Reservoir and the Boundary Diversion Channel will be operated within the limits of the drawdown curves. Boundary Reservoir will be drawn down to the elevation shown on Plate A-1 provided that the associated drawdown volume shown on Plate A-2 is equal to the estimated 90-percent 90-day runoff volume. To operate the Boundary Diversion Channel, there must be excess capacity available in Rafferty Reservoir to store the diverted amount. This excess capacity must be in addition to the capacity that would be made available as per Plate A-1. The operation of each will attempt to maximize flood reduction within the constraints of the requirements for water supply in Canada. The operation of each will be such to ensure that the resulting peak flow at Sherwood Crossing during runoff is not greater than the peak that would have occurred without the operation of Boundary Reservoir and Boundary Diversion Channel; and that flood control be provided as set forth above.

Preflood Lake Darling Spring Drawdown

Drawdown of the Lake Darling Reservoir prior to a given flood event is an integral part of the overall Operating Plan. Lake Darling Reservoir drawdown is the first step in the Operating Plan and is important because the extent of drawdown has a direct relationship to the amount of storage available for flood control. Drawdown is dependent upon the runoff volume (uncontrolled) at Sherwood Crossing, the rate of drawdown, and the time available for drawdown between March 1 and spring breakup. In addition, it must include the release of water from the Canadian reservoirs if needed, or it could be reduced based on reservoir levels in Canada lower than what is needed for flood control based on the estimated 30-day volume. The rate of drawdown shall be reviewed and adjusted on a regular schedule, as the winter progresses, to ensure that the Lake Darling Reservoir will be at or below the target elevation by April 1. Any drawdowns required after April 1 shall be made after consultation with Manitoba.

4.3.2. Spring Runoff

If the estimated uncontrolled volume is sufficient to raise Lake Darling Reservoir to its full supply level of 1597.0 feet, then the Canadian dams will store water until they have reached their respective full supply levels of 550.5 metres for Rafferty Reservoir and 562.0 metres for Alameda Reservoir. Once a reservoir has reached its full supply level, excess water will be released at a controlled rate in accordance with the terms of the Operating Plan.

If target drawdown levels for Rafferty Reservoir and Alameda Reservoir were not reached prior to the spring runoff, then the volume in the reservoir above the target drawdown level on February 1 will be released within the specified target flows at control points, and they will be coordinated with the U.S. Fish and Wildlife Service and the State of North Dakota.

Saskatchewan Water Corporation may draw down the level of the Canadian reservoirs below their target drawdown level. Releases resulting from said drawdown shall remain within the specified target flows at control points, however, and will be coordinated with the representatives of the United States Department of the Army.

The U.S. Fish and Wildlife Service may draw down the level of Lake Darling Reservoir below its target drawdown level to meet fish and wildlife needs. Releases resulting from said drawdown will remain within the specified target flows at control points; however, they will be coordinated with the Saskatchewan Water Corporation, Manitoba Department of Natural Resources, and the U.S. Department of the Army.

Sherwood Crossing Target Flow

The Sherwood Crossing target flow is a function of the Lake Darling Reservoir level which is itself a function of the target flow at Minot. To enable the operation of the total system for those objectives set forth in Section 4.1, it is necessary to vary the target flows at Sherwood Crossing as given on Plate A-5.

The maximum target flow at Sherwood Crossing will be as provided in Plate A-5, except that, under certain conditions, the target flow may be temporarily lowered. Once Lake Darling Reservoir levels are lowered to a level which allows the Minot target flow to be maintained, the Sherwood Crossing target flow can be increased to the starting value as was determined from Plate A-5. If releases from the Canadian reservoirs are not increased, then the Lake Darling Dam operator must be notified immediately and releases from Lake Darling Reservoir reduced accordingly. The maximum target flow will continue while water remains above FSL in either Rafferty Reservoir or Alameda Reservoir and Lake Darling Reservoir is below 1597 feet. By having a varying target flow at Sherwood Crossing, the summer release period would decrease, as well as the problems which occur with long summer releases.

Lake Darling Level

The release of the maximum target flow at Sherwood Crossing wi allow Lake Darling Reservoir to release water at the Minot targe level which may be above the Sherwood Crossing maximum target level resulting in the lowering of the Lake Darling Reservoir below 1597 feet. The need to draw Lake Darling Reservoir below 159 feet will only occur when there is sufficient water in Rafferty Reservoir and Alameda Reservoir above their FSL's to fill Lake Darling Reservoir back to 1597 feet and will enable releases of excess water during the period before May 15 and at reduced levels before June 1. The drawing of Lake Darling Reservoir below 1597 feet will allow the summer release period to be shortened and in some cases it will not be needed.

4.3.3 Drawdown after Spring Runoff

If any of the reservoirs are above full supply level after the spring runoff has occurred, the reservoir or reservoirs will be brought down to full supply level using the methods outlined in Section 4.3.2. It should be noted that at no time will releases from the Canadian reservoirs cause the flows at Sherwood

Crossing to exceed the target flow from Plate A-5 unless the flow cannot be controlled by the reservoirs.

Post-Peak Flood Storage Release

After the peak stage has been reached in Lake Darling Reserve target releases are maintained until the pool has returned to full supply level, with the following exceptions:

a. After June 1, 500 cfs or less is maintained.

b. After May 15, but before June 1, the target flow at Minot is maintained at a level not to exceed 2,500 cfs until pool levels reach FSL, unless the 5,000 cfs target must be extended to enable the desired reservoir levels to be reached by February 1 of the following year.

4.3.4 Significant Spring and Summer Rainfall

If significant rainfall occurs during the spring or summer flood recession, the Reservoir Regulation Manual will provide for discharging the rainfall runoff based on following the unregulated flow recession. All rainfall inflow to Lake Darling Reservoir above FSL is discharged until the unregulated flow recession at Minot reaches 500 cfs. All rainfall runoff upstream of Lake Darling Reservoir which would cause flows in excess of 500 cfs at Minot would be stored, but not to exceed a reservoir elevation of 1598 feet. (Des Lacs flow could at times cause flows higher than 500 cfs at Minot.)

4.3.5 Flood System Operation Steps

The following operating steps would be used when the February 1 flow estimate exceeds the limits as set forth in Section 4.3.

OPERATING PLAN STEPS

These steps use English Units only to avoid confusion.

I. PRE-FLOOD (February 1 to start of runoff)

A. Determine Sherwood Crossing 30-day volume

B. Determine Rafferty Reservoir 30-day volume

C. Determine Alameda Reservoir 30-day volume

D. Determine local Sherwood Crossing 30-day volume:

1. Subtract Rafferty Reservoir 30-day volume from Sherwood Crossing 30-day volume (I.A - I.B = I.D.1(

2. Subtract Alameda Reservoir 30-day volume from result of above (I.D.1 - I.C = I.D.3(

3. This result is the Sherwood Crossing local 30-day volume

E. Determine 30-day volume not controlled by Rafferty Dam and Alameda Dam

1. Determine Rafferty Reservoir starting storage value in ac-ft

Based on the estimated runoff volume and Plate A-1 determine what level Rafferty Reservoir should be at or below.

a. If the actual reservoir level is below that level required, use the actual level in the following steps.

b. If the actual reservoir level is above the level required, use the level shown on Plate A-1 in the following steps.

2. Subtract starting storage from 513,000 ac-ft (513,000 - I.E.1=I.E.2)

3. Determine if 30-day volume is controlled:

a. if result from E.2 above is larger than 30-day volume, there is no excess (I.E.2 I.B).

b. if not, subtract E.2 amount from 30-day value, this is the Rafferty Reservoir excess (I.B - I.E.2 = I.E.3b)

4. Determine Alameda Reservoir starting storage value in ac-ft

Based on the estimated runoff volume and Plate A-3 determine what level Alameda Reservoir should be at or below.

a. If the actual reservoir level is below that level required, use the actual level in the following steps.

b. If the actual reservoir level is above the level required, use the level shown on Plate A-3 in the following steps.

5. Subtract starting storage from 153,710 ac-ft (153,710 - I.E.4 = I.E.5)

6. Determine if 30-day volume is controlled:

a. if result from E.5 above is larger than 30-day volume, there is no excess (I.E.5 I.C)

b. if not, subtract E.5 amount from 30-day value this is the Alameda Reservoir excess (I.C - I.E.5 = I.E.6b)

7. If it is determined that the estimated 30-day volume from Rafferty Reservoir and Alameda Reservoir will exceed their FSL's and therefore minimum releases are

expected, the Lake Darling Dam operator MUST be informed, so that Lake Darling Reservoir can be at full supply level after flood

(If (I.B - (356,400 - I.E.1)) 0 and
(I.C - (85,530 - I.E.4)) 0, then call)

F. Determine the uncontrolled 30-day volume at Sherwood Crossing by adding the Rafferty Reservoir and Alameda Reservoir excesses, if any, to the Sherwood Crossing local 30-day volume found above (I.D.3 + I.E.3.b + I.E.6.b = I.F)

G. Using result from "F" above, determine Lake Darling Reservoir starting level from Plate A-4 (I.F + Plate A-4 == I.G)

H. Determine starting Sherwood Crossing target flow by using Plate A-5 and the total Sherwood Crossing 30-day volume from "A" above (I.A + Plate A-5 == I.I)

I. Determine Minot target flow by using Plate A-6 and the total Sherwood Crossing 30-day volume from "A" above (I.A + Plate A-6 == I.H)

J. Determine Boundary Reservoir 30-day volume

K. Determine if Boundary Reservoir storage must be used from Plate A-2

L. Determine if Boundary Diversion Channel will be used

M. Adjust estimate of 30-day volume at Sherwood Crossing based on use of Boundary Reservoir and Boundary Diversion Channel

II. DURING FLOOD (March 16 to May 31)

A. Using data as is available from within basin, estimate the peak discharge to be expected at Sherwood Crossing:

1. if discharge is less than target flow at Sherwood Crossing, releases can be made from Rafferty Reservoir and Alameda Reservoir which increase the peak to, but not greater than, target

2. if discharge is greater than target flow at Sherwood Crossing, releases are not to be made from Rafferty Reservoir and Alameda Reservoir which will add to the peak flow at Sherwood Crossing

B. Sherwood Crossing Target (After peak at Sherwood Crossing)

After the peak flow has occurred at Sherwood Crossing, estimate the average daily flows expected at Sherwood Crossing from the uncontrolled areas. Using this flow, the current Lake Darling Reservoir elevation, and the local flows at Minot, estimate future Lake Darling Reservoir elevations. Using this data, to include the Sherwood Crossing target flows, make releases to drawdown Rafferty Reservoir and Alameda Reservoir within the target flows in Plate A-5. Plate A-9 contains storage data for Lake Darling Reservoir to aid in the estimates.

Repeat this operation as needed to reduce reservoir levels to FSL.

Note: The same starting Sherwood Crossing target flow is used for the entire flood event, UNLESS, the estimated 30-day volume at Sherwood Crossing is adjusted based on updated data.

C. To aid in the operation of ALL reservoirs ALL operators must communicate on a regular basis.

D. Based on reservoir levels, determine if the Minot target date of May 15 must be extended so that the 500 maximum at Minot after June 1 will not be exceeded.

III. POST FLOOD (June 1 to January 31)

A. Following the operating guidelines, release allowable flows to bring the reservoirs to their FSL's.

B. Review actions taken during flood and note problems which occurred.

C. If flood was a large event, prepare a Post Flood Report.

4.4 Nonflood Operation

Primary emphasis is given to operations during years of flood runoff; i.e., when the spring runoff volume exceeds a 10-percent flood. Nonflood operations are guided primarily by the Board. This Operating Plan sets forth the understanding between the Parties regarding flows in nonflood years, and provides guidance on the implementation of that understanding. It is recognized, however, that the actual implementation of the Operating Plan will be dependent upon the close coordination of the Parties during the hydrologic year.

4.4.1. Nonflood Project Operation Steps

1. The flow passed to North Dakota shall be either 40 percent or 50 percent of the natural flow at Sherwood Crossing according to the 1959 Interim Measures as modified.

2. An apportionment balance will be estimated at the spring meeting of the Board.

3. If additional releases are needed to meet the apportionment balance, North Dakota will assess its needs. If the releases would not be of benefit at that time, they may be delayed.

4. If releases are delayed, they may be called for by North Dakota at any time before October 1. If they are not called for before October 1, the water may be retained for use in Saskatchewan.

5. If delayed releases are called for, the delayed release shall be measured at the point of release and the delivery at Sherwood Crossing shall not be less than the delayed release minus the conveyance losses that would have occurred under natural conditions between the point of release and the Sherwood Crossing.

6. On October 1, a final apportionment balance will be determined. Any portion of the North Dakota apportionment remaining in Saskatchewan on October 1 shall be added arithmetically to the storage in Lake Darling Reservoir on October 1 to determine the October 1 level of Lake Darling Reservoir for purposes of Section 4.2.a.

4.5 Operating Provisions During Construction and Filling

The Parties agree to use their best efforts to provide flood protection during construction of the Project.

5.0 REPORTS

Reports will be prepared each year on behalf of the United States and Canada by both the Saskatchewan Water Corporation and the U.S. Fish and Wildlife Service describing the operation of the Project. The reports will be issued to the Board and at a minimum will include a description of the operation of the reservoirs including any problems encountered, a summary of water levels, inflows and releases from each reservoir, and an estimate of reservoir levels, inflows and releases for the remainder of the calendar year. In any year in which flood operations occur, the U.S. Army Corps of Engineers will prepare a post-flood report. This report will then become a part of the U.S. Fish and Wildlife Service report.

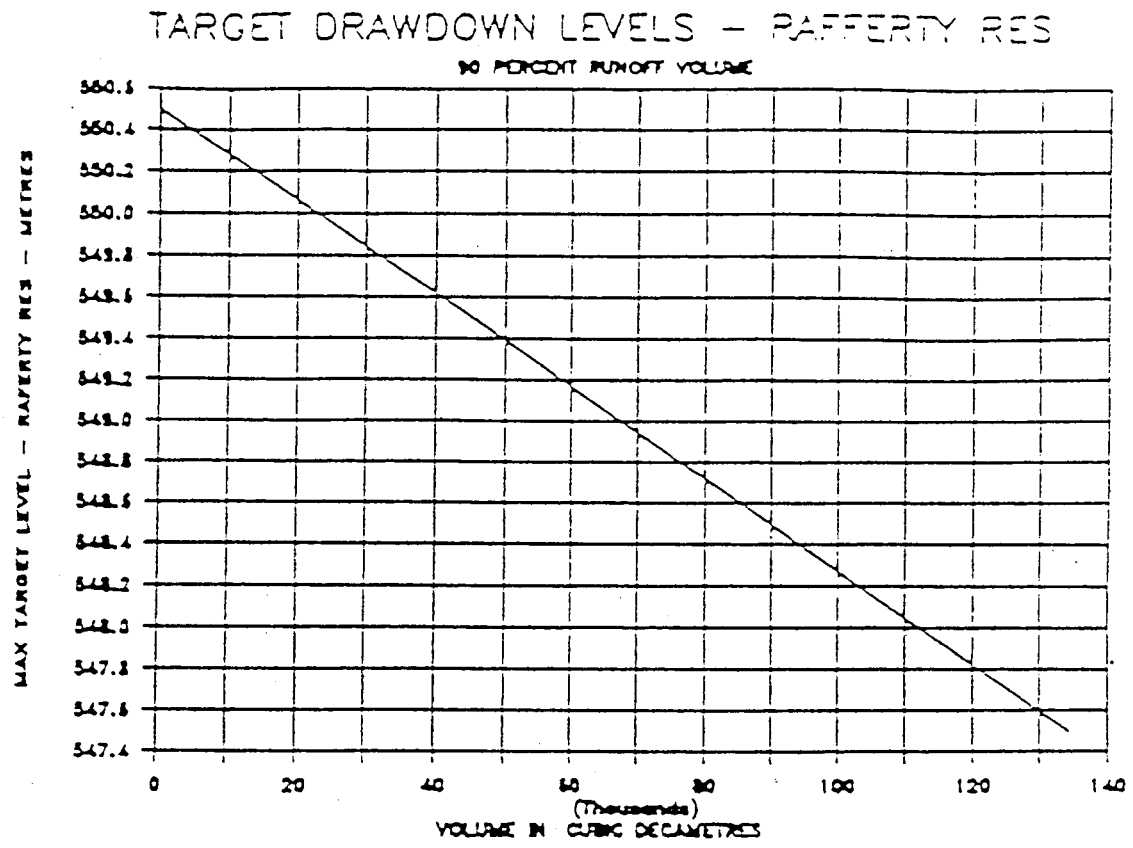
6.0 LIAISON

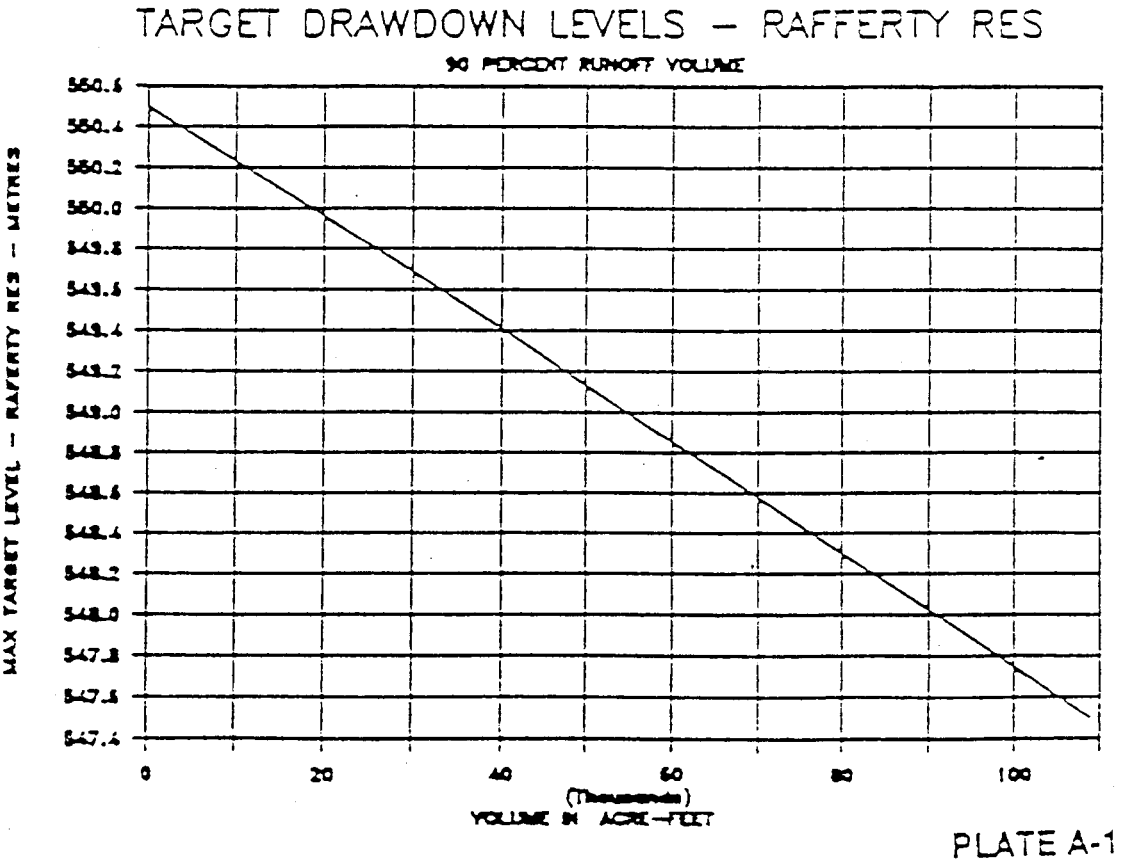
The Government of Saskatchewan, the Department of the Army, and the U.S. Fish and Wildlife Service within the Department of the Interior shall appoint a liaison person with whom interested States, Provinces, and Agencies may consult from time to time as to the operation of the improvements constructed and operated under the terms of the subject Agreement.

Representatives of the U.S. Department of the Army, Saskatchewan Water Corporation, U.S. Fish and Wildlife Service, and the North Dakota State Engineer will be responsible for monitoring the Operating Plan. It is expected that the reservoir operations will need to be closely monitored for the first several years after the project goes into operation.

7.0 DATA AND COMMUNICATION

The Parties shall exchange all desired data collected with respect to the management of water in the Souris River Basin and will use their best efforts to keep all interested States, Provinces, and Agencies adequately informed of all activities related to this Operating Plan.


TARGET DRAWDOWN LEVELS – RAFFERTY RES
90 PERCENT RUNOFF VOLUME
MAX TARGET LEVEL – RAFERTY RES – METRES
550.6
550.4
550.2
550.0
549.8
549.6
549.4
549.2
549.0
548.8
548.6
548.4
548.2
548.0
547.8
547.6
547.4
0
20
40
60
80
100
120
140
(Thousands)
VOLUME IN CUBIC DECAMETRES


TARGET DRAWDOWN LEVELS – RAFFERTY RES
90 PERCENT RUNOFF VOLUME
MAX TARGET LEVEL – RAFERTY RES – METRES
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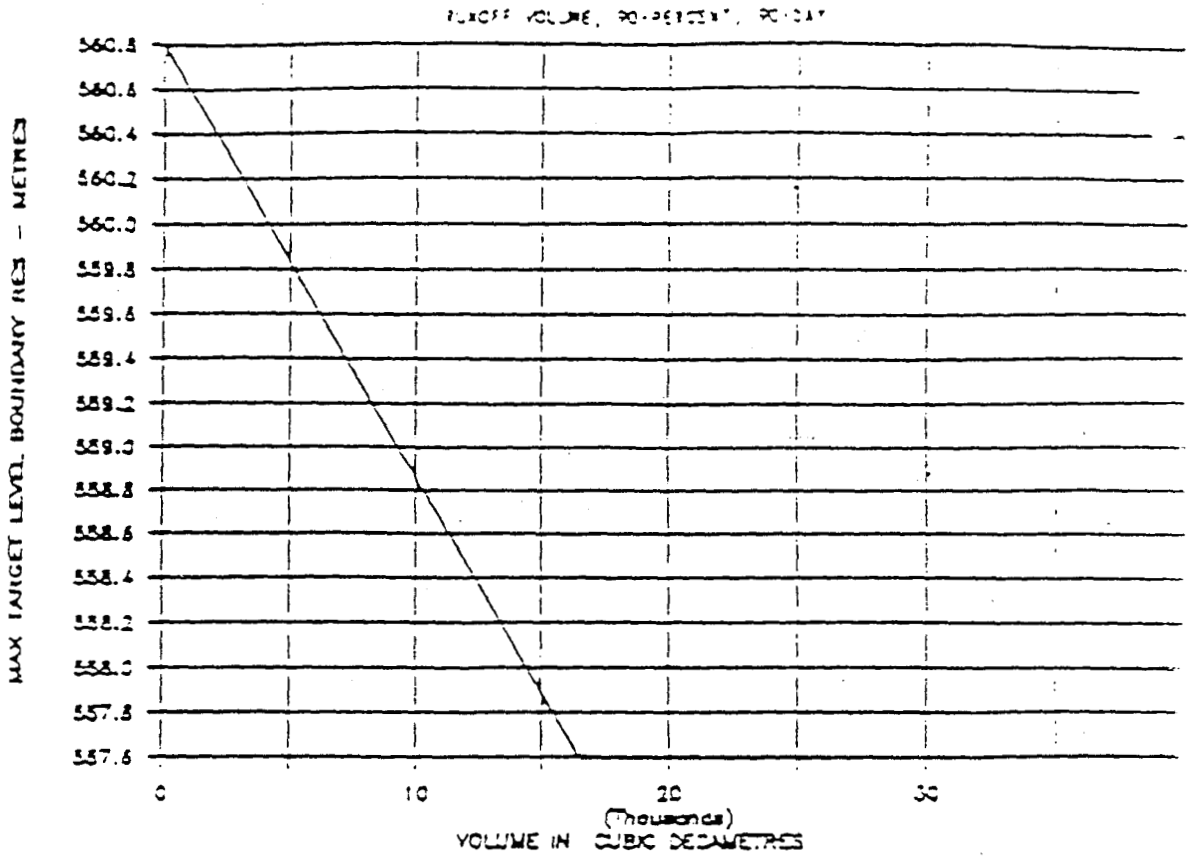
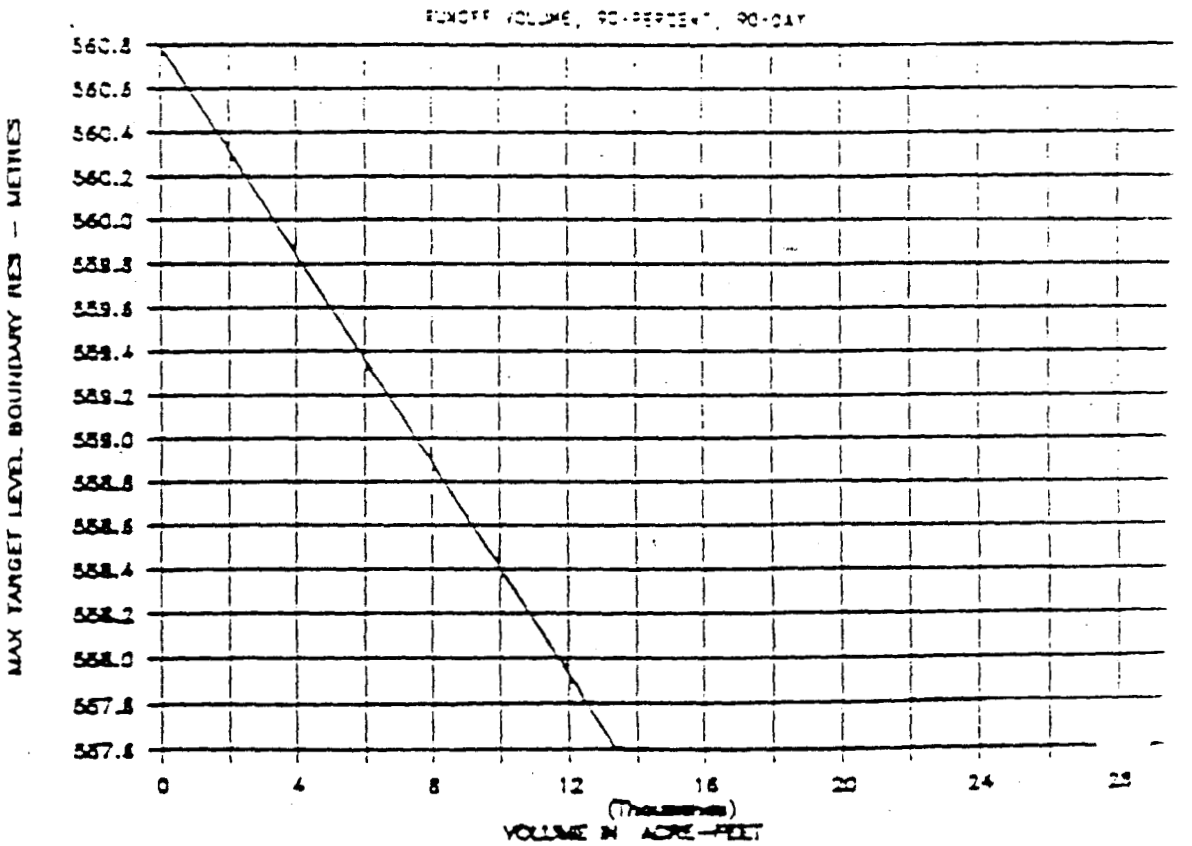
550.4
550.2
550.0
549.8
549.6
549.4
549.2
549.0
548.8
548.6
548.4
548.2
548.0
547.8
547.6
547.4
0
20
40
60
80
100
(Thousands)
VOLUME IN ACRE–FEET

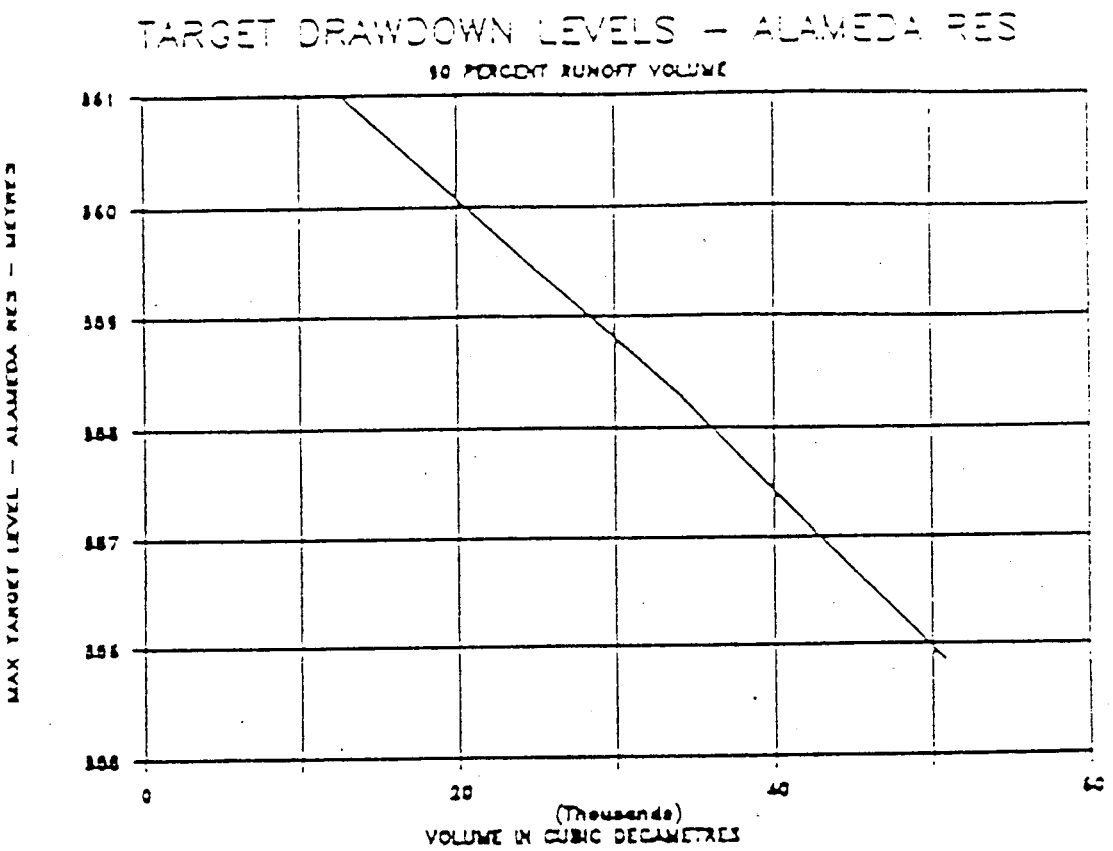
PLATE A-1

TARGET DRAWDOWN LEVELS - BOUNDARY RES



TARGET DRAWDOWN LEVELS - BOUNDARY RES




TARGET DRAWDOWN LEVELS – ALAMEDA RES
90 PERCENT RUNOFF VOLUME
MAX TARGET LEVEL – ALAMEDA RES – METRES
561
560
559
558
557
556
0
20
40
(Thousands)
VOLUME IN CUBIC DECAMETRES

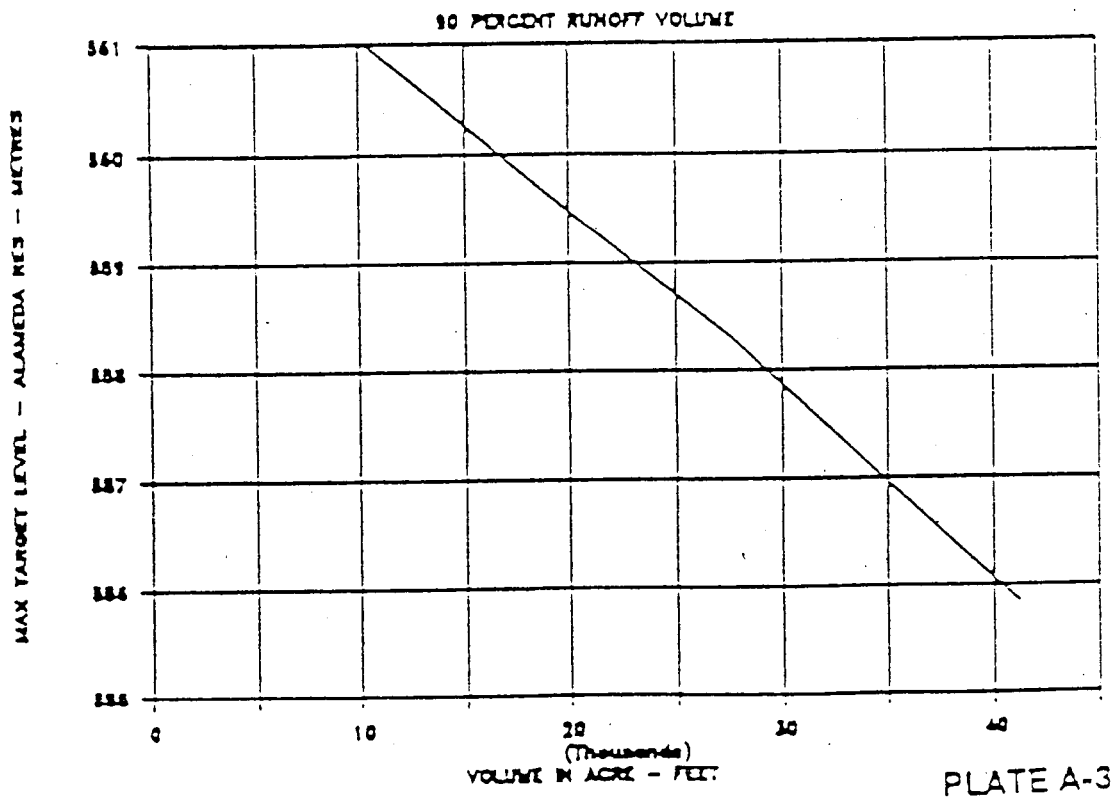
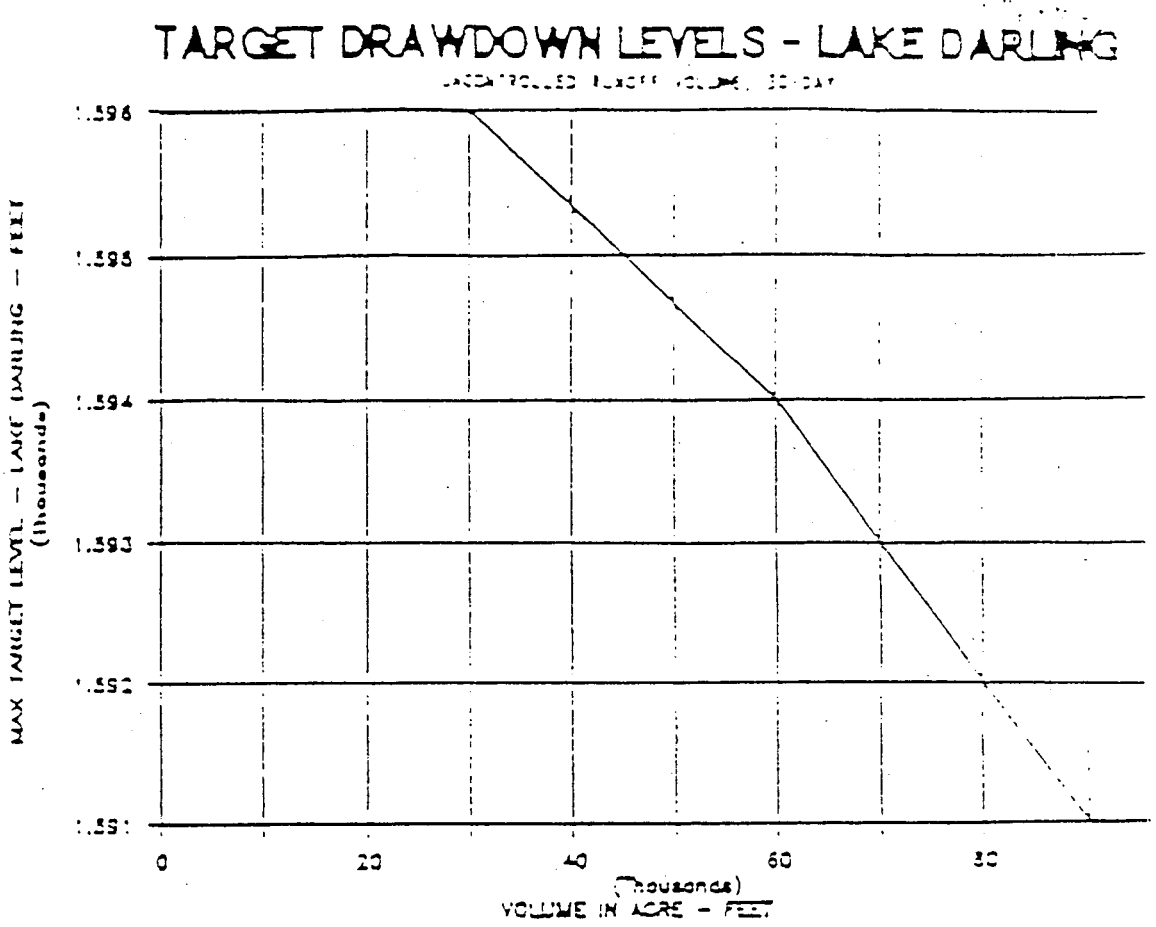
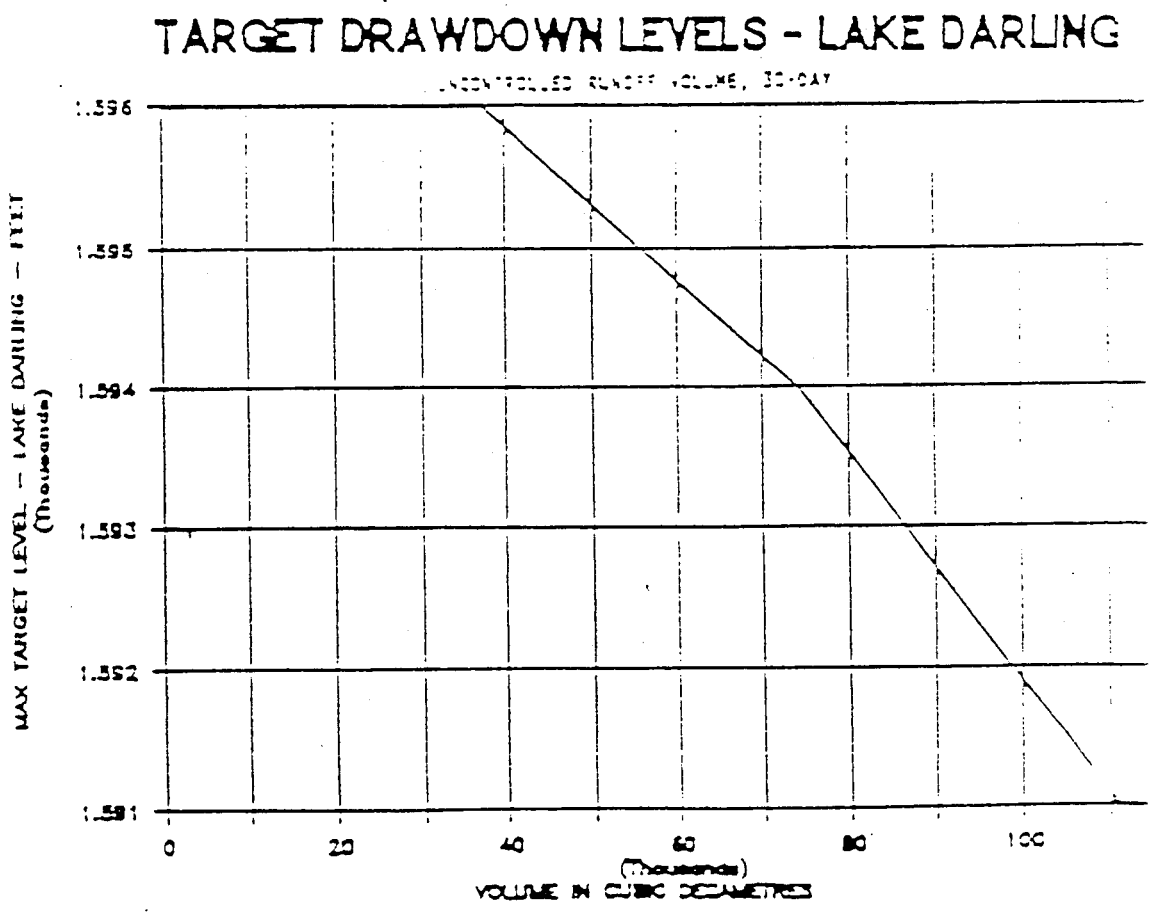
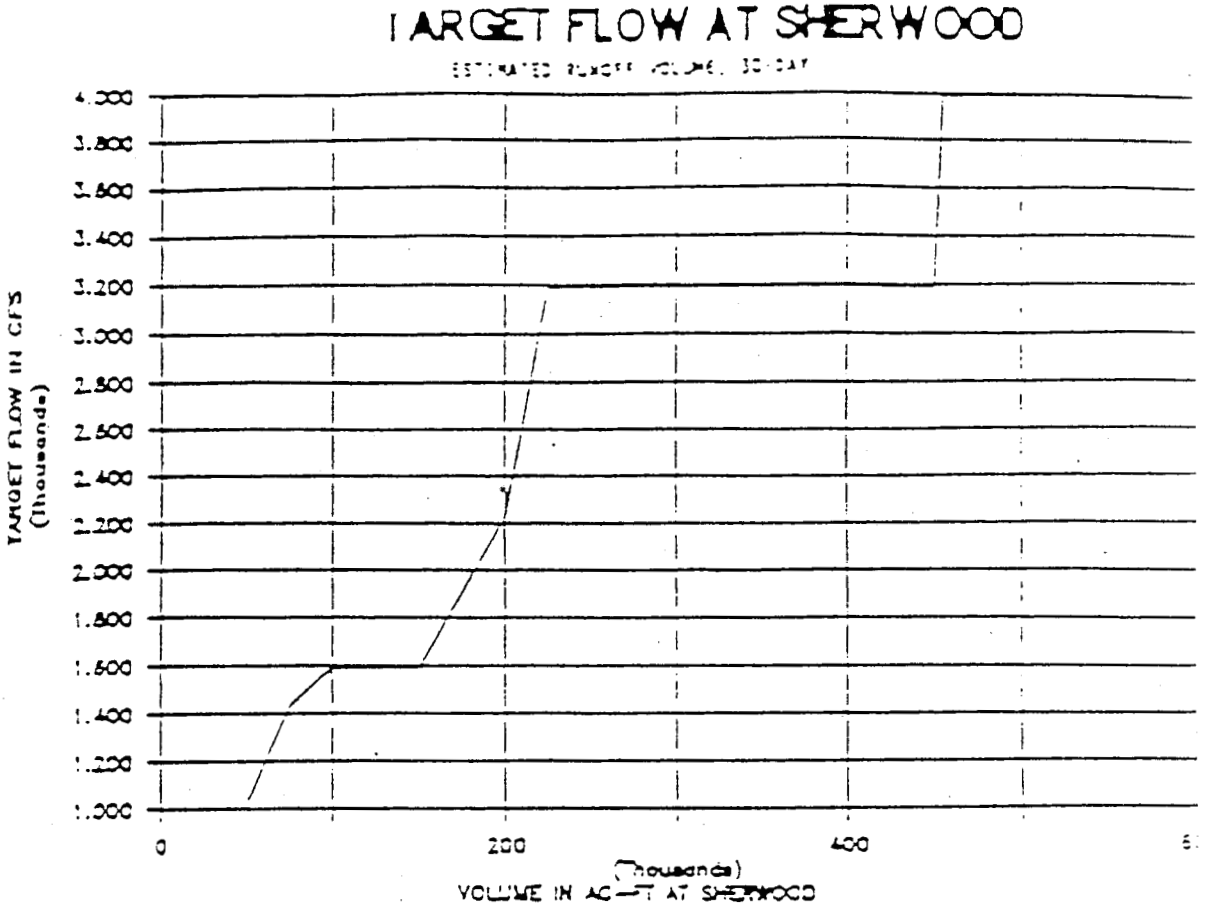
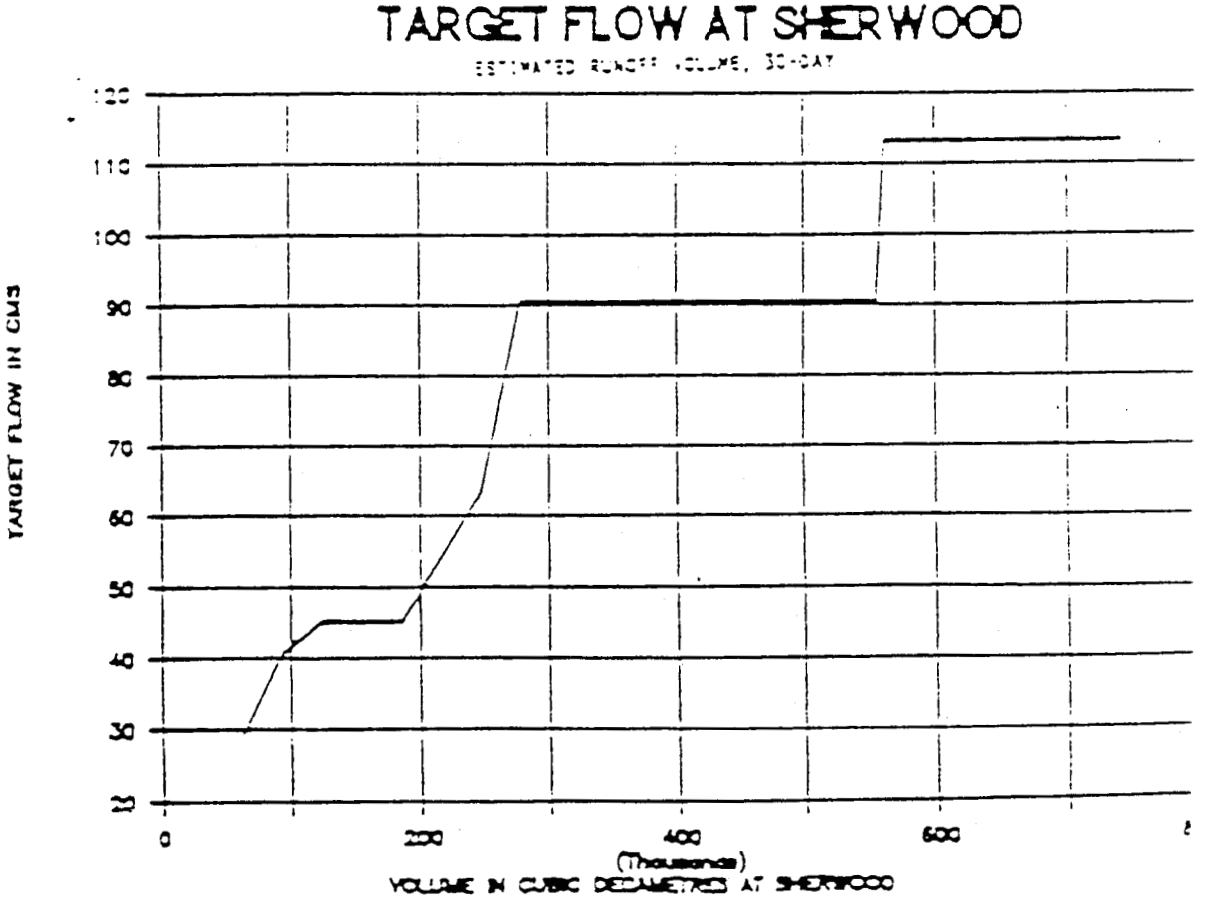

TARGET DRAWDOWN LEVELS – ALAMEDA RES
90 PERCENT RUNOFF VOLUME
MAX TARGET LEVEL – ALAMEDA RES – METRES
561
560
559
558
557
556
0
10
20
30
40
(Thousands)
VOLUME IN ACRE – FEET

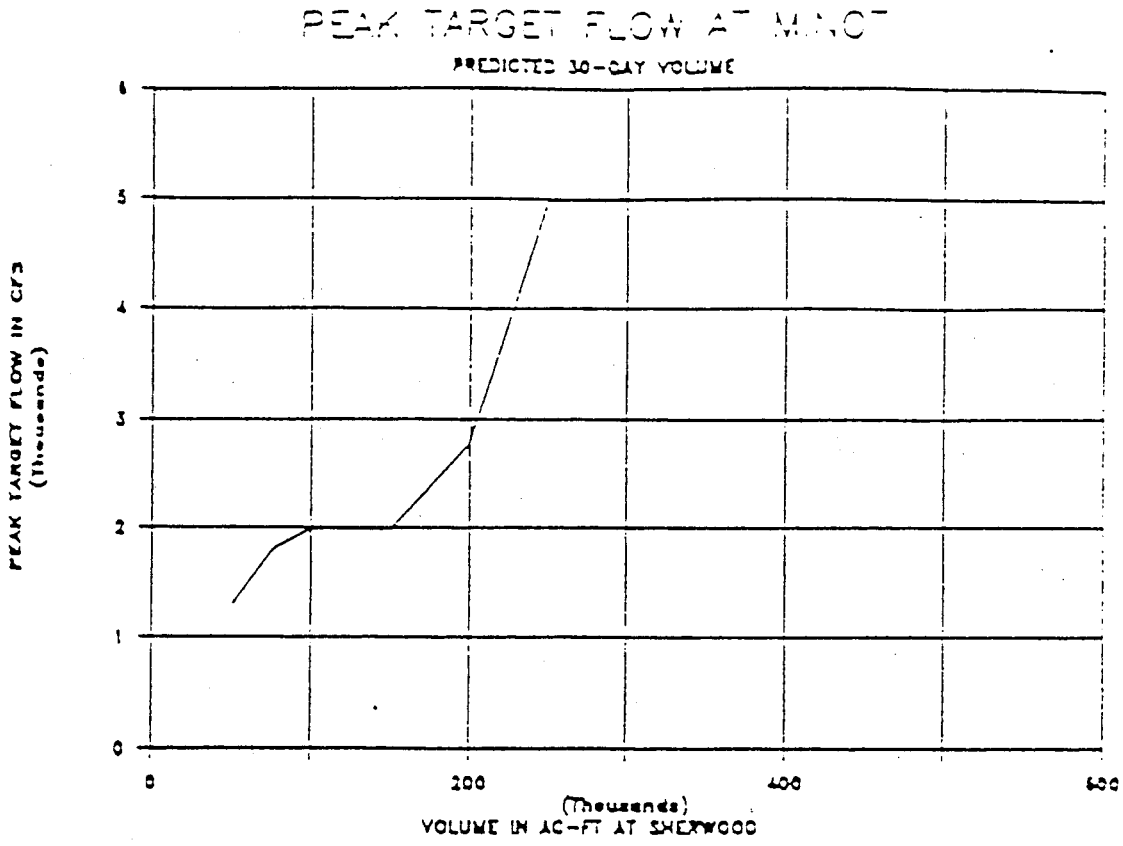
PLATE A-3


TARGET DRAWDOWN LEVELS - LAKE DARLING
1,596
1,595
1,594
1,593
1,592
1,591
0
20
40
60
80
(Thousands)
VOLUME IN ACRE - FEET


TARGET DRAWDOWN LEVELS - LAKE DARLING
1,596
1,595
1,594
1,593
1,592
1,591
0
20
40
60
80
100
(Thousands)


TARGET FLOW AT SHERWOOD
TARGET FLOW IN CFS
(Thousands)
4.000
3.800
3.600
3.400
3.200
3.000
2.800
2.600
2.400
2.200
2.000
1.800
1.600
1.400
1.200
1.000
0
200
400
(Thousands)


TARGET FLOW AT SHERWOOD
TARGET FLOW IN CMS
120
110
100
90
80
70
60
50
40
30
0
200
400
600
(Thousands)


PEAK TARGET FLOW AT MINOT
PREDICTED 30-DAY VOLUME
PEAK TARGET FLOW IN CFS
(Thousands)
0
1
2
3
4
5
0
200
400
600
(Thousands)
VOLUME IN AC-FT AT SHERWOOD

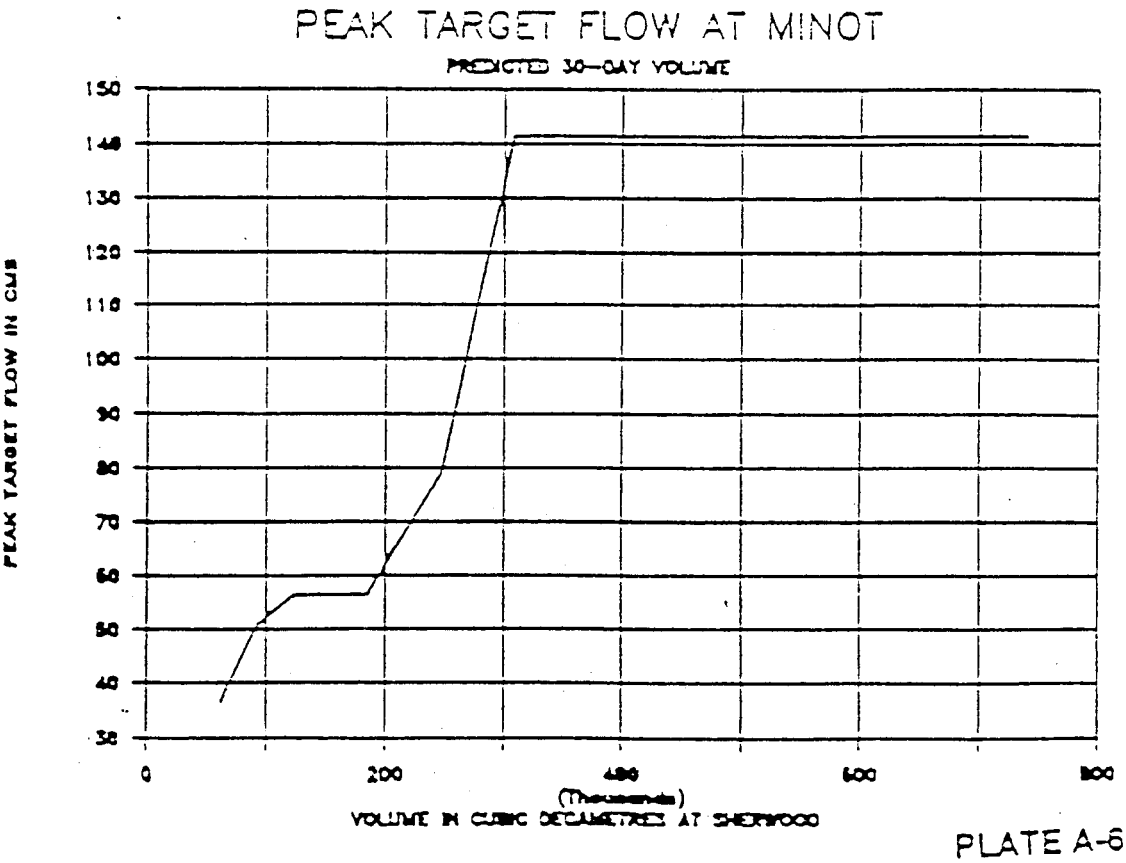
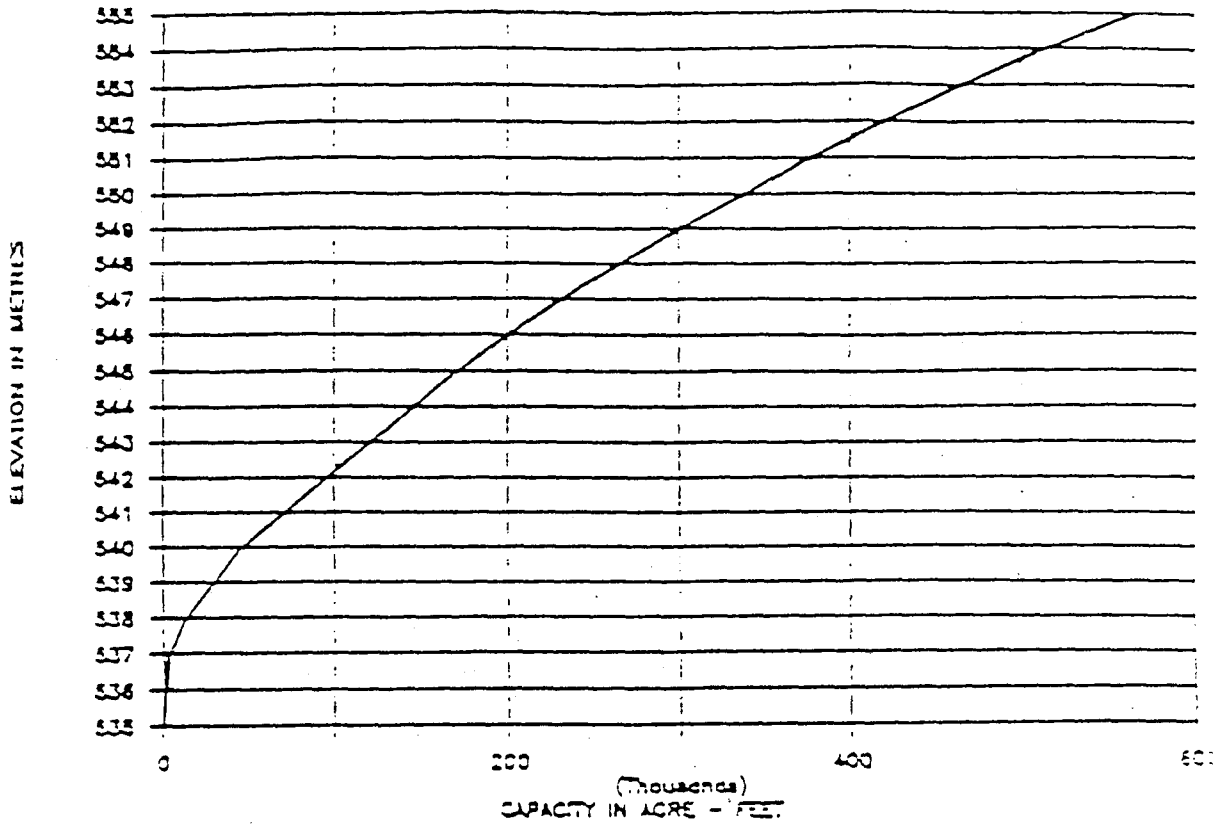

PEAK TARGET FLOW AT MINOT
PREDICTED 30-DAY VOLUME
PEAK TARGET FLOW IN CMS
150
140
130
120
110
100
90
80
70
60
50
40
30
0
200
400
600
800
VOLUME IN CUBIC DECAMETRES AT SHERWOOD

PLATE A-6

RAFFERTY ELEVATION—CAPACITY



RAFFERTY ELEVATION—AREA

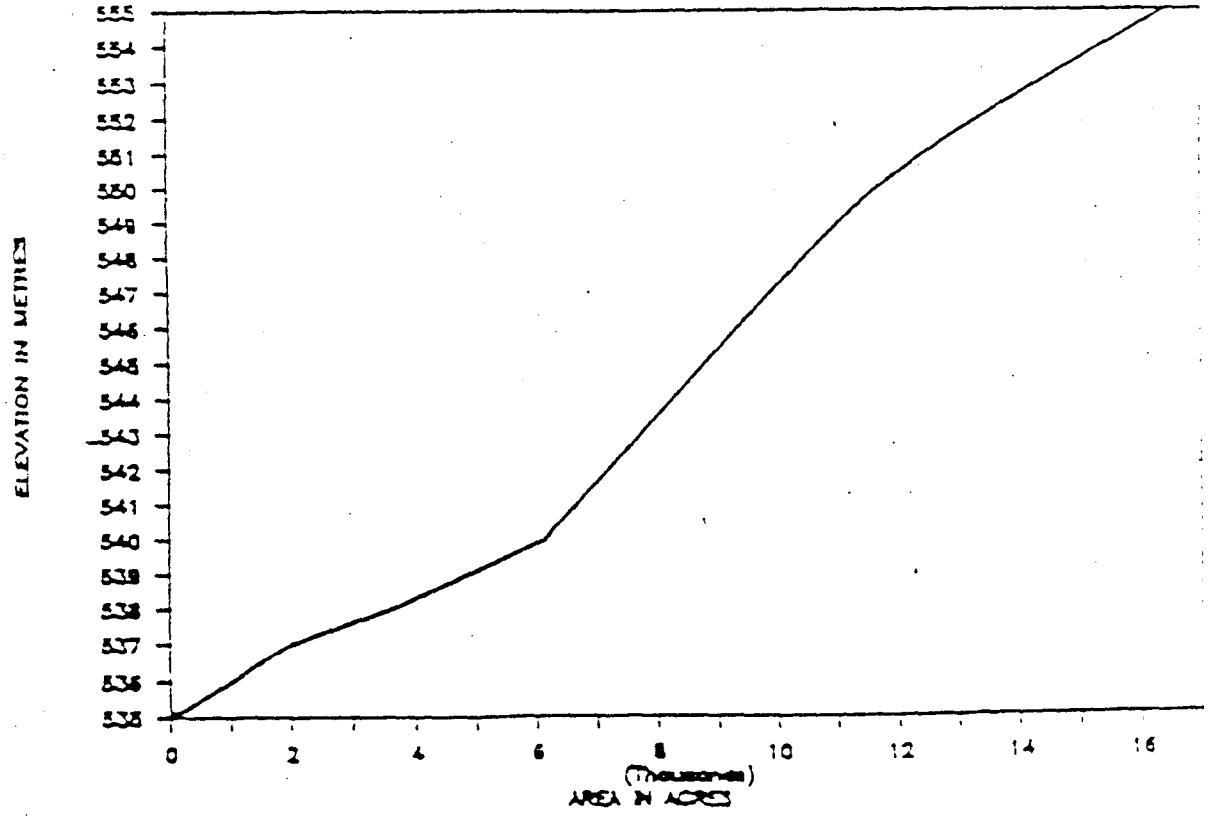
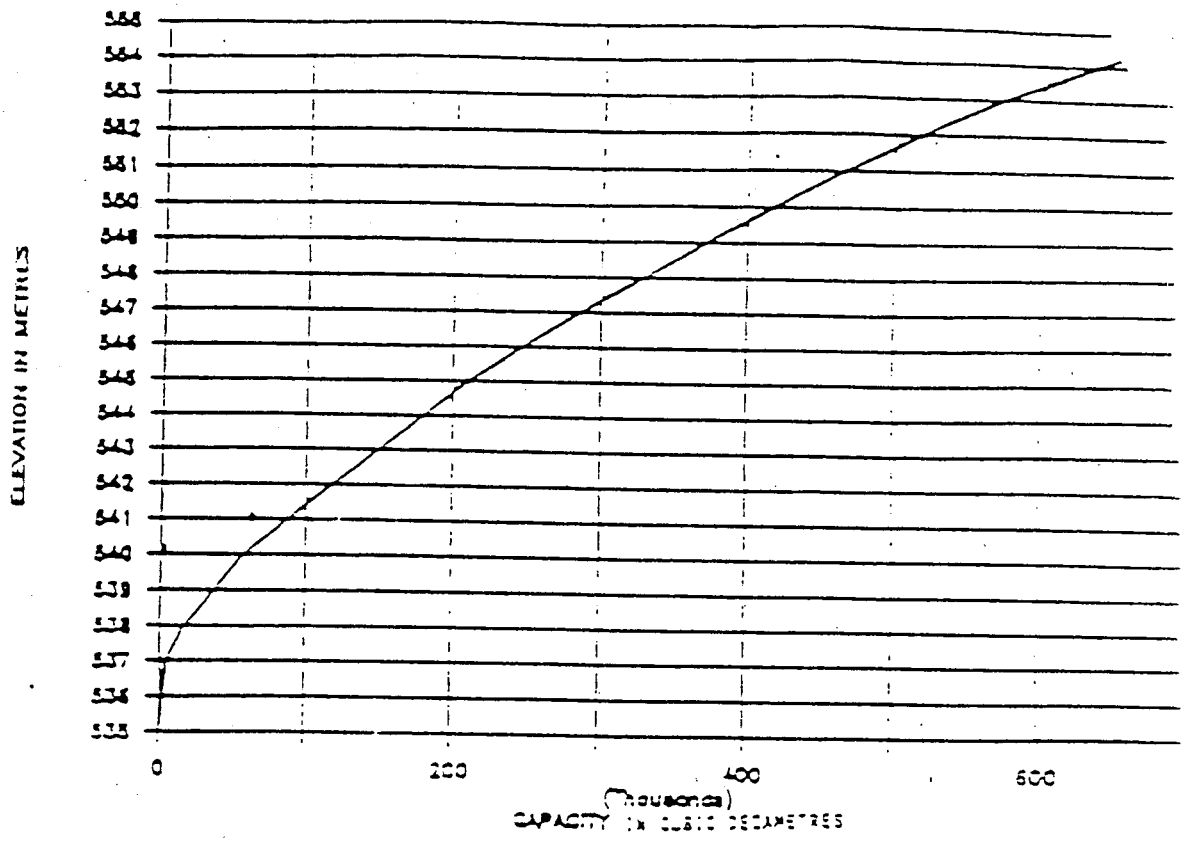
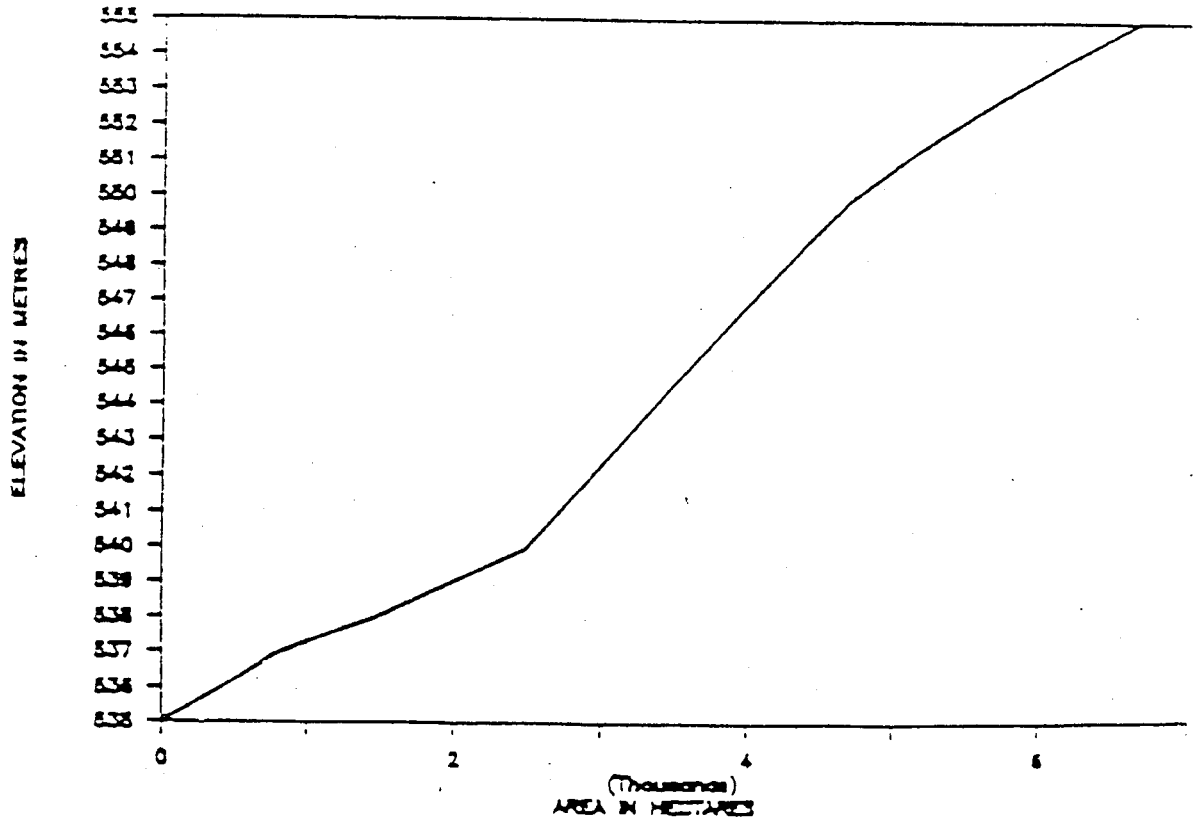


PLATE 8—

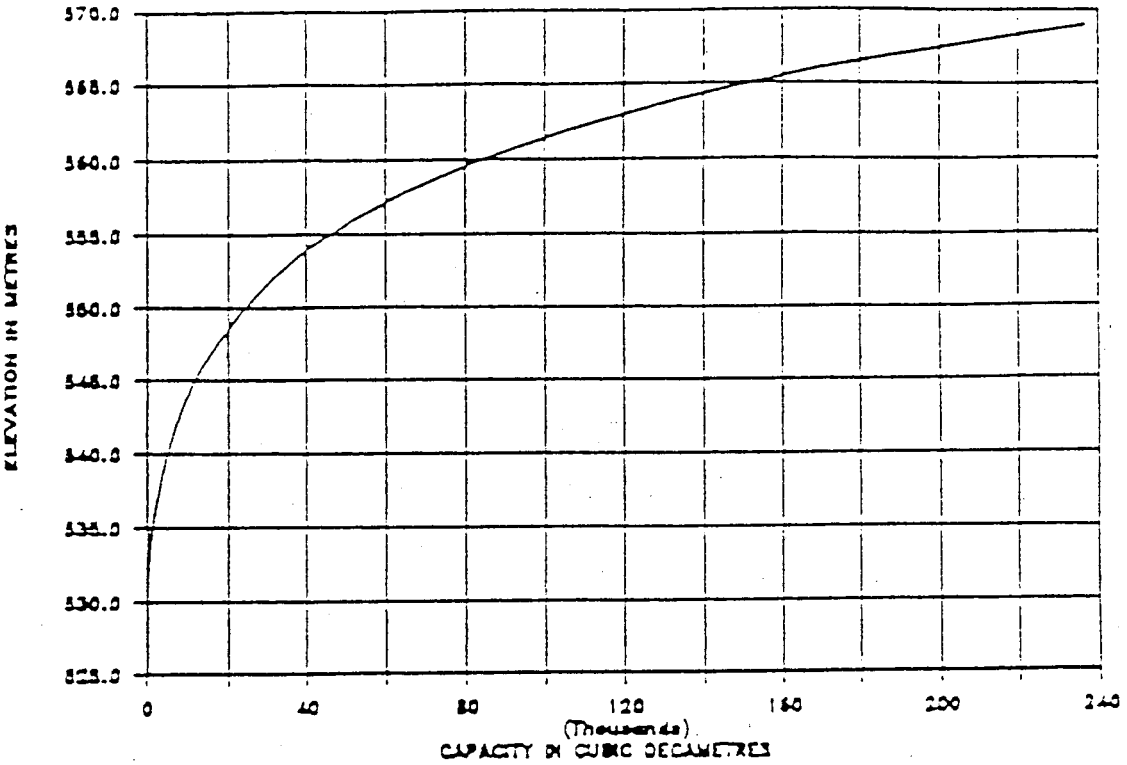
RAFFERTY ELEVATION—CAPACITY



RAFFERTY ELEVATION—AREA



ALAMEDA ELEVATION – CAPACITY



ALAMEDA ELEVATION – AREA

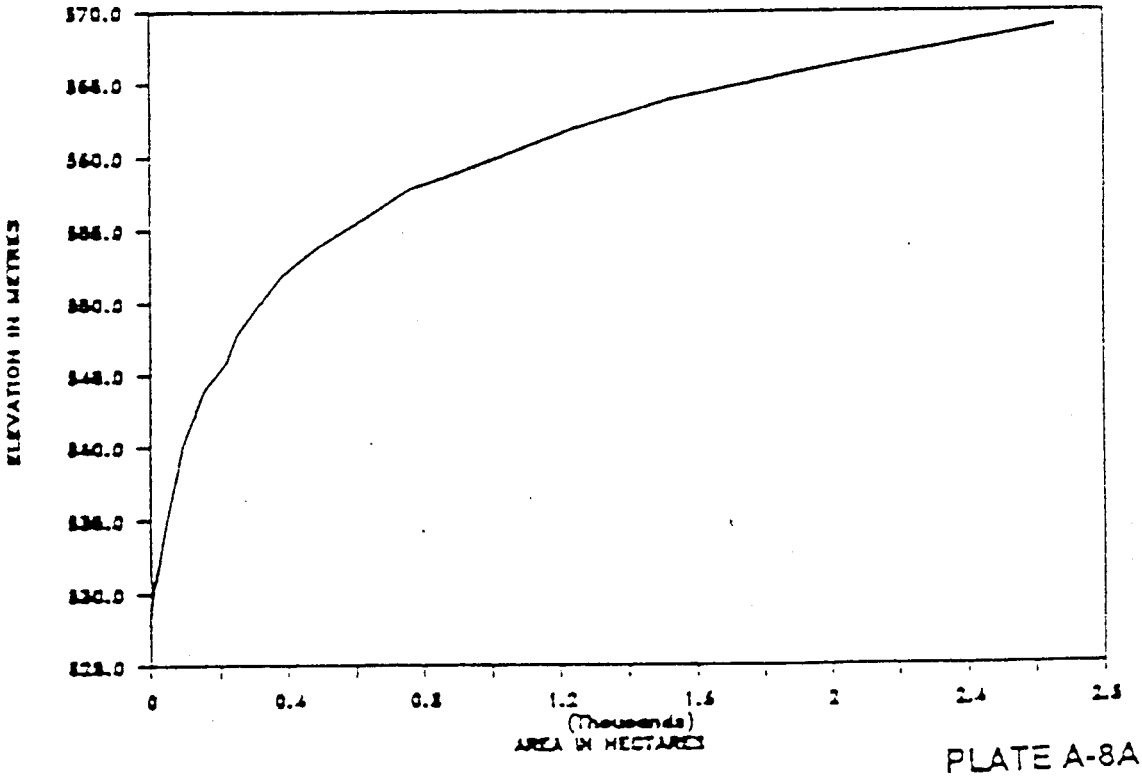
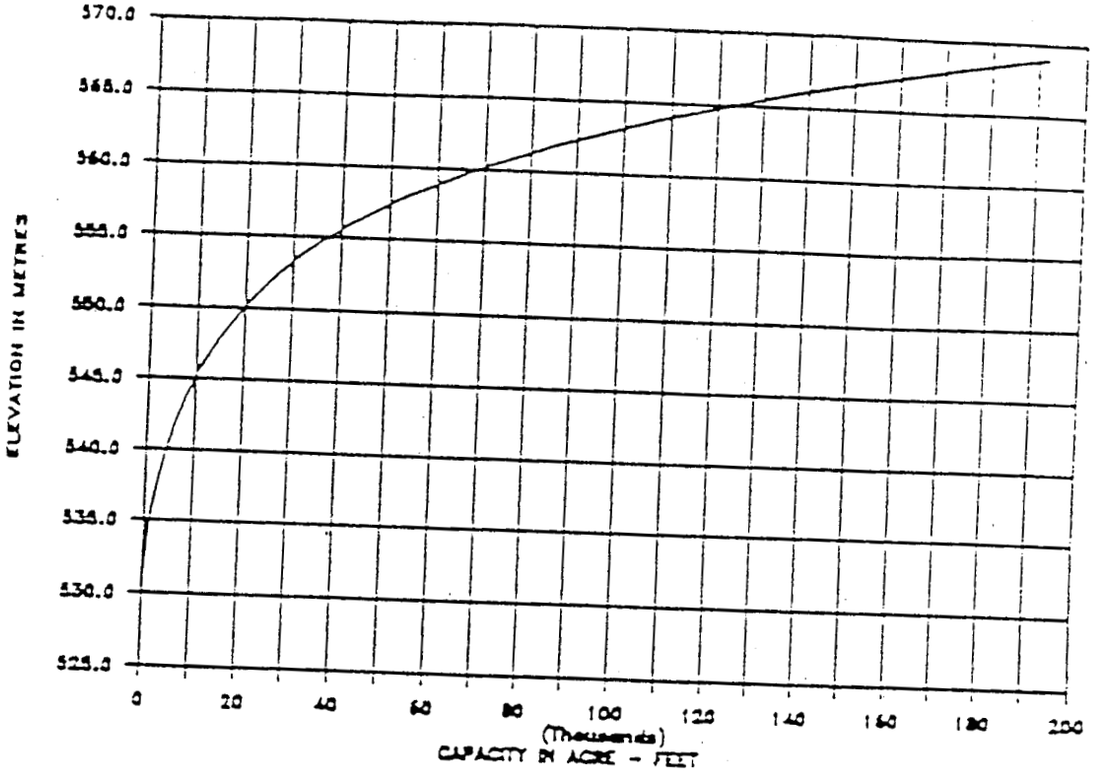


PLATE A-8A

ALAMEDA ELEVATION–CAPACITY



ALAMEDA ELEVATION–AREA

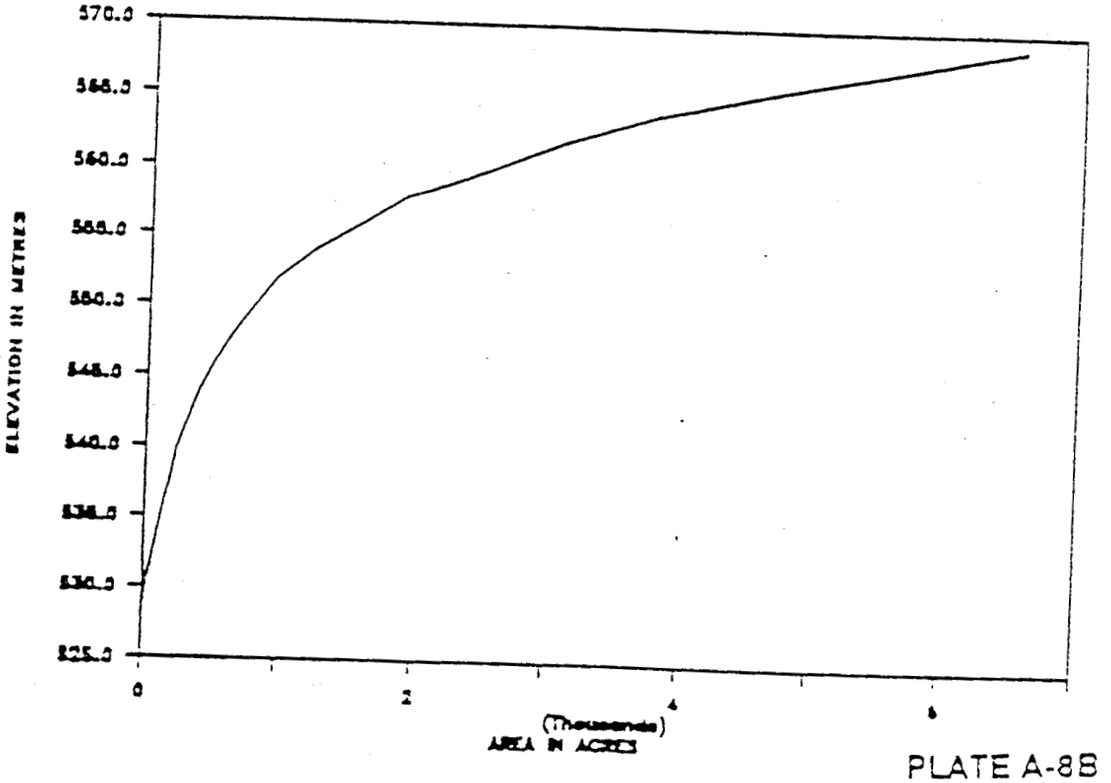
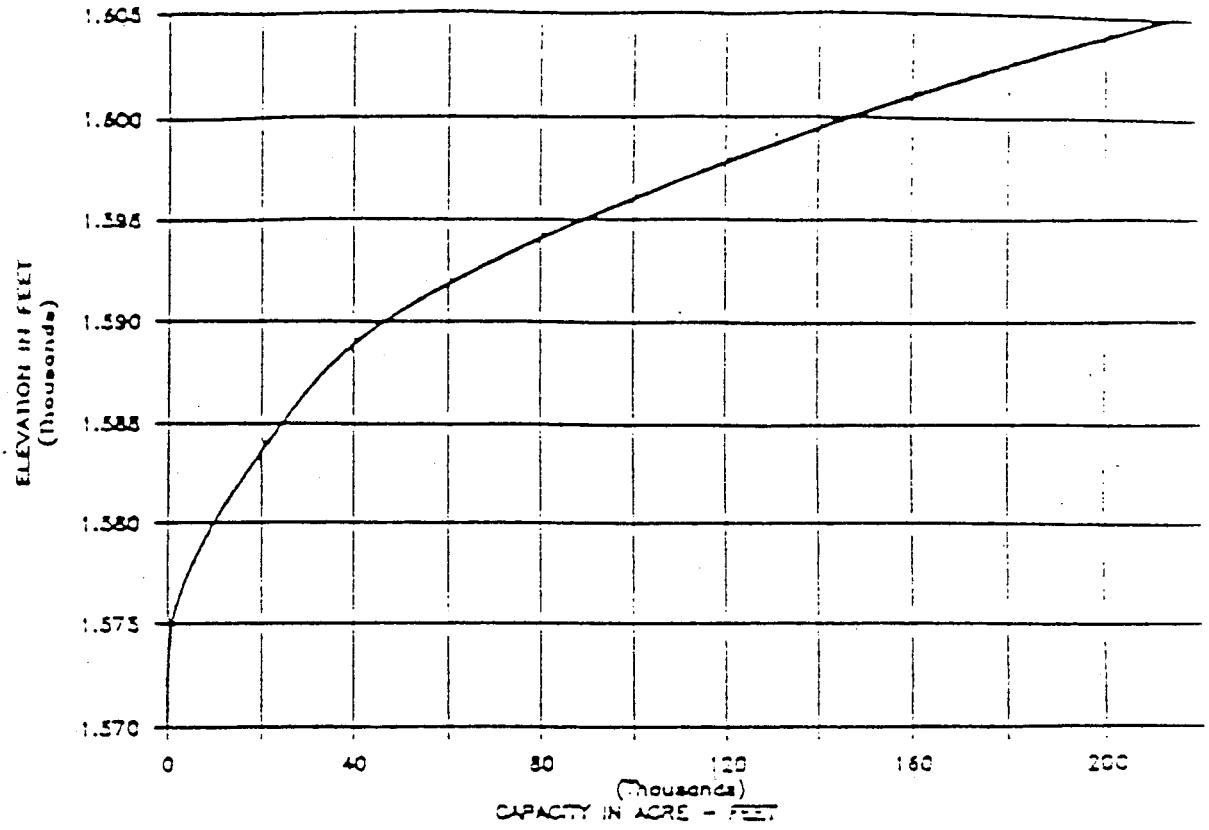
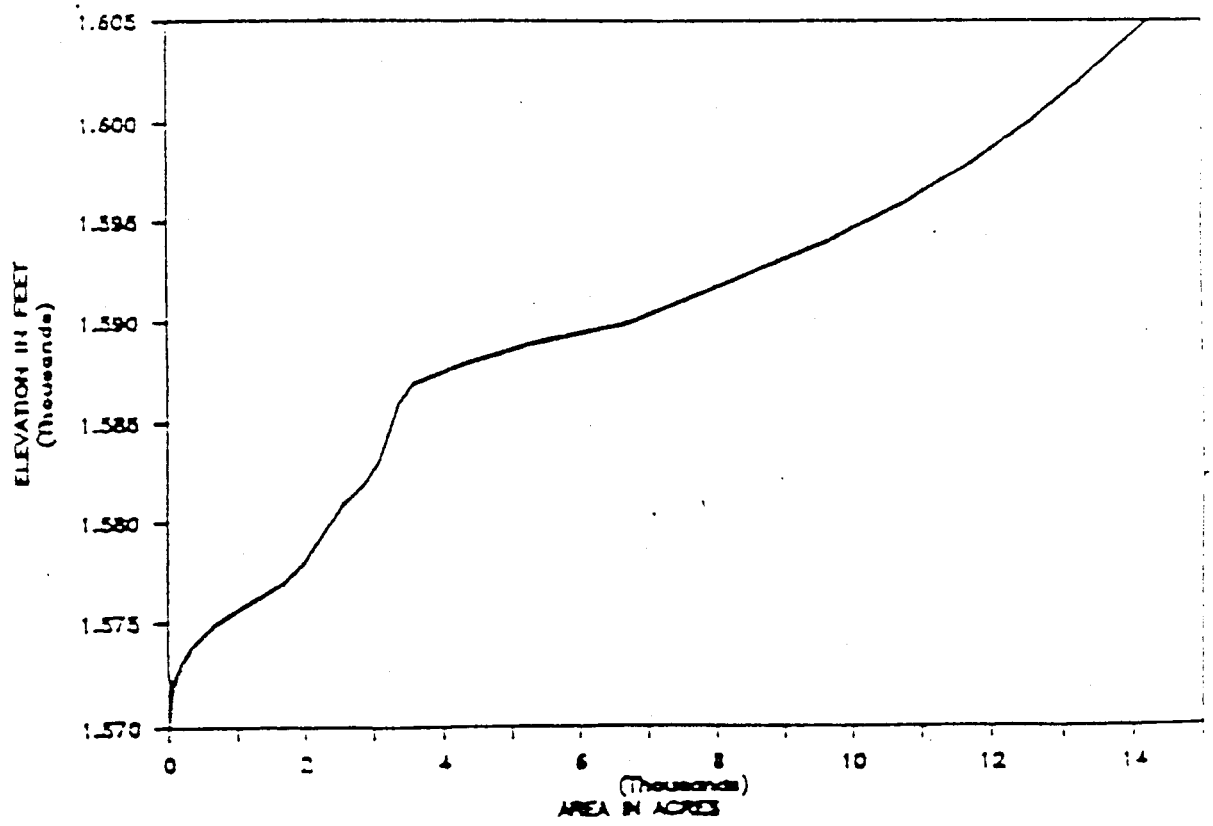


PLATE A-8B

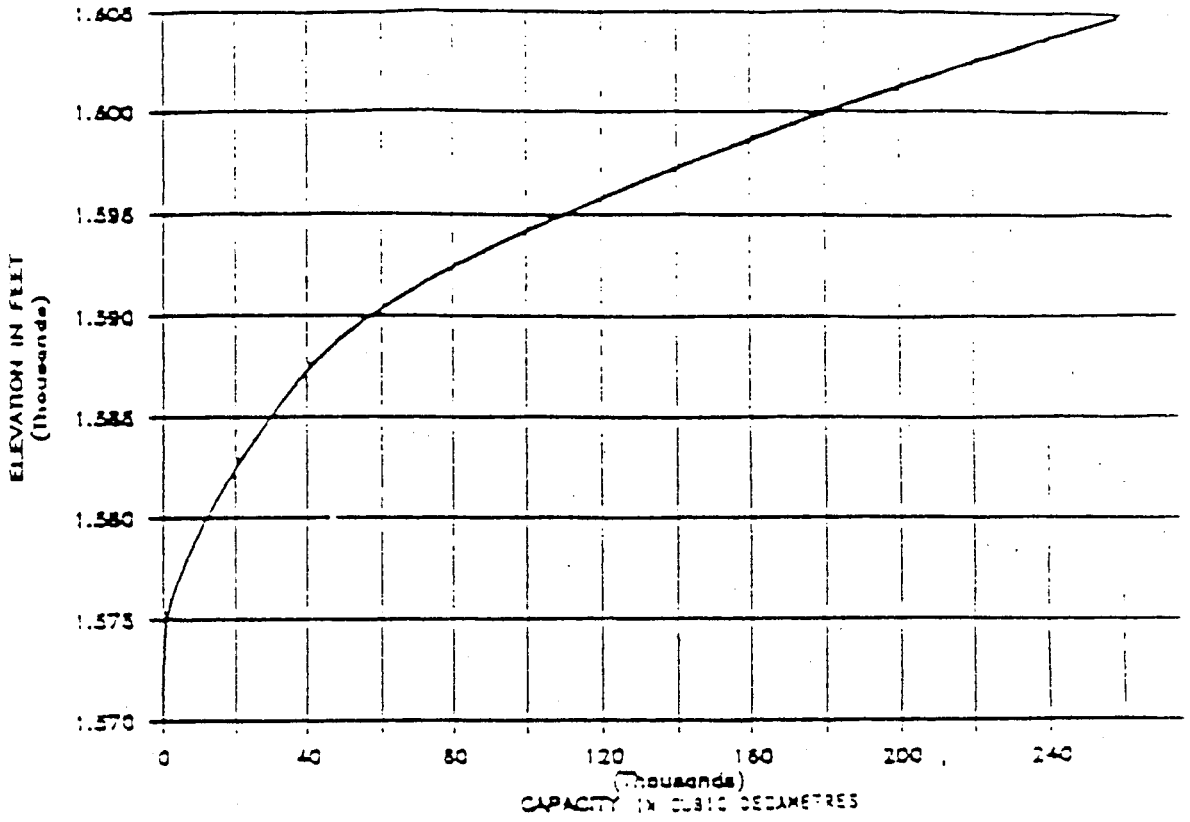
LAKE DARLING ELEVATION—CAPACITY



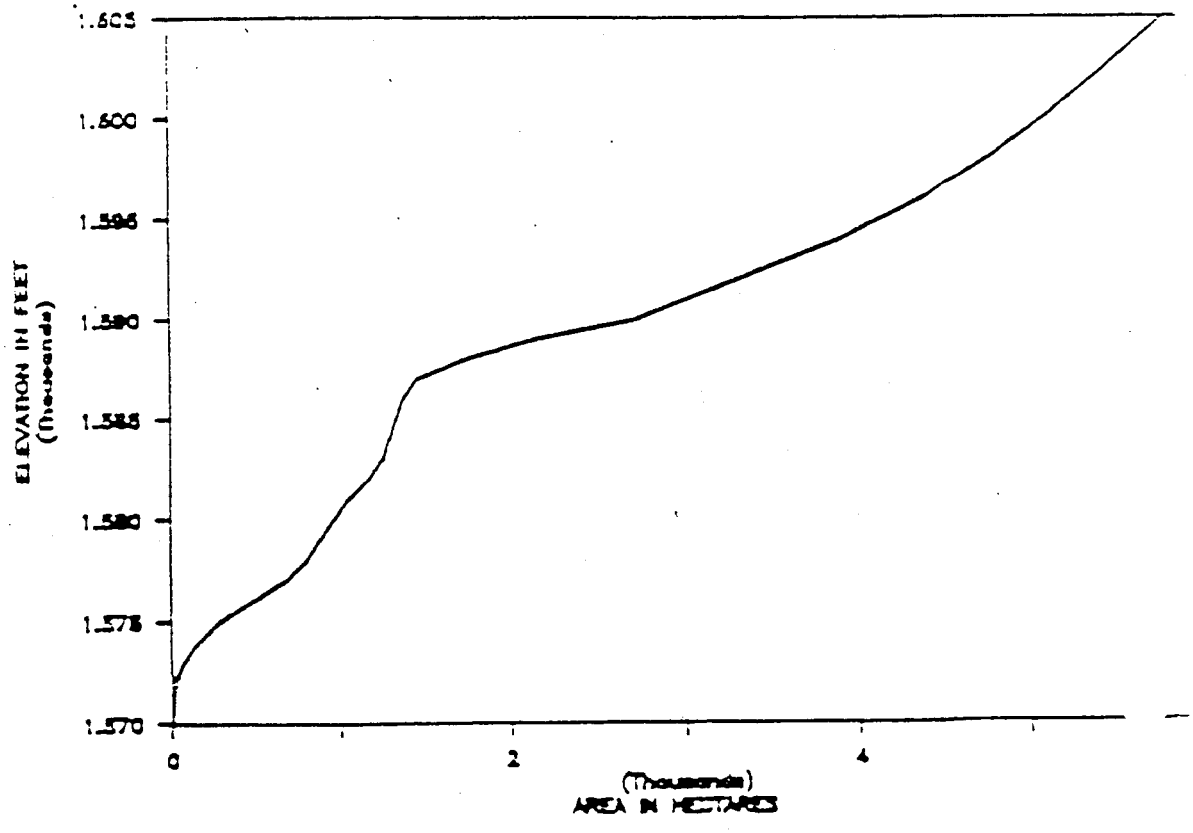
LAKE DARLING ELEVATION—AREA



LAKE DARLING ELEVATION—CAPACITY



LAKE DARLING ELEVATION—AREA



ANNEX B

1. The Province of Saskatchewan shall have the right to divert, store, and use waters which originate in the Saskatchewan portion of the Souris River Basin, provided that such diversion, storage, and use shall not diminish the annual flow of the river at the Sherwood Crossing more than 50 percent of that which would have occurred in a state of nature, as calculated by the Board. For the benefit of riparian users of water between the Sherwood Crossing and the upstream end of Lake Darling, the Province of Saskatchewan shall, so far as is practicable, regulate its diversions, storage, and uses in such a manner that the flow in the Souris River channel at the Sherwood Crossing shall not be less than 0.113 cubic meters per second (4 cubic feet per second) when that much flow would have occurred under the conditions of water use development prevailing in the Saskatchewan portion of the Souris River Basin prior to construction of the Boundary Dam, Rafferty Dam and Alameda Dam.

(a) Under certain conditions, a portion of the North Dakota share will be in the form of evaporation from Rafferty and Alameda Reservoirs. During years when these conditions occur, the minimum amount of flow actually passed to North Dakota will be 40 percent of the natural flow at the Sherwood Crossing. This lesser amount is in recognition of Saskatchewan's operation of Rafferty Dam and Alameda Dam for flood control.

The following rules determine the percentage of the natural flow at Sherwood Crossing which is to be passed to North Dakota:

i. If the level of Lake Darling is below an elevation of 485.24 meters (1592.0 feet) on October 1 in any calendar year, Saskatchewan will pass 50 percent of the natural flow at Sherwood Crossing in that year and in succeeding years until the level of Lake Darling is above an elevation of 485.55 meters (1593.0 feet) on October 1.

ii. If the natural flow at the Sherwood Crossing is equal to or less than 24,670 cubic decameters (20,000 acre-feet) prior to October 1 of that year, then Saskatchewan will pass 50 percent of the natural flow to North Dakota in that calendar year.

iii. If the conditions specified in subparagraphs 1(a)(i) and 1(a)(ii) do not apply, then Saskatchewan will pass at least 40 percent of the natural flow at the Sherwood Crossing to North Dakota.

(b) Flow releases to the United States should occur (except in flood years) in the pattern which would have occurred in a state of nature. To the extent possible and in consideration of potential channel losses and operating efficiencies, releases from the Canadian dams will be scheduled to coincide with periods of beneficial use in North Dakota. Normally, the period of beneficial use in North Dakota coincides with the timing of the natural hydrograph, and that timing should be a guide to releases of the United States portion of the natural flow. The flow release to the United States may be delayed when the State of North Dakota determines and notifies Saskatchewan through the Board that the release would not be of benefit to the State at that time. The delayed release may be retained for use in Saskatchewan, notwithstanding the minimum release limits, unless it is called for by the State of North Dakota through the Board before October 1 of each year. The delayed release shall be measured at the point of release and the delivery at Sherwood Crossing shall not be less than the delayed release minus the conveyance losses that would have occurred under natural conditions between the point of release and the Sherwood Crossing. A determination of the annual apportionment balance shall be made by the Board on or about October 1, of each year. Any shortfall that exists as of that date shall be delivered by Saskatchewan prior to December 31, if North Dakota requests the delivery.