

Milk River Basin - Preliminary Feasibility Study Request for Proposal

PROJECT DESCRIPTION

1.0 Introduction

Alberta Environment plans to commission an investigation into the feasibility of on-stream and off-stream storage alternatives in the Milk River Basin within the province of Alberta. The first component of the study is to examine the feasibility of building a dam and water supply project on the Milk River. A number of previous studies have been undertaken, as early as 1924 by the Department of Interior and more recently in 1954, 1978, 1980 and 1986 by PFRA to examine potential dam and storage sites on the Milk River. The preferred site, known as the Forks Site is located in Section 22 and 27, Township 2, Range 18, west of the 4th meridian, approximately 4.5 km downstream of the confluence with the North Milk River. Three levels of development were examined for the site; Intermediate II with a dam height of 38.8 m, High Level with a dam height of 42.7 m and Topographic Limit with a dam height of 44.8 m. The current study is intended to update the 1986 Feasibility Report prepared by PFRA by reassessing the three alternatives previously examined, ensuring that the proposed designs conform to current Canadian Dam Association (CDA) guidelines.

The second component shall examine the feasibility of off-stream storage alternatives in the Milk River Basin. The study should examine the potential enhancement of existing water bodies as well as the development of potential new diversion and storage locations. Proposed structures must conform to current CDA Dam Safety guidelines. The study shall be conducted using existing information, including National Topographical Service Mapping and digital mapping available from Alberta Environment. The consultant shall initially make a cursory investigation of all potential off-stream storage sites. Prior to undertaking more detailed investigations, the consultant, together with Alberta Environment staff shall determine if any of these sites should be omitted due to factors such as prohibitive costs or design considerations. The remaining sites that appear favorable will be fully examined in this study.

An economic evaluation shall be conducted for all viable on-stream and off-stream alternatives.

The study will address the following elements:

- Hydrology and Water Supply
- Conceptual Design of Dam and Reservoir to Current CDA Dam Safety Guidelines
- Conceptual Delivery Systems
- Environmental Issues
- Analysis of Benefits and Costs
- Other Issues
 - Legislative Requirements
 - Environmental Impact Assessment
 - Aboriginal Issues

2.0 Hydrology and Water Supply

An assessment of the water supply available for this project and how this project fits into the water management of the entire Milk River Basin including the 1909 Boundary Waters Treaty. Also required are preliminary flood inflow hydrographs and estimate of probable maximum flood (PMF) for conceptual design purpose.

2.1 Flood Inflow Hydrographs and PMF Analysis

Alberta Environment will provide preliminary flood inflow hydrographs for floods ranging from 1:20 flood frequency to the PMF for use by the consultant in preparing the conceptual design of off stream storage dams and reservoirs.

2.2 Water Supply Analysis

Alberta Environment will provide a water supply analysis, which includes historical weekly naturalized flows and current licensed allocations which can also be used to compute channel conveyance losses and U.S. entitlements to the consultant for use in determining water availability for the project.

2.3 Assessment of Impact on the Delivery of U.S. Entitlements

The consultant will provide an assessment of the potential implications of the project on Canada's delivery of U.S. entitlements under the 1909 Boundary Waters Treaty and on the delivery of U.S. diversions from the St. Mary River.

2.4 Assessment of Project Water Supply

The consultant will provide an assessment of the water supply for 90% assured and firm yield for this project based on the natural flows, current licensed allocations within the Milk River Basin and the 1909 Boundary Waters Treaty. Based on storage potential, the assessment will involve developing and describing several reasonable operating scenarios that consider potential uses of the water.

Note: For items 2.2, 2.3 and 2.4, Alberta Environment will provide Water Resource Management Model runs as required to support these analyses.

3.0 Conceptual Design of Dams and Reservoirs to Current CDA Dam Safety Guidelines

The conceptual design of all proposed dams and reservoirs for on-stream and off-stream storage alternatives shall conform to current CDA Dam Safety Guidelines.

3.1 On-Stream Site

A conceptual design was prepared by the Prairie Farm Rehabilitation Administration (PFRA) in 1986. This information is available as a reference not a constraint. The major value of this information is the site information and discussion of foundation conditions.

3.1.1 Design

The consultant will provide a conceptual design of a dam and reservoir located at the Forks Site on the Milk River. Using available information, which includes a conceptual design that was prepared by the PFRA and preliminary site

information, the consultant will prepare a conceptual design that reflects current design practice and CDA Dam Safety Guidelines.

The consultant will identify site conditions and unknowns that may affect the final design, state the assumptions used for each condition and state the possible range of impact of these conditions on the final design.

3.1.2 Construction

The consultant will identify any construction considerations that may impact the cost of the project.

3.1.3 Maintenance

The consultant will provide an assessment of the maintenance program required for this project.

3.1.4 Operation

The consultant will provide an assessment of the operational program required for this project.

3.2 Off-Stream Sites

The conceptual designs for any dam on a potential storage site must conform to CDA Dam Safety Guidelines and Alberta Transportation's Water Control Structures Selected Design Guidelines. The consultant shall provide a feasibility design and assessment, as well as an economic evaluation for each site.

3.2.1 Design

Using available topographic and digital information, a conceptual feasibility design and an economic evaluation should be developed for a dam and reservoir for each viable off-stream storage site. The conceptual designs must conform to current CDA Dam Safety Guidelines and Alberta Transportation's Water Control Structures Selected Design Guidelines. For each site, the consultant shall address and summarize items such as: dam and appurtenances, location, storage capacity, potential live storage and economic considerations, as well as addressing construction, implementation, operational, diversion, legal and environmental considerations.

4.0 Conceptual Delivery Systems

The consultant will provide a description of a conceptual delivery system for irrigation and other consumptive uses in Alberta. This concept will include the entire delivery system to the end user's property and a separate description of the on-farm system.

The consultant shall also include an evaluation of the impact of these proposals on Alberta's commitment to deliver water to Montana as part of the 1909 Water Boundaries Treaty. This assessment shall include an evaluation of the current diversions from the St. Mary system to meet these obligations. Any impact on the downstream channel capacity of the Milk River should also be addressed.

The consultant will also provide a conceptual design of the hydroelectric infrastructure potential for this project.

5.0 Environmental Issues

A preliminary understanding of the potential environmental issues associated with the construction and operation of a dam and reservoir is required. The consultant will include a description of the particular issue and the level of effort required to undertake a detailed assessment of each issue should the project move to the next phase. The consultant will also identify any required mitigation associated with each issue.

The following is a list of potential issues that the consultant will investigate. The consultant will also investigate any other issues that are identified during the course of this study.

The consultant will state all assumptions used and the limitations of those assumptions.

5.1 Fishery Issues

- Migration and mitigation for blockage to migration (e.g. separation of population, such as mountain white fish, northern pike and sauger from some portion of their habitat)
- Loss of larval fish through entrainment by hydroelectric power plant intake or spillway flow and mitigation measures to prevent entrainment
- Altered flow regime due to operation of hydroelectric dam (e.g. impact on biodiversity and species abundance)
- Altered temperature regime on fish and macro-invertebrates
- Species at risk – impact of new habitat
- Reservoir drawdown on fish spawning
- Increased mercury levels in reservoir fish

5.2 Wildlife Issues

- Corridor movement
- Inundated habitat
- Species at risk
- Target species

5.3 Native Grassland Issues

- Land use change (e.g. irrigation, livestock operations)
- Species at risk

5.4 Protected Areas Issues

- Twin Rivers Heritage Range Land

5.5 Reservoir Issues

- Shoreline erosion/bank stability
- Sedimentation

5.6 Water Quality Issues

- Reservoir (e.g. trophic status, effluent assimilation, filling, mercury buildup, etc.)

- Reservoir water meeting current water quality guidelines for irrigation/municipal use
- Downstream of dam (e.g. change in oxygen levels)

5.7 Groundwater Issues

- Aquifers
- Levels
- Quantity
- Quality
- Recharge and discharge

5.8 Historical Resources Issues

- Archaeological
- Paleontological
- Historical Period

5.9 Land Use/Social Issues

- Inundated private structures
- Relocation of individuals and/or communities
- Transportation patterns

6.0 Analysis of Benefits and Costs

An assessment is required of all potential benefits and costs of this project. An overview is also required of the general methodology and assumptions used to determine the benefits and costs, as well as a sensitivity analysis on major qualifiers with an indication of the potential range of benefits and costs.

6.1 Dam and Reservoir Costs

The consultant will provide a project cost estimate that includes estimates of the capital, maintenance and operational costs.

The consultant will provide an assessment of the conditions that may impact the cost estimate, state the assumptions used and state the possible range of impact these conditions may have on the final cost.

6.2 Land Acquisition

The consultant will identify the area of land required by the dam, reservoir and delivery system and the cost of obtaining this land. This cost estimate will include:

- Patent Land Purchase
- Disposition Compensation on Crown Land (e.g. gravel, oil, gas, grazing)
- Potential Habitat Replacement

6.3 Road and Utilities Relocation

The consultant will provide an estimate of the costs of relocating of any highways, local roads and utilities, such as pipelines, power lines and telecommunications lines in Alberta that would be affected by the dam, reservoir and delivery system.

6.4 Water Uses

The consultant shall assess the benefits of the proposed structures in terms of the potential benefits for water use as identified below. The consultant will identify any other potential benefits such as municipal and industrial uses and prepare estimates of the economic benefits of these uses. The consultant will state all assumptions used and the limitations of those assumptions.

6.4.1 Irrigation Development

The consultant shall undertake a general assessment of irrigation potential and the benefits of this development within the basin. The assessment will identify current and potential future agricultural activities on lands that could benefit from enhanced water supply.

6.4.2 Hydroelectric Power Generation

The consultant will assess the potential for hydroelectric generation and identify the potential benefits and costs. The consultant will include a statement of the assumptions used in the price of electrical power and the markets.

6.4.3 Flood Control

The consultant will identify any flood control benefits of this project and prepare estimates of the economic benefits of this flood control.

6.4.4 Recreational Benefits

The consultant will identify the potential recreational benefits of the project and prepare estimates of the economic benefits of this recreational use. The consultant will compare this proposed recreational use with the current recreational use to determine if there is a net benefit because of a change in recreational use.

6.5 Environmental Assessment and Mitigation Costs

The consultant will provide a cost estimate for the environmental assessment and mitigation identified in Section 5.0.

6.6 Summary of Benefits and Costs

The summary of benefits and costs will include an estimate of net present value over project life, benefit/cost ratio and sensitivity analysis using different discount rates. In addition it will provide a section on the distribution of benefits and costs.

7 Other Issues

A cursory understanding of the other issues associated with the construction and operation of a dam and reservoir are required. The consultant will prepare a description of the potential requirements of these issues should the proposal move to the next phase.

7.1 Legislative Requirements

- *1909 Boundary Waters Treaty*
- *Water Act (Alberta)*
- *Environmental Protection and Enhancement Act (Alberta)*

- *Natural Resources Conservation Board Act (Alberta)*
- *Hydro and Electric Energy Act (Alberta)*
- *Federal Fisheries Act*
- *Navigable Waters Protection Act*
- *Public Lands Act*

7.2 Environmental Impact Assessment

Steps and actions to consider should a decision be made to pursue a project.

7.3 Aboriginal Issues

The consultant will identify any aboriginal issues related to this project.

- Social, economic and cultural
- Infringement on existing aboriginal and treaty rights

8 Summary

The consultant will prepare a summary of all information compiled as part of this study. The summary should clearly outline the raw information, the assumptions used in all assessments and the range of potential influence of these assumptions.

The consultant is requested not to present recommendations and conclusions regarding the feasibility of the project.

9 Consultation

9.1 Government Organizations

The background information and the people knowledgeable about this information are located in a number of government agencies and geographic locations. Alberta Environment will provide a list of contacts for the consultant to contact in order to obtain and review all pertinent information. The consultant will gather copies of all information and provide a resource compendium. The consultant may identify other agencies that will need to be contacted during the course of the study.

9.2 Stakeholder Groups

The consultant will attend stakeholder meetings as requested by Alberta Environment to a maximum of two stakeholder meetings in total. The meetings will be held in Lethbridge, Alberta.

10. PROJECT ADMINISTRATION

10.1 Project Schedule and Deliverables

As part of their proposal, the consultant shall indicate their anticipated date for completing this feasibility study.

The consultant must provide ten paper copies of the final report, five to the Alberta project manager with an unbound copy for photocopy reproduction. The consultant must also provide the project manager with an electronic version of the final report in MS Office.

Alberta Environment reserves the right to reject any or all proposals and to waive irregularities and formal requirements in their discretion.

Proposals shall become the property of Alberta Environment and shall not be returned to consultants.

Alberta Environment reserves the right to negotiate with any one or more consultant prior to entering into a Formal Contract.

The successful consultant, if any, will be required to enter into a Formal Contract with Alberta Environment. A sample contract is attached for information. It will be modified to apply to any successful proposal and the consultant will be required to execute same in a form acceptable to Alberta Environment within 15 days of being provided with an execution copy.

Proposals will be evaluated on such criteria as Alberta Environment determines in their sole discretion.

10.2 PROPOSAL INFORMATION

The consultant is requested to provide a proposal for undertaking the project described above. The proposal should address the following items.

- A description of the proposed methodology for undertaking the various components of the study.
- A description of the level of effort and detail of analysis proposed to be undertaken on each component of the study
- A description outlining anticipated schedule of activities and associated costs for this project.
- A total cost to complete this study
- A description of the skills and experience of the staff that are proposed to undertake this study and a description of the amount of time proposed to be spent by each staff on the various components of the project.
- A description of the makeup of any consortium proposed to undertake the study.

To be considered, the consultant must provide five copies of the proposal to the project manager by 2:00 p.m. MST on December 3, 2002 at the addresses identified below.

10.3 PROJECT MANAGEMENT

The project manager is:

Garry Bucharski
Alberta Environment
Water Management Operations
8th floor, Oxbridge Place
9820 – 106 Street
Edmonton, Alberta
T5K 2J6
(780) 427-4003
Garry.Bucharski@gov.ab.ca

Alternate Contact:

John Morrison
Alberta Environment
Water Management Operations
8th floor, Oxbridge Place
9820 – 106 Street
Edmonton, Alberta
T5K 2J6
(780) 427-4731
John.Morrison@gov.ab.ca

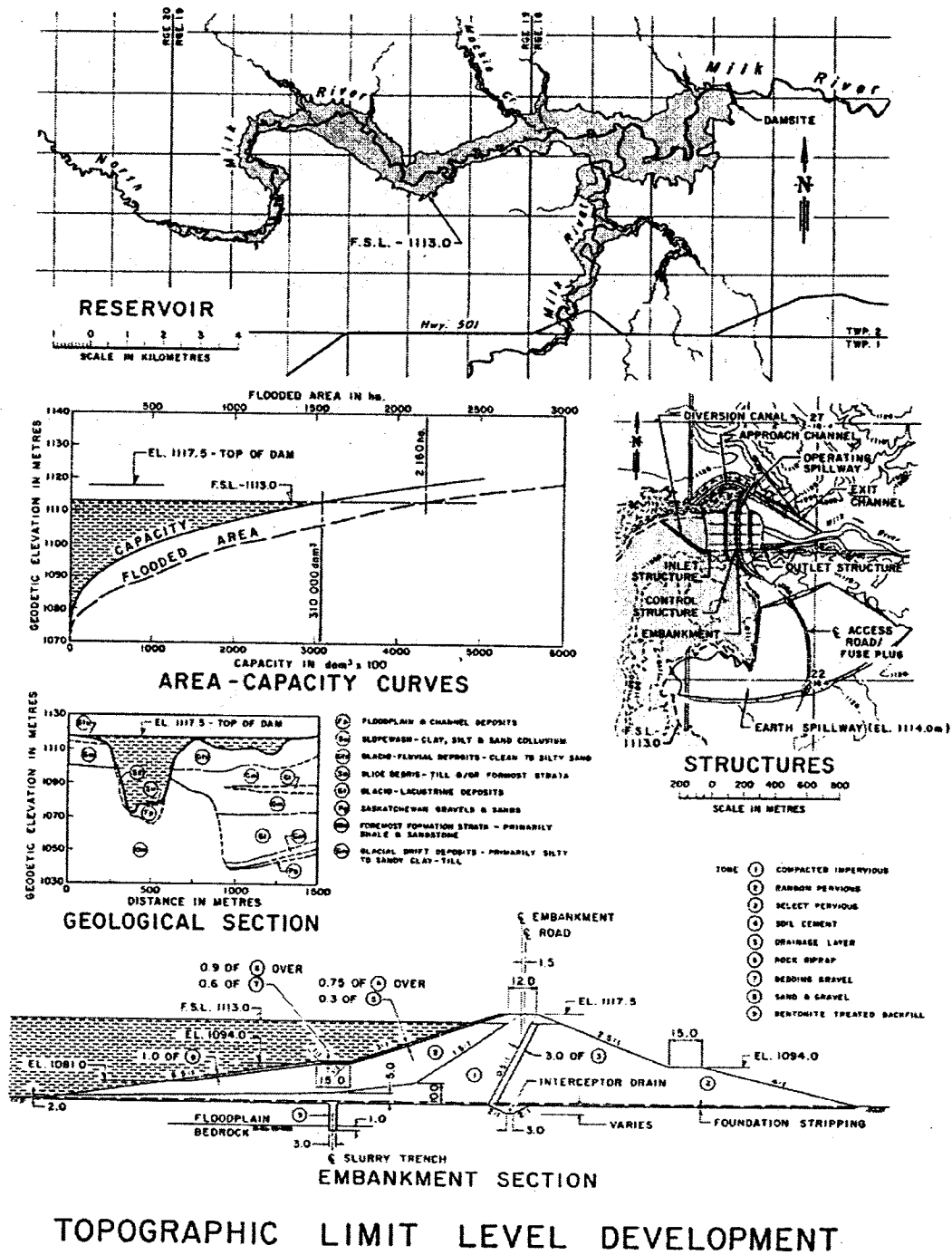
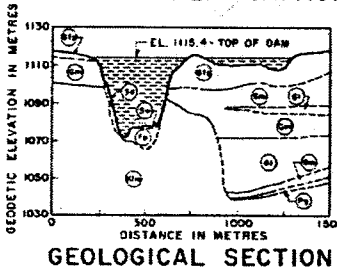
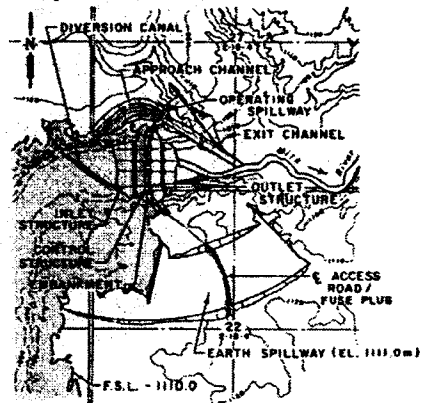
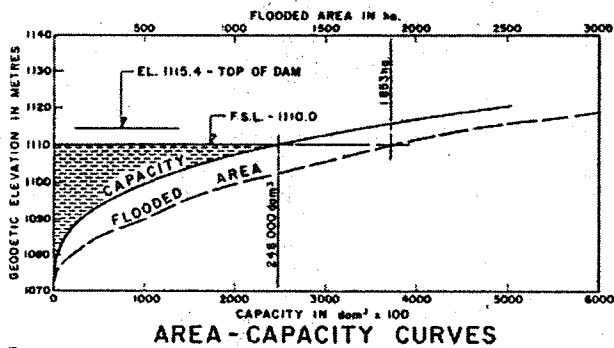
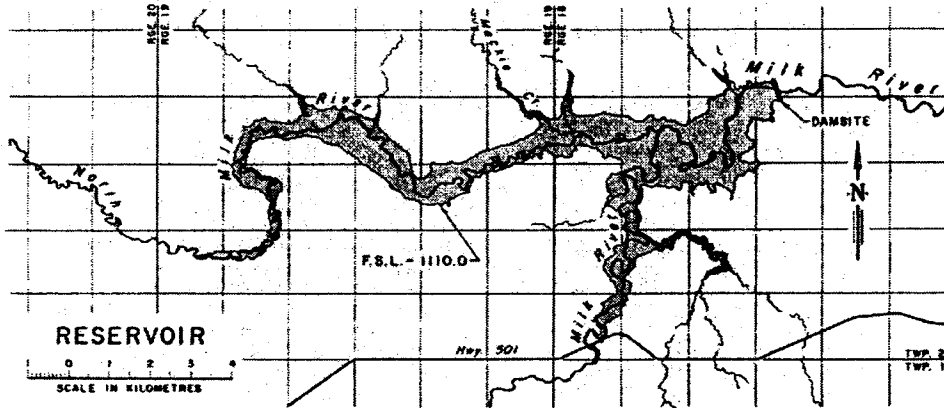


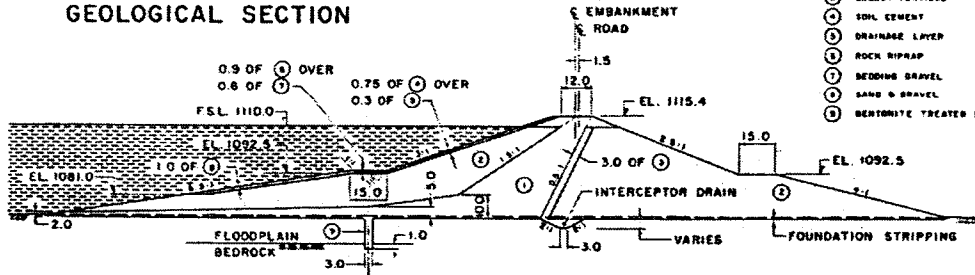
Figure 1



- ① FLOODPLAIN & CHANNEL DEPOSITS
- ② SLOPEWASH - CLAY, SILT & SAND COLLUVIUM
- ③ GLACIO-FLUVIAL DEPOSITS - CLEAN TO SILTY SAND
- ④ SLIDE DEBRIS - TILL &/OR FOREBOST STRATA
- ⑤ GLACIO-LACUSTANINE DEPOSITS
- ⑥ SASKATCHEWAN GRAVELS & SANDS
- ⑦ FOREBOST FORMATION STRATA - PRIMARILY SHALE & SANDSTONE
- ⑧ GLACIAL DRIFT DEPOSITS - PRIMARILY SILTY TO SANDY CLAY-TILL

STRUCTURES

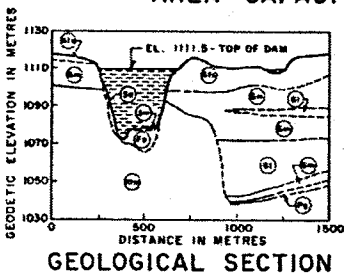
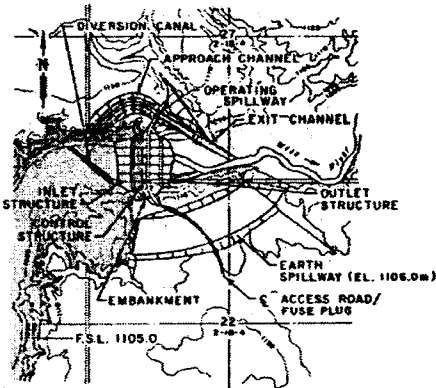
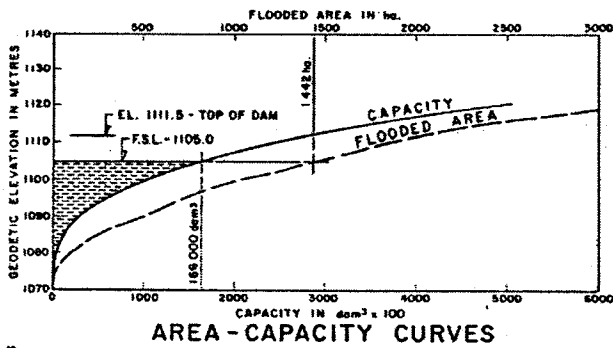
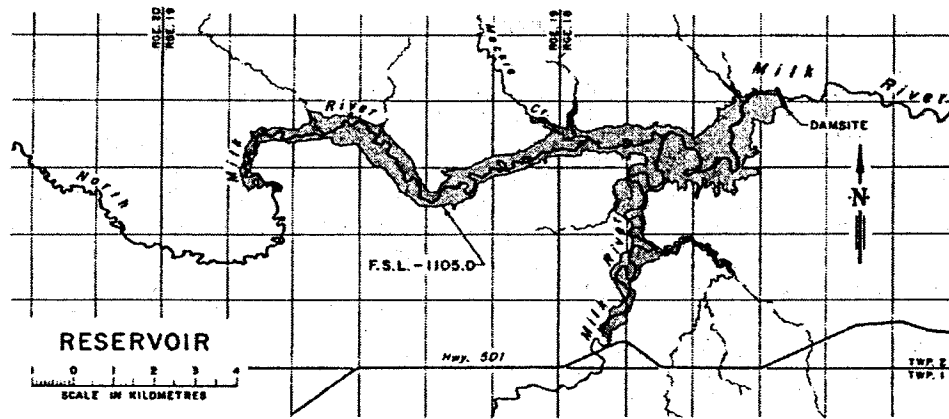
- ① COMPACTED IMPERVIOUS
- ② RANDOM PERVIOUS
- ③ SELECT PERVIOUS
- ④ SOIL CEMENT
- ⑤ DRAINAGE LAYER
- ⑥ ROCK RIPRAP
- ⑦ BEDDING GRAVEL
- ⑧ SAND & GRAVEL
- ⑨ BENTONITE TREATED BACKFILL



EMBANKMENT SECTION

HIGH LEVEL DEVELOPMENT

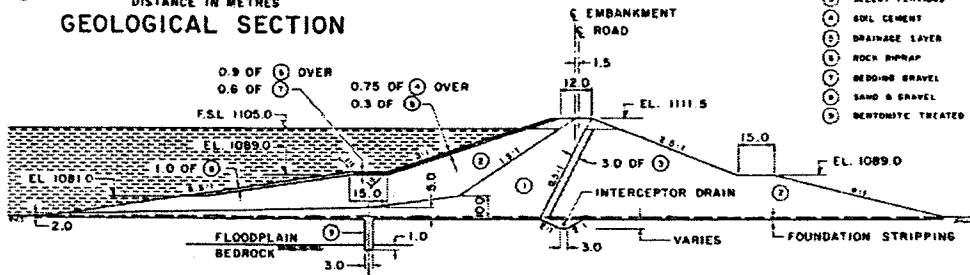
Figure 2



- ① FLOODPLAIN & CHANNEL DEPOSITS
- ② SLOPEWASH - CLAY, SILT & SAND COLLUVIUM
- ③ SLACK-FLOVIAL DEPOSITS - CLEAN TO SILTY SAND
- ④ SLIDE DEBRIS - TILL &/OR FORMOST STRATA
- ⑤ GLACIAL LACUSTRINE DEPOSITS
- ⑥ SASKATCHEWAN GRAVELS & SANDS
- ⑦ FORMOST FORMATION STRATA - PRIMARILY SHALE & SANDSTONE
- ⑧ GLACIAL DRIFT DEPOSITS - PRIMARILY SILTY TO SANDY CLAY - TILL

STRUCTURES
200 0 200 400 600 800
SCALE IN METRES

- ZONE ① COMPACTED IMPERVIOUS
- ② RANDOM PERVIOUS
- ③ SELECT PERVIOUS
- ④ SOIL CEMENT
- ⑤ DRAINAGE LAYER
- ⑥ ROCK IMPRAP
- ⑦ BEDDING GRAVEL
- ⑧ SAND & GRAVEL
- ⑨ BENTONITE TREATED BACKFILL



EMBANKMENT SECTION

INTERMEDIATE II LEVEL DEVELOPMENT

Figure 3