Executive Summary

The creation of Lake Diefenbaker offered unprecedented opportunities for multi-use water based development in Saskatchewan. It was envisioned that when the associated irrigation works were completed, water would be carried to some 450,000 acres of irrigable lands. However, some forty years later the irrigation industry still has not achieved anything near to its full potential.

The Westside Irrigation Project represents a block of potential irrigable land in an area parallel to the west bank of the South Saskatchewan River from the Gardiner Dam to Asquith. This 370,000 acre block is located in a part of Saskatchewan that offers some of the best heat units for crop development. Combined with water, producers would have the opportunity to diversify their operations. This area has the potential of becoming one of the most intensive agricultural regions in Canada fulfilling the original vision of the South Saskatchewan River Project.

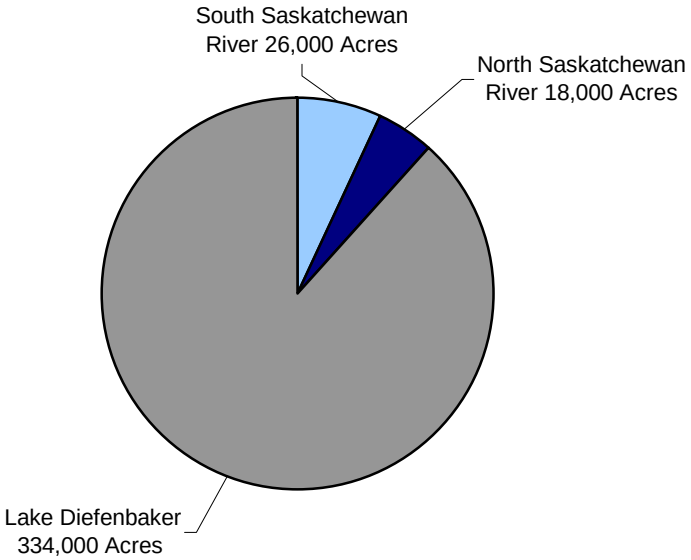
This conceptual level study provides the basis for a major development in the west central portion of Saskatchewan. It examines water development alternatives to supply irrigation, municipal, rural domestic, recreation, wildlife and industrial needs within parts of the seven rural municipalities (RM's) in the project area.

Land Suitability for Irrigation

The irrigable blocks selected were contiguous half section land units based on soil survey information, topographic maps, water well maps and geological information. Heavy clay soils were not included. The soil survey information included quarter section salinity data based on municipal assessment data. The exception is the Macrories A, B, C and D blocks where data was taken from a 1987 study with individual quarter section assignment of irrigability. An irrigated area of 130 acres per quarter section was used to calculate gross acres.

Conservatively, three hundred and seventy thousand potential acres were identified within the study area. Three hundred and thirty four thousand acres are best served from an extension of the West Main Canal (WMC) and Lake Diefenbaker. Twenty six thousand acres could be supplied directly from the South Saskatchewan River and eighteen thousand acres could be supplied directly from the North Saskatchewan River.

Westside Irrigation Project



Irrigation Demand

Water demand was based on serving each irrigated parcel with a center pivot system having a capacity of 7.0 USgpm per acre. The total peak demand was adjusted to account for crop rotation, usage factor, etc., and conveyance efficiency.

The annual consumption was estimated by examining annual diversions for six irrigation districts. Based on these comparisons, the average annual diversion requirement for the Westside Irrigation Project is estimated at 400 mm/acre. The estimated upper decile is 450 mm/acre. This represents a volume of 534,000 and 620,000 dam^3 respectively of water diverted directly from Lake Diefenbaker for 334,000 acres.

Water Availability

Water availability for irrigation out of Lake Diefenbaker was estimated by completing a multi year water balance. Monthly inflow, precipitation, spill uses and releases were simulated for various operation scenarios to determine the total available irrigation water supply. The analysis showed that Lake Diefenbaker is capable of supplying from 370,000 dam^3/yr. to 3.7 million dam^3/yr depending on spring target levels, operation objectives, water cutoff levels and acceptable magnitude and frequency of shortages.

From a strict water supply perspective there is enough water available to meet the demands of the proposed Westside Irrigation Project providing shortages are acceptable in at least ten percent of years. A reservation of approximately 106,900 dam^3 currently exists for the Westside Irrigation Project to meet part of the potential demand. Demands in excess of the reservation are considered to be met through increased withdrawals for which no reservation currently exists. Overall, the proposed project would commit a significant portion of the available water out of Lake Diefenbaker.

A project of this magnitude would have a significant impact on water management in the Province. A provincial strategy on water management and irrigation development is required to assist in the decision making process. Confirmation of an allocation of water for the project would be subject to the proposal having met the provincial government development processes and would likely require a project development schedule to retain the water supply commitment.

North Saskatchewan River diversions would not be limited except in extremely low runoff years.

Infrastructure

During the development scenarios, the existing and future infrastructures of SaskPower and Saskatchewan Highway and Transportation were evaluated in terms of the impact to cost and implementation. Most of the proposed pump stations are within 3 kms of suitable service power lines. On-farm agricultural development and consequently agricultural processing can only achieve their potential in conjunction with aggressive infrastructure development, i.e., transportation and utilities.

Water Delivery Scenario

For this analysis, the Westside Irrigation Project was divided into two Regions. The Southern Region which includes the R.M of Fertile Valley (285), a portion of the R.M. of Milden (286), the southern half of the RM's of Montrose (315) and Harris (316); and the Northern Region which includes the northern half of the RM's of Montrose and Harris, the RM's of Vanscoy (345), Perdue (346) and Eagle Creek (376). The location of the division is marked by a 10 km strip of land considered non-irrigable. The northern region was further sub-divided into the northwest and northeast block.

The Southern Region is the closest to Lake Diefenbaker. It would be easily serviced from the WMC or from an extension of the WMC.

It was recognized early that some of the Northern Region could be best served from a new pump station on the South Saskatchewan or the North Saskatchewan River. However, as the land rises sharply from the rivers, the amount of irrigable land that could be serviced economically from the rivers is limited. Therefore, the majority of the North Region would need to be serviced from an extension of the West Main Canal to the northwest and then to the northeast.

Due to the very large capacity required to supply the irrigable lands, the only viable supply option was via an open channel main canal (extension of the WMC) into the heart of the irrigable blocks. The route would follow natural land contours modified to minimize land severance and to bypass physical obstacles.

The main canal would require appropriate numbers of control structures, syphons, bridges, farm crossings, drain inlets, cross drains, wasteways and appropriate seepage control measures.

Pump stations located along the main supply canal, supply water to the distribution system which in turn supplies water to individual parcels. The assumed distribution system is a pressurized system using PVC pipe. The farm turnout provides water for the center pivot irrigation system providing an end pressure of 30 psi and delivering 7.0 USgpm per acre. In some of the blocks, a booster pump was used to lift water to an open main canal from which the distribution system was serviced.

Two pumping alternatives to supply the West Main Canal were evaluated.

- Upgrading the existing pumping faculty at Diefenbaker Lake (Coteau Creek Pump Station) and increasing the size of the West Main Canal as required.

- Construction a new pumping facility structure on the South Saskatchewan River downstream of Gardner Dam (Suicide Coulee Site). This alternative would mean that approximately 27 kms of existing West Main Canal would not need to be enlarged.

The river option was eliminated due to cost and energy requirements. The upgrading of the pumping facility at Diefenbaker Lake (Coteau Creek Pump Station) is recommended.

The supply system chosen from Diefenbaker Lake includes the following major components:

- The majority of water supply coming from an upgraded Lake Diefenbaker pump station and WMC canal.

- Supplying the southern and northwest to northeast Region by upgrading and extending the existing WMC canal to the northwest. The new canal follows the natural contour to a point 1.2 kms north of Tessier, where it divides into two smaller capacity canals. One of the smaller capacity canals proceeds west to a syphon across Eagle Creek, and the other one heads northeast and east to supply the Delisle West – Asquith and Donavan Delisle blocks. The total area of new irrigation blocks supplied from this water supply and distribution concept is 331,271 acres.

- Blocks located at higher elevations (Zealandia, etc.) require a second booster pump to lift water to a main canal system serving that block.

The recommended alignment was reviewed for environmental, species at risk and cultural consideration. Final alignment would consider severance and other land features; however, limited topographic information did not permit further refinement.

Reservoirs

There were three reservoirs, including Conquest, Eagle Hill Creek and Delisle, considered in previous studies that could potentially be integrated into the current scheme concept as peaking reservoirs. The inter-relationship of pumping from Lake Diefenbaker on demand or pumping to off–stream storage will provide some project benefits in terms of capital savings and operational efficiencies.

There is limited available information on any of the sites (other than Conquest), but there is merit in examining each site in greater detail as a next step. The key benefits of the addition of the three reservoirs are as follows:

1. The costs for Delisle and/or Eagle Creek could be significantly or totally offset against the infrastructure costs that are avoided.

2. It provides significant water management benefits (reduced travel time, etc.).

3. It offers added value to the project (recreational, wetlands, waterfront property etc.).

Cost

The total capital cost including engineering and contingencies to develop a 331,742 acre scheme, supplied from Lake Diefenbaker and excluding on-farm costs, is $1,738 million or $5,247/acre. Including on-farm costs, the cost is $2,109 million or $6,365/acre.

Estimated cost to serve 25,529 acres and 17,670 acres respectively from the South Saskatchewan and North Saskatchewan River, excluding on-farm costs, averages $229 million or $5,302/acre. Including on-farm costs, the cost averages $278 million or $6434/acre.

Project Capital Costs		
	Excluding on-farm ($ million)	**Including on-farm ($million)**
331,742 Acres from Lake Diefenbaker	$1,738 Million $5,247/acre	$2,109 Million $6,365/acre
25,529 Acres from South Saskatchewan River	$131 Million $5,115/acre	$159 Million $6,208/acre
17,670 Acres from North Saskatchewan River	$98 Million $5,570/acre	$119 Million $6,760/acre

Implementation Plan

From the economic feasibility perspective, the shorter time frame for the implementation of the project, the greater benefits gained and, therefore, the better the economics. However, from the practical side, construction will occur over several years.

The proposed implementation plan looks at a 20 year period for the project. The project has been divided into six stages for construction. Each stage will require from two to four years to complete following a two year period for engineering studies, regulatory approvals and land acquisition.

Economics

A project of this magnitude has major beneficial effects on the Saskatchewan and Canadian economics. A valuable infrastructure investment has been idle in the WIP area over the last forty years while irrigated agriculture has continued to grow and prosper in Alberta. In addition to the benefits the WIP would derive from irrigation, water would allow significant societal benefits as a whole. These benefits include the economic spin offs from such a major project, plus the opportunity to supply quality water to municipal, industrial, rural domestic, recreational, wildlife and environmental needs in the region.

- Some blocks of land are obviously more economical to serve than others. However, the differential was not significant enough to conclude that any one block was not economically viable.

- Three scenarios of on-farm development were considered. A traditional canal oilseed mix, a concentration of high value crops (Aggressive) and intensive livestock development (Livestock).

- The Project is economically sound from a provincial perspective at a five percent discount rate for the Aggressive and Livestock Development Scenarios.

- Farmer's ability to pay project costs beyond the on-farm investment costs is limited. Only the Aggressive and Livestock scenarios will be able to make a limited contribution to project costs.

- Associated agricultural processing is a must to ensure project viability.

- Livestock producers have the clearest vision of how they will incorporate irrigation into their farm program and will lead the way in irrigation uptake.

- Current non-irrigated agriculture, on average, is operating at negative returns.

- Irrigation will allow greater crop and livestock diversity in the region and contribute to the diversity required to attract agricultural processing into the Province.

- Expanded irrigation production in the Westside area will contribute to the critical mass necessary to develop specialized agricultural production and agricultural processing.

All respondents to a questionnaire, developed to document circumstances that are expected to influence uptake rates, indicated that irrigation development was needed even though the development costs may seem high. Costs will only continue to increase. The Saskatchewan agricultural economy will only keep pace with other provinces if initiatives such as this project are implemented.