

POWELL RIVER REGIONAL DISTRICT

SOUTHERN REGION WATER RESOURCE STUDY

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CONSULTING ENGINEERS

SOUTHERN REGION WATER RESOURCE STUDY

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- A. GROUNDWATER RESOURCES STUDY
(BY PITEAU ASSOCIATES ENGINEERING LTD.)
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S Y N O P S I S

This preface has been included for the purpose of providing a capsule summary of the report findings. The highlights of the report are as follows:

Planning Parameters and Considerations

1. The Southern Region consists primarily of low density rural development interspersed with a few small subdivisions and small commercial areas. There are also a considerable number of agricultural holdings and much of the area is in tree farm licence. The estimated current population of the Southern Region is 3250 persons.
2. The anticipated rate of population growth in the Southern Region is 1 to 2% per year. Although several potential development projects are possible, their impact on the area is difficult to foresee at this time.

Review of Existing Waterworks Systems

3. Domestic water supply to the area is in most cases supplied by private wells. There are, however seven existing waterworks systems which supply between 12 and 130 residences each. Four of these systems are supplied from groundwater wells and three rely on surface water sources.
4. Groundwater presently provides domestic water to the majority of residents in the Southern Region. The groundwater resource is summarized as follows:
 - shallow aquifers in the overlying glacial till or marine deposits
 - deeper aquifers in underlying "pre-Vashon" silts, sands and gravels
 - wells in fractured bedrock
5. The surface water resource consists of the following:
 - the Powell River District Municipality water system which originates from Haslam Lake
 - the Lang Creek system which also originates from Haslam Lake

- the Gordon Pasha Lakes/Lois River system which is used by MacMillan Bloedel Ltd. for power generation
 - several smaller creeks which are either too small or have potential water quality problems which make them unacceptable as regional water supply sources
6. Water quality has been identified as unacceptable in all of the existing local water systems relying on surface water sources. Only the Stillwater system presently carries out disinfection of the water supply. Water quality is less than satisfactory for many of the groundwater systems as well, however the problems appear to be associated with contamination of the water distribution systems rather than the groundwater supply.

Overview of Regional Water Supply Requirements

7. A design peak day demand for the Southern Region of 350 Imperial gallons per capita per day has been selected on the basis of available information for the District Municipality and the Sunshine Coast Regional District. Present peak demands in the Southern Region are considerably lower since they are in most cases restricted by the available water supply.
8. The existing and projected peak day water demands for the Southern Region are as follows:

YEAR	RATE (I gpm)	ESTIMATED POPULATION
1988	790	3250
2000 (design horizon)	1000	4100
2038 (ultimate case)	2124	8740

Fire protection requirements vary from 400 to 1000 Imp gpm depending upon the locality and the extent of commercial and institutional development.

9. In general surface water supplies in the Southern Region, as elsewhere, must be disinfected prior to domestic use. In addition surface water supplies may eventually have to be treated for removal of waterborne diseases such as Giardiasis.

A water quality testing program is necessary to provide information as a basis for design of a water treatment facility.

10. In general the water sources for the existing small water systems in the Southern Region are scarcely large enough to provide peak demand to their existing service areas. With the exception of the Myrtle Pond system, existing storage facilities are inadequate for any significant expansion.

Assessment of Alternative Water Supply Sources

11. Three surface water sources have been identified as possible regional water supply sources. These are:
 - purchase of water from the Powell River District Municipality
 - construction of an intake and pipeline on Lang Creek
 - purchase of water from MacMillan Bloedel on the Lois River/Gordon Pasha Lakes system
12. The groundwater resource in the Southern Region will be limited to supplying domestic water requirements to single residences and small community water systems.

Master Plan for Regional Water Supply System

13. The master plan for a regional system is based on integrated use of the three primary surface sources as follows:
 - primary supply for the western end (i.e. the Myrtle Creek valley) provided from Powell River's system
 - primary supply for the rest of the region provided from Lang Creek
 - backup supply for the entire region provided from MacMillan Bloedel's system
14. A Class D estimate of the total capital cost to construct the component facilities (i.e. including intake, connections, reservoirs and feeder mains) is in the order of \$6.5 million (1988 dollars).
15. The additional capital cost to construct a water filtration facility, should it eventually be required, is in the order of \$2.4 million.

Implementation of the Regional Plan

16. Implementation of the regional plan involves four types of action on the part of the Regional District:

- secure regional water supply sources
 - specify standards for construction of new water systems so that they can be incorporated into a regional system
 - establish standards to which existing systems must be upgraded prior to acceptance into a regional waterworks system
 - construct key elements of the regional waterworks infrastructure
16. The master plan lends itself to implementation in four phases:
- ° **Phase 1 - Preliminary:** secure sources
 - ° **Phase 2 - Major Infrastructure Elements:** develop Lang Creek to serve the Brew Bay-Lang Bay sub-area
 - ° **Phase 3 - Municipal Water Supply:** connect to Powell River's system to serve the Myrtle Creek Valley
 - ° **Phase 4 - Linking and Infilling:** complete the feeder-main links between the development centres

SOUTHERN REGION WATER RESOURCE STUDY

1.0 INTRODUCTION

1.1 Background

Description of Southern Region

The Southern Region of the Powell River Regional District comprises the area of the British Columbia mainland lying east of the Municipality of Powell River, west of Jervis Inlet, and south of the interior mountain ranges and lake systems. The region is divided between a relatively narrow coastal strip, which is the most densely populated and is experiencing the greatest pressure for development and the forested interior which includes small agricultural holdings and relatively sparse residential areas.

The study area offers an attractive alternative to higher density development in the Municipality of Powell River. Waterfront and areas close to the waterfront are especially in demand. In recognition of the potential development pressure in the Southern Region, an **Official Settlement Plan** was prepared by the Regional District in 1982.

Existing Waterworks Systems

Water supplies for the southern region have been developed almost exclusively by individuals for single or small groups of residences. Groundwater is the predominant source in the western part of the region. Water systems tend to be small and rely on production from one or two wells. Surface water has been used to a significant extent in the central and eastern parts of the region where several relatively large local water systems are in place.

The larger water systems include several dozen residences and some have been recognized as either "Local Improvement Districts" or utilities. In recent years some of these Districts have invested significant sums of money to upgrade their water supply and distribution infrastructure. Other systems appear to lack the strong organization required to maintain, improve, or upgrade the infrastructure. In several cases there appears to be no adequate organization to continue operation of the system if the present operators reduce their commitment.

Need for a Regional Water Study

Recognizing the need for a review of water servicing alternatives, and also the possibility that the public water supply function within the study area may eventually be best carried out by a single water supply agency, the Powell River Regional District has commissioned this study. The primary objective is to complete a comprehensive engineering study which provides a practical framework for long term water supply planning and development in the region. More specifically the intent is to address the following:

- identify surface and/or groundwater sources of adequate quality and quantity to serve a future regional water system
- assess the adequacy of existing local water supplies to serve existing and anticipated future users
- prepare a conceptual plan complete with costs, to provide an integrated water supply system to serve existing and new development areas within the southern region of the District

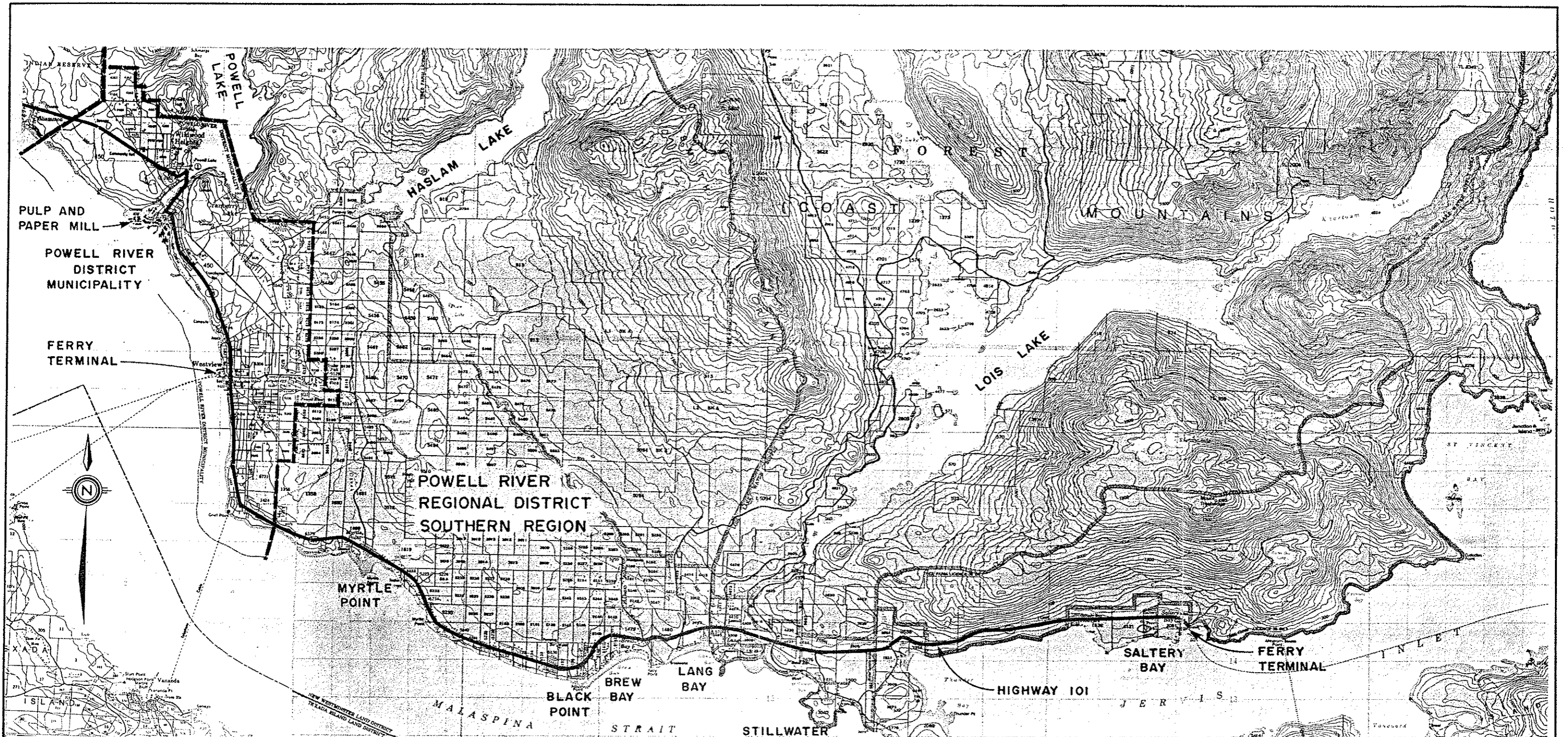
Kerr Wood Leidal Associates Ltd., Consulting Engineers, were selected to undertake the assignment on the basis of considerable related experience in the field of regional water supply planning.

1.2 Study Area

The Study Area is shown on Figure 1. The southern region of the Powell River Regional District is characterized by forested terrain sloping broadly southward from the Smith Mountain range toward Malaspina Strait. The area is marked by three major drainage systems, Myrtle Creek, Lang Creek, and the Lois River, as well as several lesser watersheds.

The eastern extremity of the region consists of steeper forested mountain slopes which extend virtually to the edge of Jarvis Inlet.

Presently development is focussed on a relatively narrow strip of land along the coast and in proximity to the main transportation route (Highway 101). The present population of the southern region is estimated to be 3100 people and growth is estimated between 1 and 2 percent per year.



STUDY AREA

POWELL RIVER REGIONAL DISTRICT - SOUTHERN REGION

FIGURE 1

1.3 Scope of Assignment

The purpose of this Water Resource Study is to provide direction with regard to:

- planning for future development and for settlement areas to accommodate future population growth with regard to the location, quality, and quantity of water supply sources
- planning for and taking steps to secure and protect adequate water supply sources for present and future needs
- possible gradual acquisition and amalgamation of existing water supply systems

The study has been completed in three phases. Phase I of the water resource study includes assembly and review of information, review of planning parameters, review of potential surface and groundwater sources, and investigation of existing community waterworks systems.

Phase II of the study provides an assessment of regional needs and potential water resources.

Phase III of the study includes presentation of a concept plan for regional water supply.

1.4 Reference Sources

Field investigations were carried out to obtain first-hand information on the existing systems. This included visits to the watershed areas, examination of intakes, and inspection of groundwater well pumping stations, storage tanks, and water treatment facilities.

The following reports and data have provided historical background information relative to both the planning and operation of waterworks systems:

1. Powell River Regional District, Southern Regional District (Electoral Areas B and C), Official Settlement Plan "Schedule A", May 1982.
2. Waste Management Plan - Supplementary Documents, including a Preliminary Groundwater Assessment prepared by the Water Management Branch and a Review of Surficial Geology prepared by the Waste Management Branch.

3. Surface water licence records and documents made available by the Water Management Branch.
4. Miscellaneous drawings, documents, and records, as well as verbal information relating to the existing local waterworks systems.

2.0 PLANNING PARAMETERS AND CONSIDERATIONS

2.1 Planning Horizon

A critical consideration in long-term water supply planning is the selection of a reasonable time frame for projecting future water supply requirements. The selection of a specific planning horizon for water supply design provides the basis for all subsequent decision making with respect to the sizing of facilities.

For the purpose of this report, the planning horizon for sizing of infrastructure such as intakes, pipelines, and storage facilities will be the year 2000 (i.e. 12 years). Assessment of water sources, however, will be based on a 50 year horizon (i.e. year 2038) to ensure that the Regional District has the flexibility to expand water use over the longer term.

Discussion regarding acquisition of water sources will be based on the estimated population in the year 2038 which, at a 2% growth rate, would be 8740 people.

2.2 Existing Population and Land Use

The current population of the southern region is estimated to be 3250 people. The last census (1986) put the population at 3120.

Land use in the Southern region falls into the following categories:

- a) Developed residential, subdivided: Several subdivided areas exist within the region, generally located around areas of historical development. In addition, the density of development is much higher along the waterfront due to the attractiveness of the land.
- b) Rural, low density and small holdings: Most development falls into this category with lot sizes ranging between 2 - 5 acres. Emphasis is on recreational aspects of the area as well as some hobby farming.
- c) Agricultural: There are a considerable number of agricultural holdings in the interior, inland portion of the region (north of Highway 101).
- d) Tree farm licence: Much of the region (especially to the north and east) is currently a part of active tree farm licences with occasional logging activity.

- e) Several minor commercial establishments are spread along Highway 101. These are usually located near areas of residential development or adjacent to the boundary of the Powell River Municipality.
- f) Outside of logging, industrial development is limited to a few small saw mills. In recent years there have been some applications for commencement of fish farming operations.

2.3 Future Population and Land Use

At present there is no indication that the population of the southern region will expand at a rate in excess of (the current) 1 to 2% per year. Therefore, using an estimated growth rate of 2%, the anticipated population in the year 2000 could be in the order of 4100 persons. Discussion regarding water supply infrastructure will be based on this population.

The District does not anticipate any major shifts in land use in the foreseeable future. The current trend is toward smaller parcels but not high density development. It is felt that the predominant attraction of the area will continue to be availability of larger properties, and escape from higher density development.

In spite of this general trend, there are potential impending developments which could have an impact on the area. These include:

- a possible golf course and resort development near Deighton Creek (east of Myrtle Point)
- activity surrounding mineral claims in the Hammil Hill area
- possible further fish incubation, rearing, and farming activity
- application for development of higher density subdivisions targeting the retirement market is anticipated in some areas
- a large block of land in the interior between Myrtle Point and Black Point has been designated for a possible airport development in the remote future
- some industrial development may occur as a result of connection of the peninsula to the proposed natural gas pipeline to Vancouver Island

The impact of any of these potential development cannot be foreseen at this time.

TABLE 1

SYSTEM	MYRTLE POND SPECIFIED AREA	WORKS	SALTERY BAY DISTRICT
AREA SERVED (developed)	35 residences in Myrtle Point Area (plus 23 developed lots (unoccupied))	28 Myrtle Point	16 residences
SOURCE	one groundwater well rated @ 24 lqpm pumped at 17 lqpm (located in unoccupied subdivision)	one screened well	Bishop Creek, screened intake
STORAGE	60,000+ gal steel reservoir	10 re: tank c/w	none
TREATMENT	iron and manganese removal, chlorination	no treatment	none
DISTRIBUTION SYSTEM	old system at Myrtle Point not sized for fire demand. New 6-in. PVC in unoccupied subdivision	4-in c/w piping hydrants. One re-	2-in polyethylene
COMMENTS	new system designed and constructed for new subdivision. Purchased by the MPSA and connected to old "Munson" system	des: placed str: em Ste: em div: Manage-	

3.0 REVIEW OF EXISTING WATERWORKS SYSTEMS

3.1 General

The existing waterworks systems considered in this report only include those which serve subdivisions or a significant area of development. These have been registered as "Local Improvement Districts", Specified Areas, or as utilities.

These systems have evolved in the following ways:

- ° Engineered water systems installed as part of a subdivision development.
- ° Private water systems expanded over time to serve a larger area.
- ° Cooperative ventures formed by users creating a utility or a Local Improvement District and either installing a new water system or modifying and expanding an old one.

The location of these systems is shown in Figure 2. A general description of each system is given in Table 1.

It can be seen from Figure 2 that the existing waterworks systems serve pockets of development which have evolved historically around local industries (i.e. sawmills) and desirable coastal settlement areas. Many of the existing systems are isolated from each other with no potential for linking into combined systems given the present resources of the Improvement Districts. Exceptions are:

- the Myrtle Pond Specified Area which could be expanded to include the Stella Maris Estates system
- the Pinetree and Woodlynn system could be combined subject to investment in suitable pumps and equipment to coordinate the pressure zones

With the exception of the Myrtle Pond Specified Area and the Brew Bay Improvement District, the existing waterworks systems appear to be controlled by organizations predominantly concerned with day to day finances and operation of the facilities. There does not appear to be much interest from many of these groups in improving water quality, upgrading existing facilities, or expansion.

The people responsible for operation of the waterworks facilities are paid nominally, if at all, for their services. In many cases there is a genuine concern regarding who will operate the system once the current staff retire.

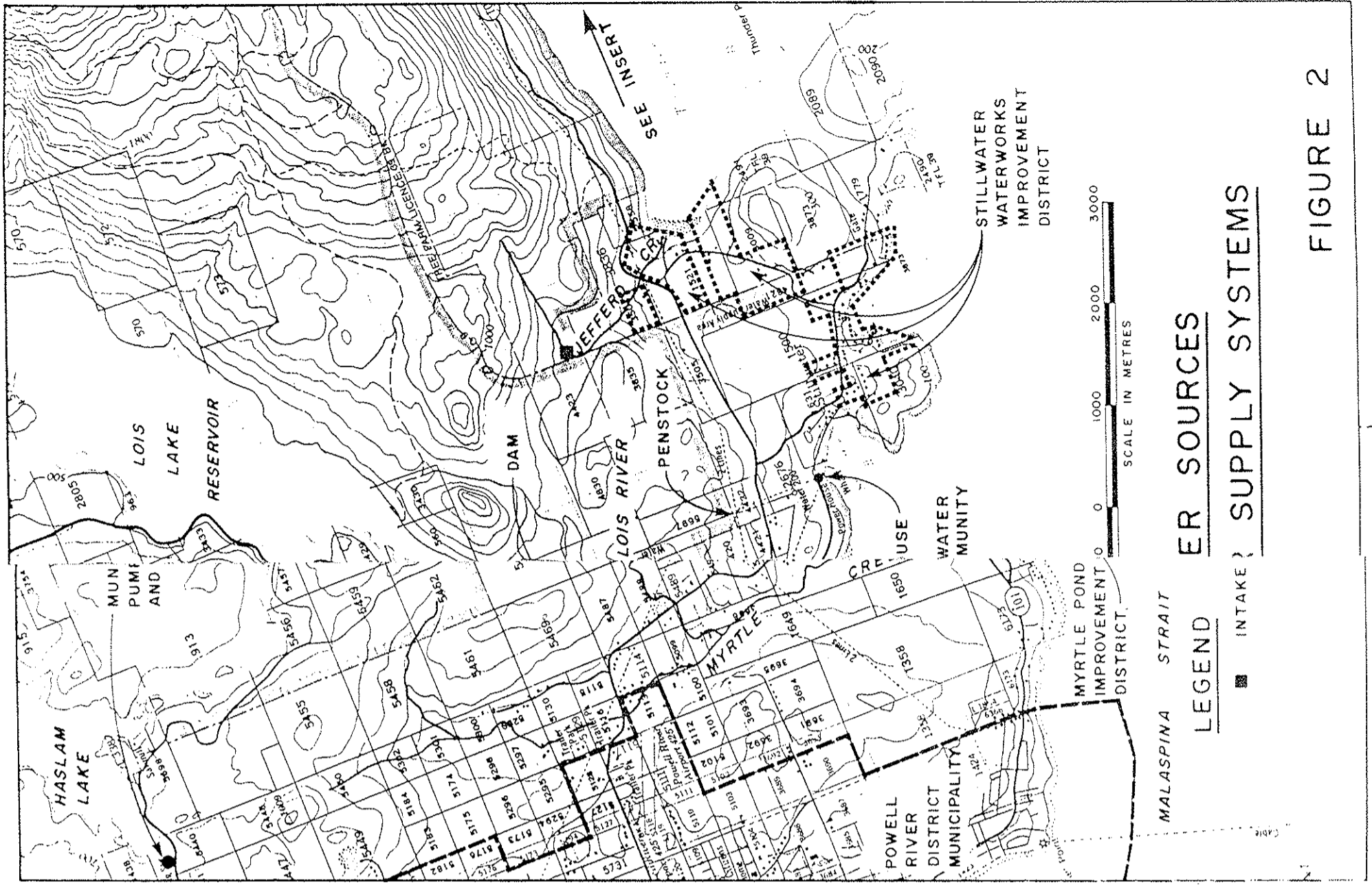


FIGURE 2

3.2 Water Sources

Groundwater

The majority of residents of the Southern Region obtain their water supply from either excavated or drilled wells. These include users in four of the seven Local Improvement Districts investigated during preparation of this report, as well as several hundred private or shared wells.

The **Groundwater Resource Study** completed by Piteau Associates is included herein as Appendix A. The description of the groundwater resource for the Southern Region is summarized as follows:

- Shallow aquifers representing local permeable zones in the glacial till or marine deposits. These are exploited by excavated wells throughout the Southern Region but water levels tend to fluctuate and the shallow wells may not be reliable.
- The pre-Vashon silts, sands, and gravels underlying the till have been exploited as an aquifer by numerous deeper wells in the area west of Kelly Creek. The total quantity of groundwater available in this aquifer is expected to be significant, but limited by the total recharge possible through the overlying till.
- Several wells have also been successfully completed in fractured bedrock.

Surface Water

The locations of various surface water sources in the Southern Region are noted on Figure 2. A summary of information for each source is presented in Table 2, with potential and existing water supply sources assessed as follows:

- ° **Powell River District Municipality:** the option exists to supply water to western areas of the Southern Region lying adjacent to the Municipality with water purchased from the Municipality. This is contingent upon the potential requirements being made known to the Municipality so that they can plan their water supply and distribution system accordingly.

TABLE 2

SUMMARY OF SURFACE WATER SUPPLY WATERSHEDS

WATERSHED	AREA (sq.km)	PREDOMINANT LAND USES	EXISTING WATER USE	EXISTING WATER LICENCES	COMMENTS
Myrtle Creek	20	Agriculture, some small holdings, tree farm license	-	-	Hamil Lake currently used by municipality as a domestic water source. Remainder of watershed is contaminated due to agricultural land use.
Deighton Creek	6	Agricultural and tree farm license	Irrigation	5000 Ig per/day domestic 35 Acre/Ft Storage (Irrigation)	Proposed golf course/resort development
Kelly Creek	10	Agricultural, small holdings, tree farm license	Domestic	3600 Ig per/day domestic	Considerable development in lower half of watershed
Lang Creek/Haslam Lake	128	Agricultural and small holdings in lower watershed. Most of watershed is tree farm license	Water Works	39,500 Ig per/day	(27.5 Igpm) Brew Bay
			Miscell. Domestic	4700 Ig per/day	
			Fishery Enhancement	16 cfs	(5980 Igpm)
			Municipal Water Works	25 cfs 14,400 Acre/Ft. per/yr (storage)	(9350 Igpm) Powell River Dist. Municipality intake on Haslam Lake
Whittal Creek	8	Tree farm license, and agricultural. Rural high density at the coast	Domestic	1000 Ig per/day	
Lois River/ Gordon Pasha Lakes	456	Tree farm license	Power Generation	1300 cfs 469,000 Acre/Ft. per/yr (storage)	(486,000 Igpm) controlled by MacMillan Bloedel Ltd.
Silver Creek (tributary to Lois River near highway)	4	Tree farm license	Water Works Miscellaneous Domestic	250,000 Ig per/day 500 Ig per/day	(173 Igpm) Lang Bay Water Works

- **MacMillan Bloedel Ltd:** The Lois River drains the large (450+ sq.km) Gordon Pasha Lakes watershed. The watershed is controlled by MacMillan Bloedel Ltd. who operate a dam, penstock, and powerhouse to generate electrical power for their pulp and paper mill. During low flow periods the entire discharge from the watershed is committed to power generation. However, the mill does have a backup power source from B.C. Hydro, therefore there is the potential for water to be purchased from MacMillan Bloedel at a rate based on the difference in power costs between the Stillwater Power Generating Station and B.C. Hydro.

In addition to consideration of Lois Lake (above the dam) as a location for a water supply intake, it is possible that the penstock itself could be a source of pressurized water supply. At present MacMillan Bloedel supplies fresh water to the powerhouse and several residences in the Stillwater Bay area through a 150mm diameter flanged connection to the penstock located approximately 100 metres above the powerhouse.

- **Other creeks and river systems:** In general, most of the streams catalogued in Table 2 are quite small with localized watersheds. Of the remainder, Myrtle Creek and Kelly Creek draw from watersheds already largely developed with low density and agricultural settlement. Only Lang Creek has significant potential as a regional source.

The majority of the Myrtle Creek watershed is in an agricultural area, however, Hammil Lake (which is the creek's source) is currently used as a supplementary water source by the District Municipality. The Municipality is planning to abandon the Hammil Lake source in the future rather than make a major investment in a new pipeline and intake. Preliminary investigation indicates that the lake is quite shallow and possibly subject to water quality problems. The watershed is too small to serve as more than a fragment of a regional water supply.

Lang Creek extends from Haslam Lake, (at the northwest corner of the study area), to the central coast of the Southern Region. Haslam Lake is already managed as a watershed for the benefit of the Powell River District Municipality. The Brew Bay Improvement District has an intake on Lang Creek a few hundred metres from the estuary at Lang Bay.

The Lang Creek/Haslam Lake watershed lies predominantly in tree farm licence areas with some agricultural land

use adjacent to the lower three kilometres of the creek. There is a salmonid incubation facility operated by the local salmon society southeast of Duck Lake as well as a spawning channel constructed by the Department of Fisheries and Oceans near the estuary.

The flow into Lang Creek is controlled by the Powell River District Municipality by means of a weir located at the outlet to Haslam Lake. This weir is used to control storage for the municipal water supply from Haslam Lake. It is currently also controlled to maintain minimum flow to the fishery enhancement facilities downstream.

3.3 Water Quality and Treatment

Groundwater

Groundwater quality in the Southern Region tends to be marginal with regard to some dissolved minerals. In general, however, the numerous "deep" (as opposed to shallow excavated) wells probably provide an acceptable source of domestic water without requiring treatment. Shallow wells, on the other hand, may be subject to contamination from local septic fields or agricultural activities.

At present, the Myrtle Pond Specified Area well is the only system for which the ground water is treated. The treatment facility includes iron and manganese removal (tested somewhat over Provincial guidelines) and chlorination (due to detection of choliform bacteria at the time that the well was drilled and tested).

Surface Water

Surface water sources in the Regional District generally may be subject to contamination from the following sources:

- Human and/or animal contamination from septic fields, agricultural use, and indigenous wildlife. In addition to wastewater contamination (as typically determined from coliform bacteria counts) there is also potential for "giardiasis", a water borne disease originating with native beaver and similar animals.
- Contamination resulting from agricultural activities including fertilizing and spraying.
- Fishery enhancement activities including fish, wastes, chemicals and drugs employed in disease control.
- High turbidity in the water, always a problem on the coast during high run-off periods, will be made worse by improper logging practices within a watershed.
- High tannin levels have been reported in Lang Creek at certain seasons.

At present, only the Stillwater Water Works District provides disinfection (by chlorination) of surface water. The new Brew Bay system, which is currently under construction, will also incorporate a disinfection facility.

The local health unit has identified the following inadequacies in the existing local surface water sources and associated systems:

- Lang Creek (Brew Bay Improvement District): occasional significant coliform counts have been noted in the lower reaches of the creek.
- Silver Creek (Lang Bay Water Users Community): coliform counts have been recorded in the system on a regular basis.
- Jefferd Creek (Stillwater Water Works): coliform counts have been noted on occasion, apparently associated with temporary failure of the chlorinator.

3.4 Water Usage and Design Peak Day Demand

General

Water usage may be categorized in terms of residential, commercial, institutional and industrial demands. For relatively small communities residential demand is the predominant category, and other usages are either not applicable or are insignificant by comparison.

The residential category includes the use of water in homes for both domestic purposes and for irrigation of lawns and gardens.

A regional waterworks system should be designed to provide a level of service adequate to meet all the requirements in the community in accordance with generally accepted standards for water supply. In addition to providing for normal residential needs under conditions of specified maximum demand, a water works system should have sufficient capacity to provide adequate fire protection.

Rates of water usage in residential areas vary with factors such as land use, population density, climate, and system capacity. Therefore, one of the first steps in the process of developing a plan for upgrading a waterworks system is to establish appropriate design criteria for estimating water supply requirements.

Existing Water Consumption Records

One approach to determining water supply requirements is to look at existing records of water consumption in the subject community or adjacent communities with similar requirements. Water usage records for the existing water systems in the Southern Region are sparse. Table 3 shows estimates of water consumption in the various systems and the basis for the estimate.

General comments on Table 3 are as follows:

- peak day demand for systems with marginal or limited water supplies are quite low (i.e. Stella Maris and Pine Tree)
- where the water supply is plentiful, sprinkling tends to be unrestricted, and peak day demands exceed 300 gpcpd (Imperial gallons per capita per day)
- the water demand in the Powell River District Municipality is very high relative to most coastal communities. This is probably due to lack of sprinkling regulations as a result of the secure water supply. Approximately 20% of the peak demand in the municipality is from automatic park sprinkling and golf course irrigation.

In addition to the communities shown in Table 3, the Sunshine Coast Regional District reports that for a population of 12,000 people (including the communities of Sechelt and Gibsons) the peak day demand is 3.5 million Imp. gal or 291 gpcpd.

Design Values for Water Consumption

The peak day demand is the flow criteria most commonly used for sizing infrastructure components such as water supplies, reservoirs, and distribution mains. It consists of the total flow required by the system during the day of the year with the highest water consumption.

The average day demand may be much less than the peak day demand since the peak day demand is usually heavily influenced by seasonal irrigation requirements.

The peak hour demand is often estimated to be 50% greater than the peak day demand. The peak hour demand is usually allowed for by balancing storage in reservoirs.

