



Electrical Master Plan

September 2008

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Executive Summary

The District of Summerland operates an electric utility under the departmental name of Summerland Power. Over the past 5 years Summerland Power has realized a 4.4% load growth. The peak load growth calculated in this report is based upon an overall 4% peak load growth over the next 25 years. This is varied by electrical circuit from 2% to 5% depending upon the amount and type of development expected in each area of the District. The 2008 Official Community Plan indicates that population growth will slow slightly after 2010 and for this reason load growth has been reduced slightly from the actual 4.4% realized to date.

The major development areas expected in the next 25 years are the downtown core, Summerland Vistas, Cartwright Mountain, Rattlesnake Mountain, and Summerland Hills. Recommended for the downtown core are three projects. To serve the new Wharton Street development, underground civil and electric works on Brown and Kelly are required to be built in 2010. To reinforce and increase security in the downtown underground system, cables will be looped into the existing area and underground capacity reinforced in 2012. A third project to underground overhead lines on Wharton Street between Rosedale and Kelly is recommended to improve the streetscape in conjunction with the first phase of the Wharton Street development.

The major issue identified and discussed in this report is the delivery of more capacity from the existing Prairie Valley substation to serve the expected growth. Recommendations include both increasing some circuit capacities out of the substation and increasing the number of circuits in the substation. The recommendations for the Prairie Valley substation cost \$700,000, 42% of the total \$1,650,000 total recommended in the report. To resolve the existing capacity problems, the substation improvements should be constructed between 2009 to 2011. The report calls for \$250,000 to be used in 2009 for the Prairie Valley underground crossing, \$90,000 to be spent in 2010 for new circuit cables, and \$360,000 to be spent in 2011 for new circuit breakers in the substation.

There is considerable benefit in expanding this substation. Because of the Fortis terms and conditions of service, Fortis owns the 69KV to 8KV substation transformer, 69KV circuit breaker, and voltage regulator. Fortis is responsible for increasing the substation transformer and other high voltage equipment when load increases. These costs could well exceed \$1,000,000 if the District were required to do the work themselves. Because of the tariff, this expenditure is not required by the District. A timely benefit is that a necessary civil works crossing Prairie Valley Road will be built before or in conjunction with the construction of the road upgrade. A new circuit will also be required from Trout Creek substation in 2023. At a cost of \$295,000, the new circuit will meet growth needs in the Trout Creek and Giant's Head areas.

Several circuits require some upgrading and stronger links with other circuits to increase capacity in certain areas and to provide better security. The total cost of this is \$365,000 spread over the 25 year study period. The report calls for \$80,000 to be spent in 2009 to resolve some

more immediate issues. In 2012, \$150,000 should be spent on downtown undergrounding and load transfer to reinforce the downtown area electrical supply and increase security for the downtown businesses, schools, and institutional buildings. There is a desire to complete the Downtown undergrounding. This is expected to cost \$1.4 million but can be done in five stages costing \$250,000 to \$300,000 per stage. Each stage can be done as funds become available.

Council wants to encourage electrical energy reduction and green electrical generation initiatives. Proposals to support this include;

1. Develop metering standards to allow electricity from individual customer green projects such as solar panels or microturbines to flow onto the electric system.
2. Modify rates and rewards to encourage reduced electric consumption.
3. Identify sites for green wind and dam projects.

Summerland Hills is a 1600 unit residential subdivision and golf course. To service this development a new substation will be required near the development. Currently it is proposed to build a three circuit substation near the water treatment plant. Preliminary costs are \$8 million. This will be required two to three years after the Summerland Hills project begins construction.

After 2030 a new substation will be required to reinforce the existing feeders #249, #549, #649 and #749 as they near capacity. This substation will be required then whether the Summerland Hills development proceeds or not. This electrical master plan should be reviewed and updated every five years to incorporate the actual growth realized and revise project requirement dates. After the 2023 review, a decision should be made whether it is necessary to begin planning for this substation. Substation planning and construction will likely take five years.

The annual maintenance/improvement budget of \$125,000 is not a part of the capital improvement costs listed in this document. These funds to change poles, wires, transformers, and do routine tree trimming are necessary to safely maintain the electric distribution system. It is recommended that a small annual fund of \$35,000 be established from 2010 to 2014 to support customer undergrounding required in areas other than downtown. This would expedite undergrounding where presently some duct is installed in the ground but not enough to allow overhead lines on the street to be placed underground.

An organization review recommends remaining with three working linemen for both productivity and trouble response purposes. As well, a design technician should be added in the future when there is an opportunity.

Summerland Electric Master Plan

Expenditure Timetable

<u>Year</u>	<u>Circuit</u>	<u>Project</u>	<u>Amount</u>	<u>Total</u>
2009	Prairie Valley Substn.	New underground civil exit	\$250,000	
	Cct #149	Re-establish #349 link	\$35,000	
	Cct #249	Reconductor one section	\$20,000	
	Cct #379	Giant's Head loadbreak switch	\$25,000	\$330,000
2010	Prairie Valley Substn.	New underground cables	\$90,000	
	Cct #749	Brown/Kelly civil & electric	\$140,000	
	"	Wharton U/G civil & electric	\$150,000	\$380,000
2011	Prairie Valley Substn.	New circuit breakers/controllers	\$125,000	
	"	New substation disconnects/steel	\$100,000	
		Overhead cables and switches	\$100,000	
		Fortis to move capacitor bank	\$35,000	
		3 Phase Jubilee Ave.	\$40,000	\$400,000
2012	Cct #849	Downtown U/G civil & electric works	\$150,000	\$150,000
2014	Cct #149	Build tie to #249 and move load	\$45,000	\$45,000
2015	Cct #449	Cartwright/Rattlesnake Mtn. Dev	\$25,000	\$25,000
2023	Trout Creek Substn.	New breaker and controller	\$65,000	
	"	Substation rearrangements	\$80,000	
	Cct #479	Double circuiting to Gartrell Rd.	\$150,000	\$295,000
2029	Cct #279	Load transfer to #949	\$25,000	\$25,000
				\$1,650,000
Beyond 2030		New Substation	\$8,000,000	

Introduction

This master plan has been developed to identify issues and recommend solutions for growth in the district electrical distribution system over the next 25 years. This will allow the District of Summerland senior management and council to plan for the cost and timing of capital projects needed to accommodate this growth. This Master Plan uses the 2008 Official Community Plan as the guide to growth plans for the District. As well overall area growth is a major consideration in determining the future needs of the district electric utility known as Summerland Power.

There are two components of electricity; demand and consumption. Demand is the peak electricity required at one time expressed in kilowatts (KW). Consumption or energy is the electrical usage over time expressed as kilowatt-hours (KW-hrs). This report focuses on meeting the peak electrical demands forecast over the coming years necessary for the district to safely supply it's customers. When the peak electrical demand is met, then the electrical distribution system can safely meet the other demands during the rest of the year.

Growth To Date

Over the last five years from 2002 to 2007, peak demand in Summerland has increased an overall average of 4.4% per year. This is significant electrical growth. This peak demand occurs once a year at the coldest period of the winter. Summerland Power must meet this load and the future loads to come otherwise some parts of the district would face electrical brownouts or complete loss of service. The electrical energy (KW-hrs) sold by the district has also increased 3.4% per year over the past five years reflecting how much more energy is being used by the district. Fortis is forecasting an average 1.9% growth for the Okanagan Valley area. The growth in Summerland has been significantly above the overall Okanagan growth.

Although the Official Community Plan indicates population growth has been increasing at 1% per year, there are a number of reasons for the larger energy and demand growth. More commercial, institutional and commercial/residential buildings are being built which use more electricity both in summer and winter than single family residences. Examples are the new seniors complex on Atkinson Road, the commercial/residential building on Victoria Road, the apartment building/hotel on Lakeshore Drive, as well as the municipality's new Water Treatment Plant. There has also been considerable residential infill from both smaller subdivisions and lot splitting. More multiple residential units are using electric heat despite the electric heat penalties charged by the district.

During November 2006, a record electric demand peak of 22,888 KW was reached by Summerland Power during a record cold snap that lasted several days. This peak has never been reached before or since. The more recent January 2008 peak is used in determining load for this report but the cold snap indicates that individual circuits must not be loaded to their total capacity in case of another unusual record cold snap.

Planned Growth

Based upon the Official Community Plan overall electric peak load growth will continue to be spread across the District from residential infill and development combined with continued institutional and commercial growth. For the purposes of this report, load growth across the District is expected to continue between 3% and 4%, down slightly from the 4.4% experienced over the last 5 years, reflecting the OCP forecast of a slow population decline after 2010.

The major specific areas of growth will be;

1. Downtown reflecting the 7 story Wharton Street development and increased downtown densification to multistory buildings.
2. North West area of urban Summerland reflecting the Summerland Vistas, Cartwright Mountain, and Rattlesnake Mountain potential developments.
3. North Prairie Valley lands reflecting the large Summerland Hills golf course and residential development.
4. The future Jersey Lands possible development.

The growth figures used in this report reflect the actual growth over the last five years reduced slightly. The actual figures for each substation and circuit should be reviewed against the forecast every five years and the forecast should be updated to reflect the new conditions from the actual growth realized. At this point there is considerable discussion about the economy slowing. This may slow down load growth for a few years delaying when some of the work listed is needed but over the longer period as the District continues to develop all the work listed will be required.

Downtown Growth

The downtown area including the Wharton Street Development is now supplied by one circuit. It is overhead along Wharton Street, the lanes north of Main Street and east of Victoria. The underground electric system consists of two parts. The larger one is an underground area along Jubilee from Victoria to Kelly which also serves the fire hall and the Municipal Hall. The second area is along Kelly from Wharton Street to the swimming pool. These two underground areas are independent. Capacity is of concern for the downtown growth as explained below in expansion details for circuit #749. As downtown redevelopment occurs more downtown buildings will be placed on the underground system requiring more capacity in the underground system.. The downtown capacity issue is a significant issue and must be dealt with in the next few years. As well underground wiring is more difficult to repair than overhead wiring. Should an underground cable failure occur, the underground cable must be replaced to restore power. To increase the security of the downtown network, some additional underground ducting and wiring must be installed to loop circuits and split the electric load. With a looped underground system, service can be restored much more quickly by disconnecting the failed cable section of the loop. To service the Wharton Street development as well as resolve long term capacity

needs for downtown growth, additional circuit #849 is required in this area and should be tied underground to the existing circuit #749 for security.

Northwest Residential Growth

The significant residential growth areas planned for the northwest area of the District include the present Summerland Vistas development as well as future Cartwright Mountain and Rattlesnake Mountain developments. This will add approximately 1000 residential units in this area and will considerably tax the existing feeder supply in the area. Introducing a new feeder to remove part of the existing feeder load will resolve this problem. From this area, no more than 100 new residential housing units per year are expected as the District and developers manage the new housing supply. Growth on the circuit serving this area is expected to be 5% over the next 10 years.

North Prairie Valley Growth

This area is essentially the Summerland Hills development including a golf course, 1000 detached houses and 650 townhouse/apartments as well as some commercial development. Although currently on hold, the complete load from this development cannot be supplied from the current substations. A new substation and three feeders would be required for this development. Preliminary costs have been discussed with Fortis although detailed construction costs from others should be considered. The new substation would not be required at the start of development. If other recommendations contained for circuit #649 are implemented capacity will be available for the first three years of the development as loads will be lower while the golf course and first buildings and subdivisions are developed. Action on this substation should be taken when it is known the Summerland Hills project is firmly proceeding or when capacity in the existing substations require reinforcing, expected around 2027.

Jersey Lands Development

The Jersey Lands development would require a new feeder from the Trout Creek substation located near Giant's Head Road and Hillborn Street. Since this project has been on hold for quite some time and there is no known timing for the project, the costs and work for this feeder are not included in this forecast. Costs can be determined once the project again becomes active. Like the Summerland Hills development, early development phases can be provided from existing circuits near the area. The Trout Creek substation has adequate space for an additional circuit breaker for this project.

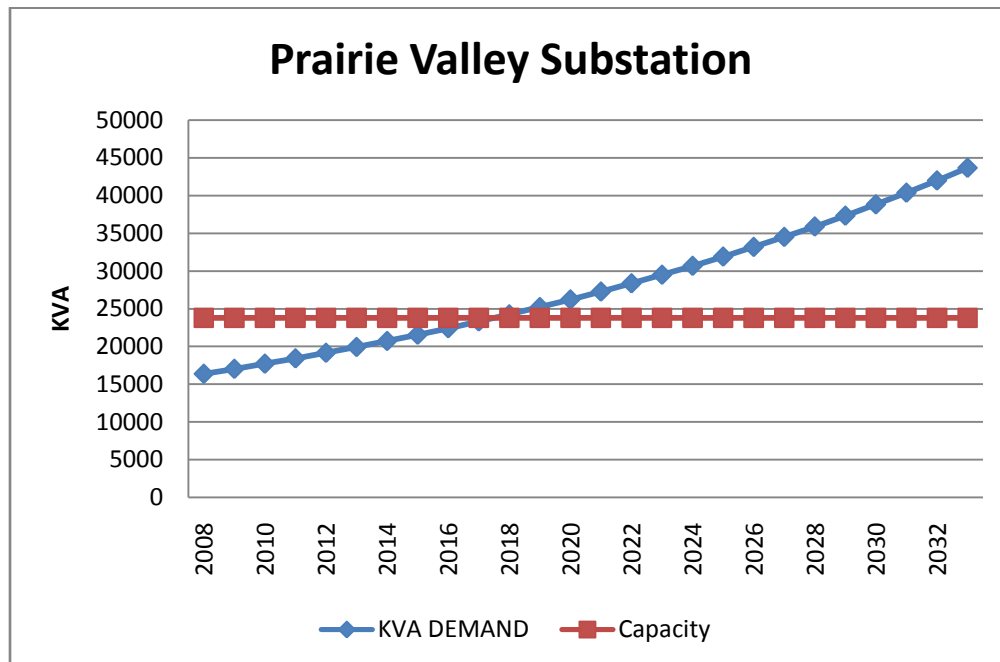
Substation Structure

Currently the District has two substations; Prairie Valley Substation on Prairie Valley Road and Trout Creek Substation near the corner of Giant's Head Road and Hillborn Street. The Fortis tariff that provides service to the District allows for joint ownership of these substations. Fortis owns and maintains the 69KV breaker, the 69KV to 8.3KV transformer, voltage regulators, capacitors and part of the electrical bus work. These costs are included in Fortis's electrical tariff for the District.

The District owns and maintains the 8.3KV circuit breakers, disconnect switches, circuit exit cables and wires, and some of the electrical bus work. Both substations will require new transformers and associated equipment over the growth period reviewed. Because these transformers cost \$500,000 to \$1,000,000 each, under the existing Fortis terms and conditions of service it will be their responsibility to pay these costs. In fact they will likely use other larger transformers they have in their system but nevertheless, the savings to the District are very significant.

Prairie Valley Substation Growth

For the Prairie valley Substation, continued 4% peak growth would require changing the substation transformer and possibly 69KV breaker before 2018. This is shown on the chart below. As mentioned above this will be done by Fortis at no cost to the District since these costs are included in the Fortis tariff charged to Summerland. There will be a savings of approximately \$1,000,000 for Summerland residents.



Prairie Valley substation provides 73% of the existing peak demand. What is required in the next few years is the ability to deliver more load capacity from the Prairie Valley substation. To do this two new circuit breakers will need to be installed in the substation and an ability to route larger feeders out of the substation needs to be built. It is recommended this work be done to accommodate the Wharton Street development, to increase the security of the downtown underground system, and to create more capacity to serve Summerland Vistas, Cartwright Mountain, and Rattlesnake Mountain developments.

Because there is limited ability to route new feeder cables out of the substation, it is time to install a proper underground exit to the north across Prairie Valley Road. This will allow the new feeder cables to exit as well as resolving a problem created when the last two circuits were installed. When circuits #649 and #749 were installed, the access problem was solved by using overhead bundled conductors attached to existing poles to deliver additional capacity from the substation. The bundled conductors can only deliver part of the circuit capacity each way. It is time to replace these bundled conductors with full capacity conductors which must be installed underground. This a second important reason to build a proper underground exit to the north.

The civil works will include 2 manholes outside of the substation; one located to the immediate west of the substation and one located on Armstrong Avenue to the north of Prairie Valley Road. The two sets of bundled conductors now crossing Prairie Valley Road would be replaced with larger full capacity feeder cables installed in the new underground civil works. This would increase the critical capacity to the downtown core and the new residential developments in the north west area of the District. The civil works would be placed under the large storm drain installed in Prairie Valley Road. It is timely that this matter has come up since this civil work should be done before or in conjunction with any Prairie Valley Road upgrades.

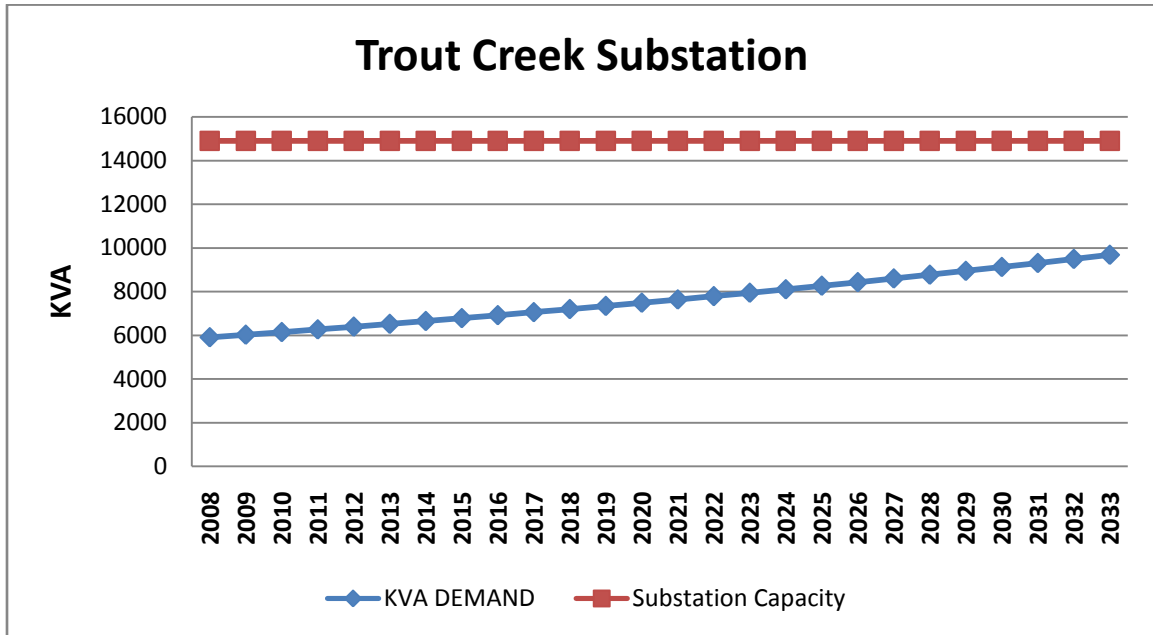
The second component of the substation work is to install two new electric circuit breakers and the associated disconnects and supports to hold them. This, in fact would take the existing 2 circuits, #649 and #749, and make them four circuits. This second step increases total capacity from the substation by 28% and deals with much of the District's capacity needs for at least the next 15 years. After these two circuits are installed, Prairie Valley Substation will not be able to install more circuits because of the limited space available.

Construction and Timing – the underground exit should be built as soon as possible to increase capacity to the downtown core. The following year the new substation breakers should be installed. This phases the capacity increase over two years to ease the capital cost required in one year.

New underground civil exit	2009	\$ 250,000
New underground cables	2010	\$ 90,000
New circuit breakers and controllers	2011	\$ 125,000
New substation disconnects/steel	2011	\$ 100,000
Overhead cables and switches	2011	\$ 100,000
Fortis to move capacitor bank	2011	<u>\$ 35,000</u>
TOTAL		\$ 700,000

Trout Creek Substation Growth

Trout Creek substation currently has two circuits owned by the District plus a third Fortis circuit that serves the Federal Research Station. The District's two circuits supply the southern part of the District including Trout Creek, Giants Head Road and the James Lake industrial area. The transformer capacity of Trout Creek substation is not expected to require reinforcing before 2033. When required it will be Fortis' responsibility and cost to install a larger transformer saving the District approximately \$500,000.



There is adequate room for two more District circuit breakers in the substation. It is difficult to bring more feeders out of the substation because of the limited roads in the area. One of the two existing circuits, circuit #379, will require reinforcing in 2023. This will require a third breaker, a substation expansion, and some ducting to bring the new circuit out of the substation. Those costs are shown below.

Should the Jersey Lands proceed at some point, another circuit will be needed a couple of years after the Jersey Lands start to build homes. This circuit should also come from Trout Creek substation and will require a new circuit breaker and ducting to bring the circuit out of the substation. The costs would be similar to those shown below but are not included in this study because of the undefined timing of the Jersey Lands.

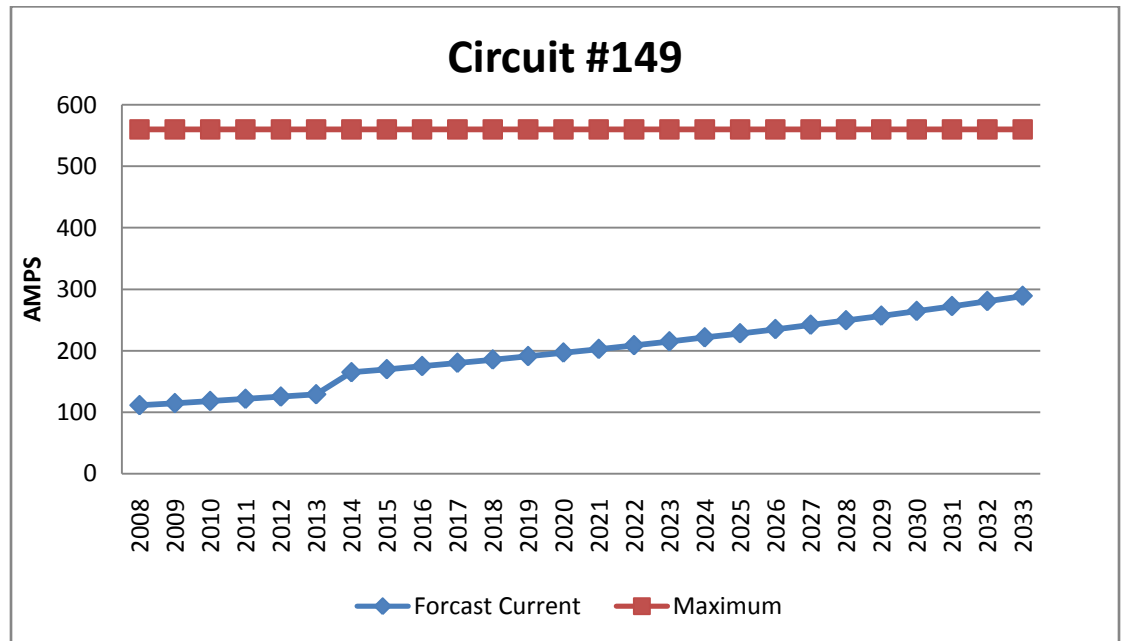
The difficulty in getting further circuits out of Trout Creek substation is the limited number of roads leading away from the substation. After two more circuits are installed it is unlikely further expansion of Trout Creek substation could occur.

Timing and Costs -	One new breaker and controller	2023	\$ 65,000
	Substation rearrangements	2023	\$ 80,000
			<u>\$ 145,000</u>

Growth By Circuit and Circuit Reinforcement Requirements

Circuit #149

Growth – Circuit #149 serves Prairie Valley Road and Solly Road areas. Normal 3% growth is expected with some commercial development around Hwy 97 and residential infill development west of Hwy 97. There is adequate capacity in Circuit #149 to support development over the next 25 years. Some existing capacity can be used to provide support for the more heavily used circuit #249 by building a three phase line over to Peach Orchard Road and transferring that load to circuit #149.



2014 – load transferred from Circuit #249

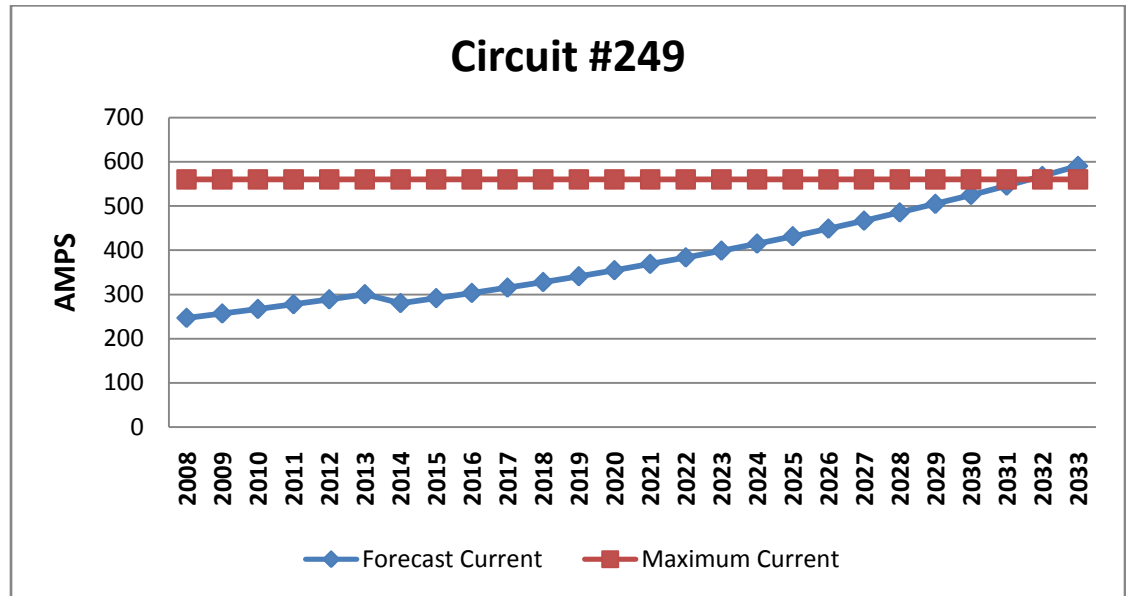
Current Issues – Circuit #149 was used to backup the Lowertown area from the north. An inaccessible line recently suffered some storm damage. This line should be rebuilt or relocated to re-establish this link. This will provide necessary backup for the underground cables on Lakeshore Drive and for the entire Lowertown area.

Construction and Timing – The underground link should be re-established in 2009. To provide relief for the heavily loaded circuit #249, a 3 phase line between Solly Road and Peach Orchard should be built with a switch to transfer the load on Peach Orchard west of Atkinson to circuit #149 from circuit #249.

Re-establish #349 link	2009	\$35,000
Build tie to #249 and move load	2014	\$45,000

Circuit #249

Growth – Currently circuit #249 is the most loaded circuit operated by Summerland Power. This circuit supplies all load north of Blackwell and east of the highway including along Hwy 97 to the northern limits of the District. As well it supplies the Jones Flats area to the west of Hwy 97 and acts as the backup feeder for circuit #549 underground along Rosedale Ave. Growth for Rattlesnake mountain area would be added to this feeder without changes. A 4% growth rate is expected for this feeder.



2008 – load transferred to circuit #649

2014 – load transferred to circuit #149

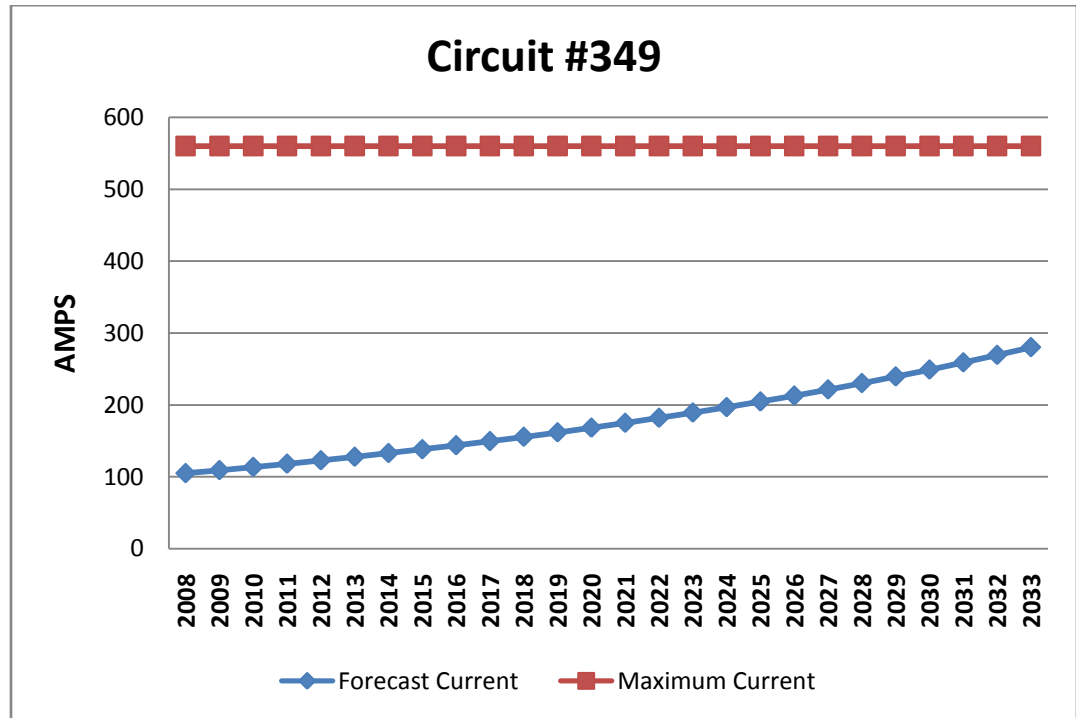
Current Issues – This feeder is limited in capacity in one area and the conductors should be replaced with larger conductors. As well, this feeder should have more backup capacity in case of a traffic accident or conductor breakage. This would be partly resolved with a proposed new link and load transfer to circuit #149. Some load should also be transferred to circuit #649 at this time. The 2008 load transfer to circuit #649 is not shown in the chart above but the load transfer to circuit #149 in 2014 shows as the dip in 2014.

Construction and Timing – The tie conductors between circuit #249 and #349 should be built in 2009 to partially offload circuit #249 of the load west of Atkinson on Peach Orchard Rd (as shown in costs for circuit #149). Some load can be transferred to circuit #649 at no cost. When the Rattlesnake Mountain development starts a reconfiguration of circuit #649 will handle this load.

Reconductor one section 2009 \$20,000

Circuit #349

Growth – Circuit #349 serves part of Giant’s Head Road, Hespeler Road, and Lowertown. This will support the additional growth in Lowertown including new commercial and multi-residential development. This circuit also acts as a backup for circuit #379 and can provide load relief for circuit #379 when required in the future about 2018. This circuit has adequate capacity for 4% growth over the coming years.

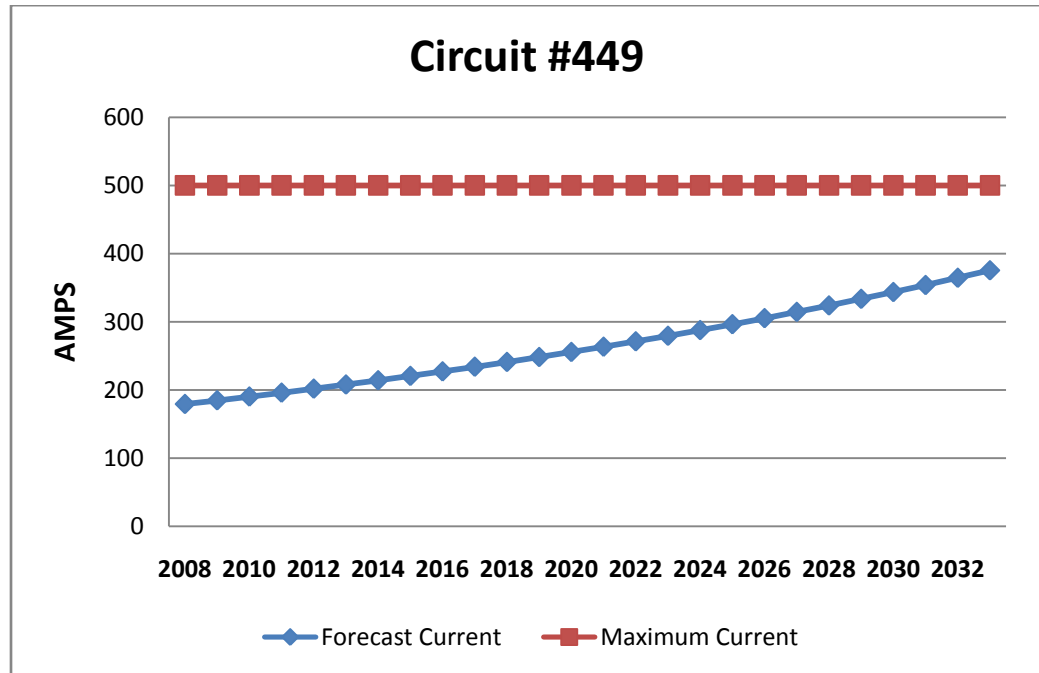


Current Issues – the only current issue with this circuit is lack of a backup for the underground section on Lakeshore. The proposal for Circuit #149 includes restoring this ability in 2009.

Construction and Timing – None required.

Circuit #449

Growth – Circuit #449 feeds the residential parts of the District south of Jubilee and west of downtown including parts of Prairie Valley Road. Currently this area will redevelop with infill at this time and adequate capacity exists for the area for the next 25 years. A lower 3% growth rate has been used for this area. This circuit acts as a backup for Prairie Valley.



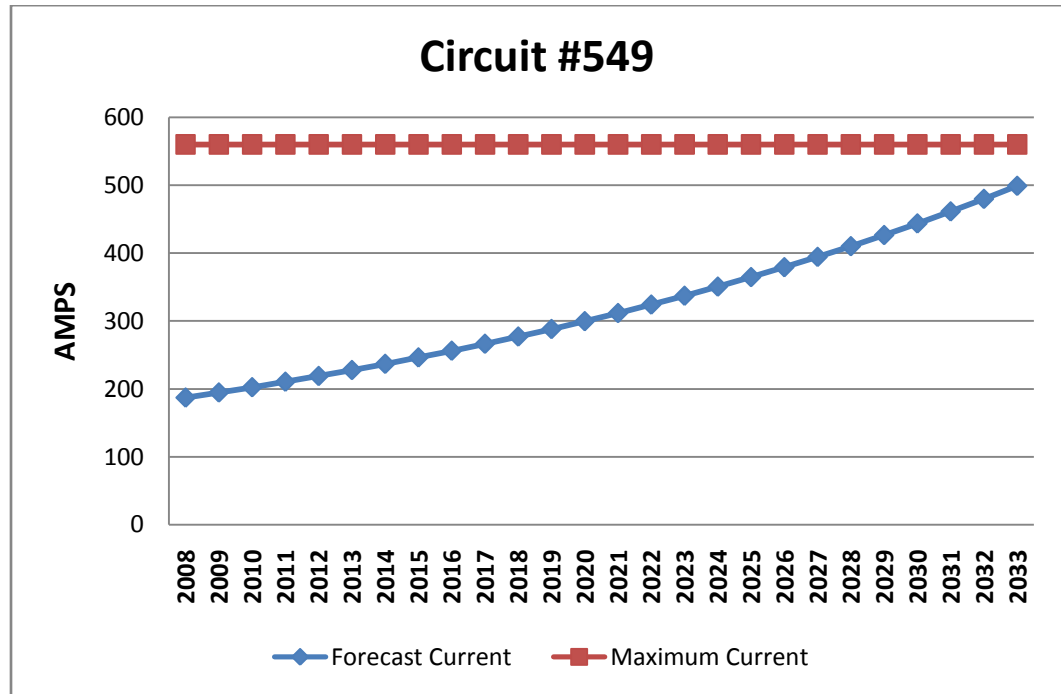
Current Issues – When the Wharton Street development occurs, changes will occur to have the development area currently supplied by this circuit to be supplied by future circuit #849. As well, some load from Summerland Vista neighbourhood may be transferred to this circuit from circuit #649 when the Rattlesnake Mountain or Cartwright Mountain developments start to occur.

Construction and Timing – Load transfer associated with Rattlesnake Mountain or Cartwright Mountain development.

Cartwright/Rattlesnake Mtn. Dev	2015	\$25,000
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Circuit #549

Growth – Circuit #549 supplies Rosedale Avenue, the commercial area to the east of Rosedale Avenue, and along Quinpool Rd. to Jubilee Rd. This area has had significant growth and the road is proposed to be redeveloped. To provide better supply security, the overhead line on Jubilee from Quinpool to Turner should be three phased and an air brake switch installed.



Current Issues - Plans exist to underground parts of Rosedale in association with the development at Rosedale and Peach Orchard. The remainder of the undergrounding would be completed in 2009/10 with municipal funds in association with the Rosedale road redevelopment.

Construction and Timing –

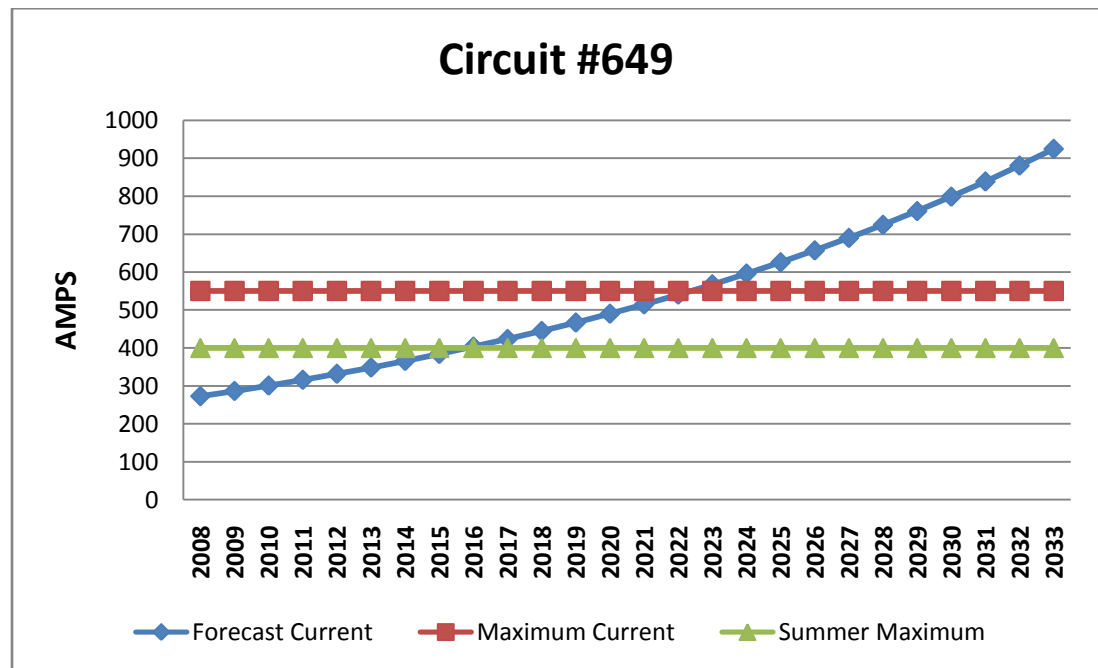
3 Phase Jubilee Ave.

2011

\$40,000

Circuit #649

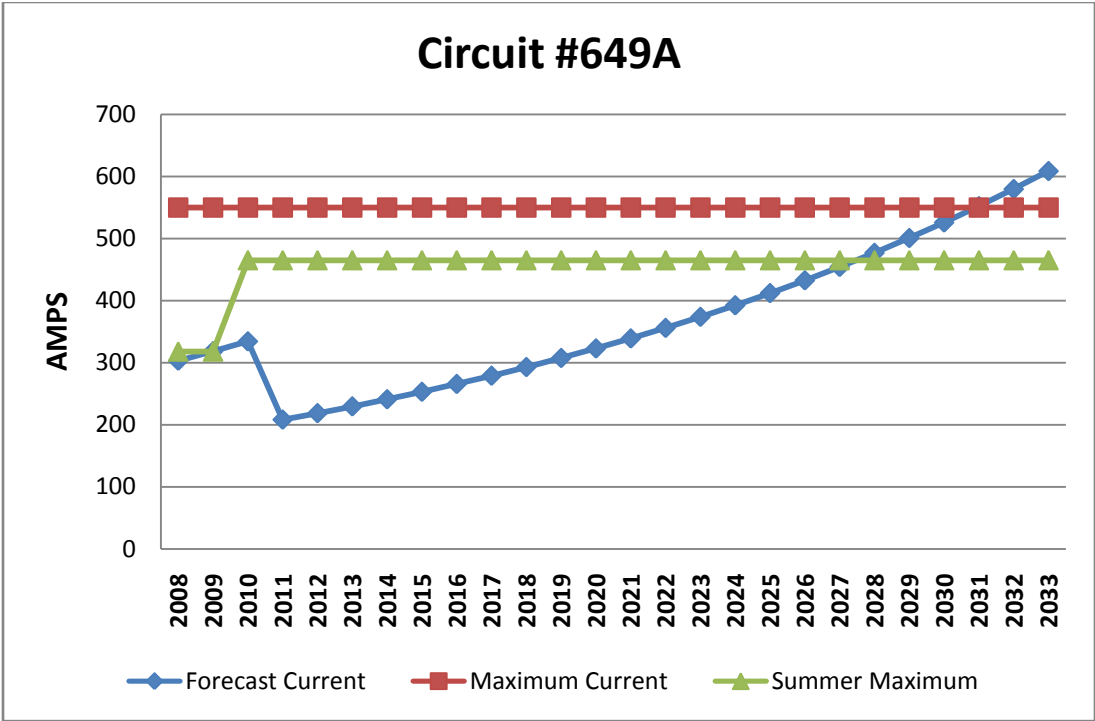
Growth – Circuit #649 is now the second most loaded circuit after circuit #249. It will see the most significant growth of all circuits in the District. This circuit now splits into two directions at Prairie Valley substation. Half of the circuit goes north and supplies the north west of the town from Jubilee north including Garnet Valley, the currently developing Summerland Vistas, the future Cartwright Mountain development and the future Rattle Snake Mountain development. The other part of the circuit now feeds west to Prairie Valley including Dale Meadows, the new Water Treatment Plant, and the existing residential developments in North Prairie Valley. This is where the future Summerland Hills golf course and housing development will occur. Almost all of the major residential developments would be added to this circuit. This will lead to capacity overloading by 2014.



Summer Maximum from is an additional restriction due to higher outdoor temperatures

Current Issues – a major issue with both circuit #649 and #749 is that they both split in half at the substation and leave the substation in 2 directions. This occurred when overhead bundled cable was used to provide adequate space to install the two new circuits. Only part of the feeder load can go in each direction. This creates a problem as shown above. With circuit #649 the split circuit in fact creates some tremendous opportunities. Since two entire circuits are there except for two short distances of smaller sized cables, adding a new breaker at the substation and changing the smaller cables to larger cables will allow double the load to be served, effectively creating a new circuit. This same rational can be applied to circuit #749.

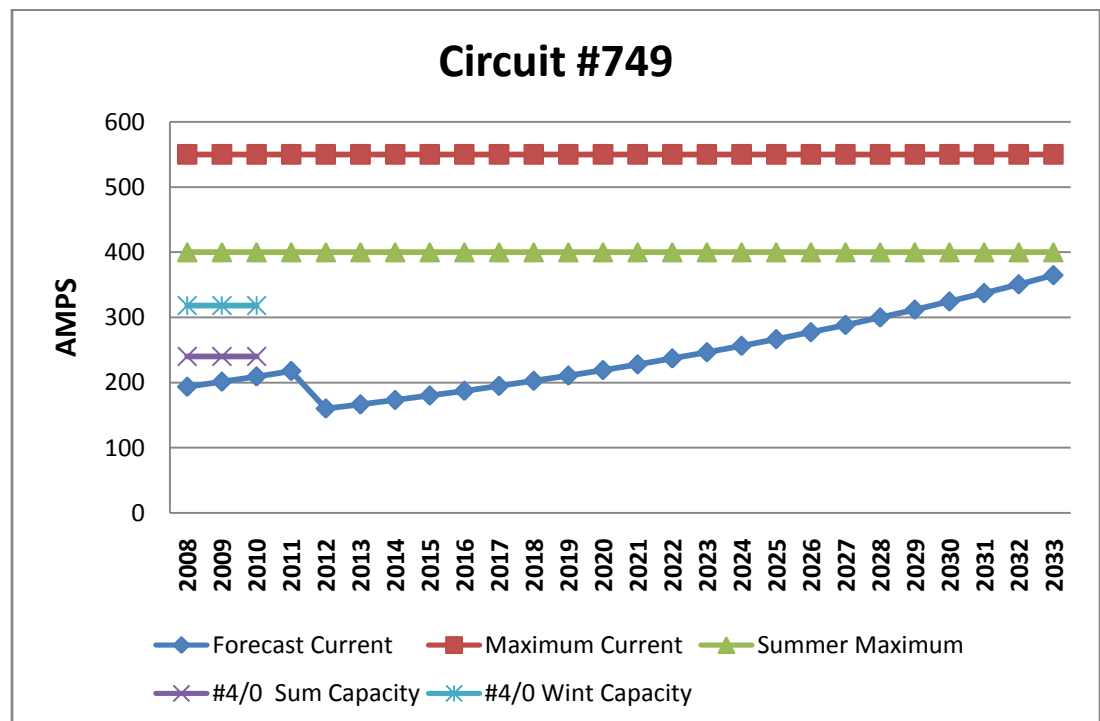
Construction and Timing – To create more growth capacity for the development in the north west and north Prairie valley areas, circuit #649 must be split in two. This is done by creating a new underground exit from the substation and installing new larger exit cables. As well a new substation breaker, controller and steel work will be required. The results are shown on the chart below. The increased green summer maximum reflects the new underground cable exit in 2010 and the decreased current in 2011 reflects using the new circuit breakers to split the load in half. All costs are included in the Prairie valley substation improvements and in the circuit #549 Jubilee three phasing. Ultimately this circuit will require reinforcing in 2027.



2010 – new underground circuit cables increase summer maximum
 2012 – new circuit #949 removes load from circuit #649

Circuit #749

Growth – Circuit #749 is now the third most loaded circuit after circuit #249 and #649. This circuit feeds the downtown area west of Rosedale Ave. This circuit now splits into two directions at Prairie Valley substation. The part of the circuit going north supplies the downtown. The other part of the circuit going west comes to Brown and Prairie Valley and acts as a backup for circuit #449 and has the possibility to serve the Wharton Street development. Almost all downtown growth and development would be added to this circuit. A specific load for the Wharton Street development combined with a 5% growth rate is forecast for this circuit.



2010 – bundled conductor restrictions removed when replaced by underground cables
 2012 – part of the existing downtown load transferred to new circuit #849

Current Issues – The major issue with circuit #749, like #649, is the circuit splits in half at the substation and leaves the substation in 2 directions. This occurred when overhead bundled cable was used to provide adequate space to install the two new circuits. Only part of the feeder load can go in each direction but all of the downtown load goes in only one direction. At this time a problem is developing with circuit #749 because the downtown core load going to the north is nearing the summer capacity of the #4/0 overhead bundled conductor. This is shown in the above graph.

The split circuit creates some tremendous opportunities. Since two entire circuits are there except for two short distances of smaller sized bundled cables, adding a new breaker at the substation and changing the smaller cables to larger cables will allow twice the load to be served, effectively creating a new circuit. The increase in capacity will be able to serve all phases of the Wharton Street development.

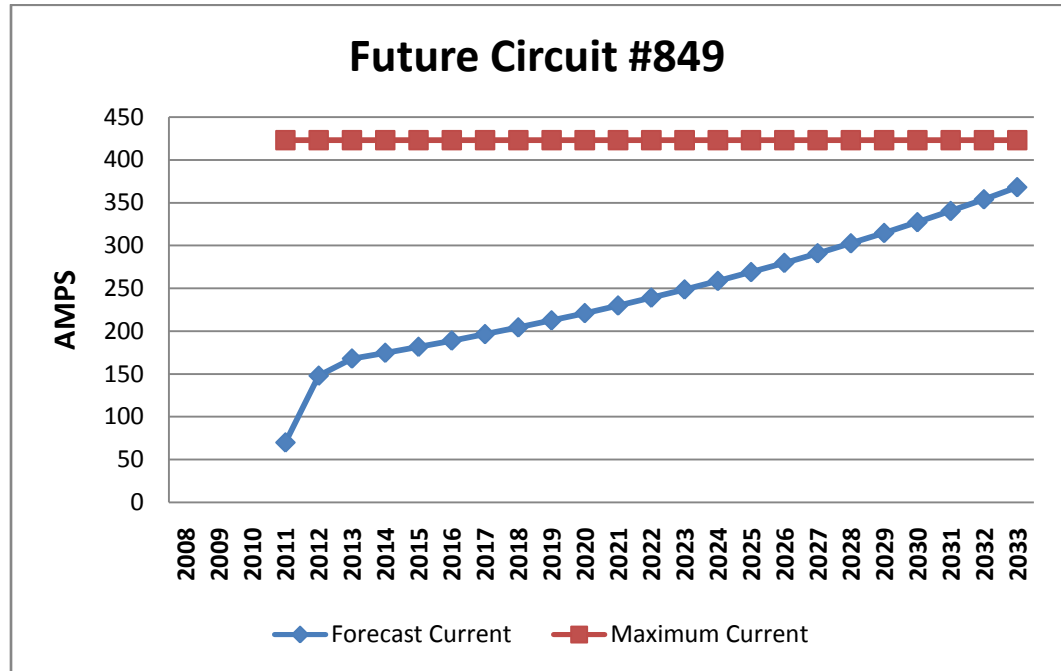
Another smaller issue is that the downtown underground portion of circuit #749 should be looped with other feed sources to increase supply security in the event of a cable failure and to allow future downtown growth. This work should be co-ordinated with the Wharton Street development although it is a separate project from Wharton Street.

Construction and Timing – To create more growth capacity circuit #749 must provide more capacity to the north and be split in two. This is done in conjunction with circuit #649 relief by creating a new exit from the substation to the north and installing new larger exit cables at the same time. This work is included in the Prairie valley substation improvements.

Park/Brown Street U/G Civil and Electric	2010	\$140,000
Wharton Street U/G Civil and Electric	2010	\$150,000

Future Circuit #849

Growth – Circuit #849 will be created by splitting circuit #749 in 2011. This new circuit will supply the new Wharton Street developments and reinforce the downtown electrical capacity and security.



2011 – Wharton Street loads

2012 – Load transferred from circuit #749 plus additional Wharton Street load

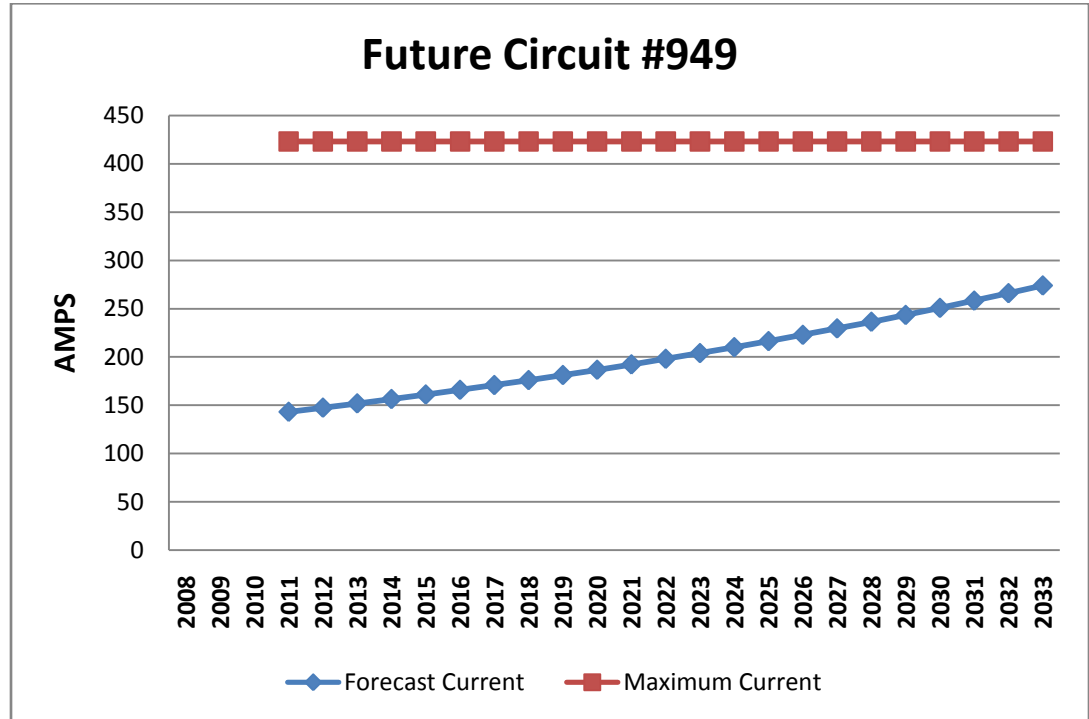
2013 – Additional Wharton Street load

Construction and Timing - A new substation breaker, controller, steelwork and overhead exit cables will be required. These costs are included in the Prairie Valley substation upgrades. Bringing circuit #849 into the downtown area to loop with circuit #749 are shown below.

Downtown U/G civil and electric looping	2012	\$ 150,000
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Future Circuit #949

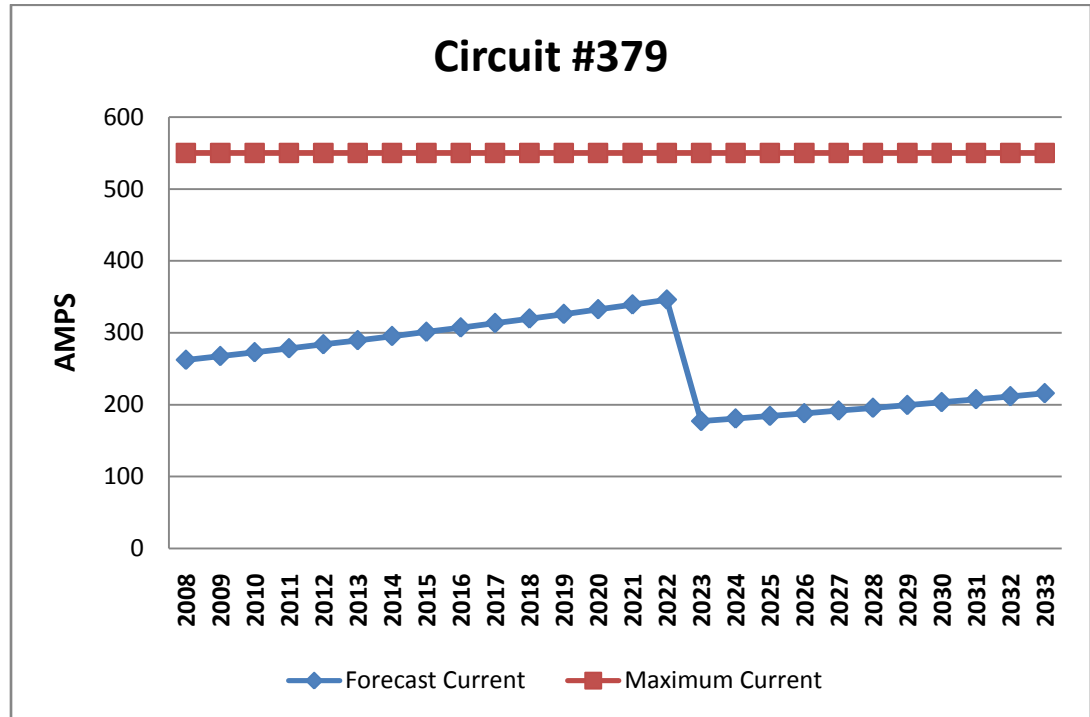
Growth – Circuit #949 will be created by splitting circuit #649 in 2011. This would take the #649 load now supplying Prairie Valley and make it a separate circuit as discussed above. This would reinforce the Prairie Valley area and provide capacity for the construction and early stages of Summerland Hills development. It could also provide some relief for circuit #279 if necessary as the south Victoria Road area develops.



Construction and Timing - A new substation breaker, controller, steel work and overhead exit cables will be required. These costs are included in the Prairie Valley substation upgrades.

Circuit #379

Growth – This circuit from Trout Creek substation supplies all load east of Giant’s Head Mountain and south of Harris Road including the Trout Creek area. Some residential and commercial growth and infill will take place leading to an expected 2% load growth.



2023 – load transferred to new circuit #479

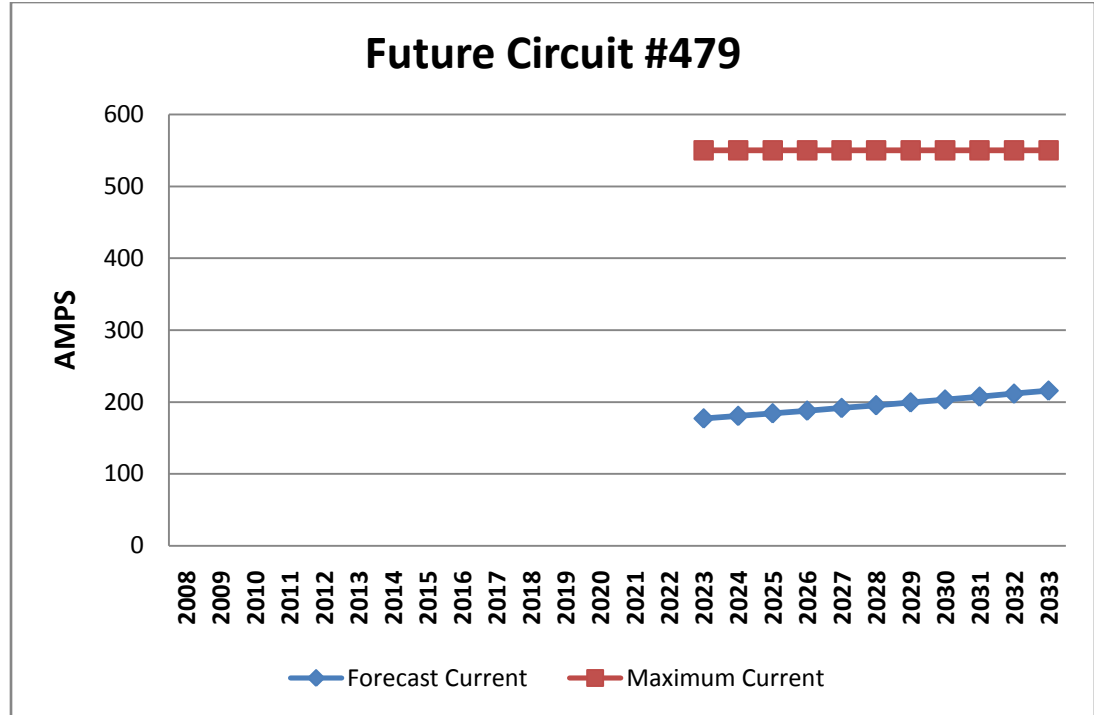
Current issues – for simpler load switching in the event of motor vehicle accidents and temporary load relief, a switch should be installed on Giant’s Head Road north of Gartrell Road and south of White Street.

Construction and Timing – When peak loads grow above 325 amps, a new circuit, #479, from Trout Creek substation will be required. This can be done by double circuiting from Trout Creek substation to Gartrell Road.

Giant’s Head loadbreak switch	2009	\$ 25,000
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Future Circuit #479

Growth – created by the splitting of circuit #379 in 2023. This will supply the lower Trout Creek area by splitting the circuit #479 load at Giant’s Head Road and Gartrell Road.



Construction and Timing – A new breaker and exit ducting will be installed in Trout Creek substation. The line from Trout Creek substation along Giant’s Head Road will be double circuited to Gartrell Road.

Double circuiting to Gartrell Rd. 2023 \$ 150,000

Annual Maintenance Costs

Currently annual maintenance costs of \$125,000 yearly are budgeted for pole replacement, conductor repair and replacement, transformer upgrades and minor tree trimming. This work must continue to be done on a regular basis to maintain the safety and security of the electric distribution system. The annual maintenance/improvement budget of \$125,000 is not a part of the other capital improvement costs listed in this document. Any maintenance fees not spent should be carried over to the subsequent year.

Undergrounding Existing Overhead Distribution in the Downtown Area

It is the desire of council to place the existing overhead distribution and telecommunication wiring underground in the Downtown area. This can be done by placing five blocks of overhead wiring underground. It is recommended that one block be undergrounded each year for a five year period, spreading the costs over the five years. The blocks listed below should be done in this order;

1. Lane north of Main Street from Kelly to Victoria
2. Wharton Street from Kelly to Victoria – phase 1
3. Wharton Street from Kelly to Victoria – phase 2
4. Lane east of Victoria south of Jubilee
5. Lane west of Victoria from Wharton to Jubilee

Wharton Street (#2 & #3) would be done by placing the primary cables and transformers underground the first year. The second year customer services and telecommunication cables would be placed underground and all poles removed.

The downtown undergrounding project would place two high voltage circuits underground with the associated local distribution wiring, padmounted transformers and underground services to existing customers. Some lanes will require easements from customers to accommodate ground level padmount transformers on private property as the existing lanes cannot accommodate both the transformers and safe vehicle passage.

A significant component of the cost is the undergrounding of telephone and cable wiring. All costs of the civil and communication wiring will need to be born by the District of Summerland if the project is initiated by the District.

Preliminary cost estimates for the five stages of undergrounding are;

1. Lane north of Main street from Kelly to Victoria	\$ 250,000
2. Wharton Street from Kelly to Victoria – phase 1	\$ 300,000
3. Wharton Street from Kelly to Victoria – phase 2	\$ 300,000
4. Lane east of Victoria south of Jubilee	\$ 250,000
5. Lane west of Victoria from Wharton to Jubilee	<u>\$ 300,000</u>
	\$ 1,400,000

The suggested timing of this five year project should begin after the major capacity reinforcement projects described elsewhere in the report and planned from 2009 to 2011 are completed. As funding becomes available, one or more of these projects can be undertaken upon council's approval.

Consumption Reduction Initiatives

Council encourages initiatives to reduce electrical consumption. Presently through the rates paid, Fortis delivers the PowerSense programs to Summerland residents and businesses. This provides information about and rebates for reducing electrical consumption. There are several other ways council may wish to support electricity consumption reduction. These include;

1. Electrical rate modification
2. Smart meter usage
3. Low consumption rewards
4. High consumption penalties
5. Increased surcharges
6. Increased education on electrical usage

Accommodating Customer Green Projects

Customers may wish to install equipment such as solar panels and microturbines which produce electricity. At times the customer may produce more electricity than they can use. To accommodate these customers who are undertaking individual green or local generation initiatives, a service and metering standard will be created to allow the extra Kw-hrs of electricity from these projects to safely flow onto the distribution system. This will not apply to emergency electricity generation used during power outages.

The electricity that is supplied by the customer to the District can be used to reduce the amount of Kw-hrs of electricity used at other times of the year.

Identifying Sites for Green Generation Projects

There is the possibility larger green generation projects could supply a portion of the District's electricity needs. This could be a wind farm, a hydro dam, or other possibility. Council should consider identifying sites for possible future projects and either setting them aside or encouraging their development. The decision to purchase this power could be made by council once price and supply conditions are known.

Underground Sections Elsewhere in Summerland

The existing subdivision bylaw calls for underground cables to be placed in many new , but not all subdivisions. Often the ducts are installed but there is not enough ducting to justify undergrounding any overhead lines. Currently there are areas that can be placed underground by connecting existing sections of ducting and installing underground cables. To do this some funding is required that cannot be charged to a particular development. The District can expedite this type of undergrounding by providing some funding to supplement the customer undergrounding. This will increase the amount of undergrounding that can be accomplished each year. It is recommended that this be funded and tried for a five year period with a review of the enhanced results at the end of the period.

Undergrounding Enhancement	2010-2014	\$35,000/year
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Department Organization

Currently the District of Summerland electrical department is staffed by seven people consisting of;

- | | | |
|--------------------|---|------------------------|
| Supervisor/Foreman | - | Foreman Lineman |
| Office/Field | - | meterperson |
| | - | Technician (0.6 time) |
| Line Crew | - | Charge Hand Lineman |
| | - | 2 linemen |
| | - | Truck driver/groundman |

This organization arose when the previous electrical superintendent left in the mid 1990s. To minimize department costs the foreman lineman assumed the supervisory duties and ultimately the senior lineman became the charge hand lineman to manage crew responsibilities on a day-to-day basis. At the time this reduced staff by one person. The line crew then consisted of a foreman, 2 full time linemen, part time linemen and the truckdriver/groundman. The office staff was one meterperson/technician/materials co-ordinator.

The job duties associated with the positions today are;

- | | | |
|---------------------|---|--|
| Supervisor/ Foreman | - | Assists the Director in staff selection, approval of time cards, and overall office administration |
| | - | Organizes crew work and weekly and seasonal work plans. |
| | - | Ensures regular maintenance is identified and completed |
| | - | Designs commercial, subdivision and maintenance projects |
| | - | Co-ordinates civil and electric works with Telus and Shaw |
| | - | Develops cost estimates and quotes costs to customers |
| | - | Specifies materials |

- Ensures material is ordered to meet project timelines
- Recommends hiring of contractors as needed
- Responds internally to municipal subdivision/development applications
- Inspects civil works on projects for design conformance and resolves field problems
- Participates in annual budget process and reconciles actual costs to budgeted amounts
- Backs up the charge hand as the PIC (person in charge) of the electric distribution system
- Takes standby and trouble calls
- Relieves charge hand lineman when not available
- Administers department safety, work order, purchasing, and council requirements as needed within District guidelines.
- Responsible for department vehicles including line truck safety inspections.

Meterperson

- Installs new commercial, industrial and residential meters
- Changes out meters as needed to meet Measurement Canada requirements
- Maintains and updates the Summerland electric meter database
- Responds to meter complaints from customers and municipal staff
- Orders meters and maintains adequate meter inventory
- Orders all significant electrical equipment including selecting alternate suppliers and receiving quotes for materials
- Technically selects materials to meet electrical department requirements in association with the supervisor/ foreman
- Co-ordinates material shipping and receipt
- Charges material out to work orders
- Designs residential services, creates work orders for services, and releases to the crew, reconciles service work order costs
- Takes weekly substation readings, prepares reports and maintains demand database
- Tracks critical item inventory
- Is department safety chair and joint health and safety committee representative

Part Time Technician (60%)

- Issues maintenance work orders for pole and transformer repairs, motor vehicle accidents, and other repairs
- Updates pole and transformer locations to ensure GIS system is up to date and accurate
- Reviews work order charges for accuracy before close out
- Designs residential services, creates work orders for services, and releases to the crew, reconciles service work order costs
- Assists meterperson with inventory matters

Charge Hand Lineman

- Organizes the daily work of the crew, material for the work, and vehicles used
- Acts as the PIC (person in charge) concerning daily system and crew safety matters such as electrical protection while working
- Ensures daily time cards are completed and turned in
- Ensures material charge sheets are completed and turned in
- Performs all lineman duties
- Trains new linemen on the Summerland distribution system
- Takes standby and trouble calls
- Relieves foreman lineman when not available

Lineman

- Performs all daily construction needs of the electric system including
 - o overhead construction and repair
 - o underground construction and repair
 - o substation breaker operation and resetting
 - o service and meter installs
 - o minor tree trimming
- takes standby and trouble calls
- drives line vehicles
- relieves charge hand when not available
- takes substation readings when meterperson not available

Truckdriver/Groundman

- drives line vehicles and operates boom controls on work sites
- assists linemen with materials on job including supplying materials to linemen in the air.
- Acts as safety watcher when linemen perform rubber glove work
- Installs electrical ducts and inspects electrical duct installations of contractors
- Maintains inventory on vehicles and in the shop. Makes orders to replace routine materials.
- Maintains vehicle cleanliness

Line Crew Size and Staffing

The minimum number of working linemen that the District can operate with is three linemen. This is because certain work particularly three phase live line work can only be performed with three linemen on site. At this time Summerland has 3 working linemen on staff and the supervisor who, as Foreman Lineman, can and does work as a lineman when necessary. In the past, the District had two working linemen plus part time linemen to meet this need.

The two linemen added last fall replaced a lineman who left for better pay and two part time retired linemen. The part time linemen provided valuable summer holiday relief but they

did not take or want standby or trouble calls. They travelled during the winter and were not available during the peak winter trouble period. Now the third working lineman will be available during the peak winter trouble period. As well, the third working lineman allows the crew to split into 2 crew; one of 2 linemen and one of the third lineman and driver/groundman allowing more work overall to be accomplished. It is strongly recommended that the District have three working linemen in the crew as it increases the District's ability to respond to trouble as well as increasing productivity.

A significant consideration is the need to have a lineman available off hours to respond to trouble calls. One lineman is on call at all times. He receives off hour trouble calls and responds to repair the trouble, calling out other linemen if needed. The linemen are expected to respond quickly and be fit to respond. As such linemen really cannot leave the Summerland and Penticton area while on call and cannot drink. These restrictions mean that linemen like some standby but do not want too much as it restricts their personal lives. When the Foreman and Charge Hand Linemen were the only two linemen in the District during 2007, the constant standby became onerous and frustrating since they were very limited in what they could do in their personal lives until new linemen were added. Generally linemen in distribution operations in B.C. earn an additional one or two months pay per year in standby and overtime. This varies by how much overtime they are willing to work.

There is a strong demand for linemen in North America. Attracting and retaining linemen can be difficult. Penticton has had difficulty both attracting and retaining linemen for a number of years forcing them to use more expensive contractors to complete workloads. Since linemen can often make considerably more than the District pays working with line contractors, what attracts a lineman to town or municipal work is the more stable home and family life that comes from a regular working schedule. The atmosphere in the line department is also critical in retaining linemen. The District was able to hire the last two linemen because they did not like the atmosphere where they were working.

The meterperson is a part of the linecrew and is important to install and maintain the metering system particularly the three phase metering for high revenue commercial and industrial customers. As well the move to the new meters for AIM (Advanced Metering Infrastructure) is requiring a significant meter changeout over the coming years. The meterperson also deals with billing issues whose cause cannot be determined and resolved by other staff. Currently the meter work involves 50% to 60% of the day. The remainder is mainly involved with material ordering, quoting, and supply matters.

Office Organization

The major office functions consist of;

1. Design
2. Estimating
3. Work order preparation and issuing
4. Work order reconciliation
5. Fielding customer and electrician calls
6. Material ordering
7. Receiving cost quotes for material
8. Arranging and co-ordinating material delivery

9. Reconciling material inventory costs
10. Managing plant records

Most designing and estimating, work order preparation and final cost reconciliation is done by the Supervisor. The meterperson orders material, receives quotes, prepares purchase requisition forms and co-ordinates delivery to meet project requirements. The technician (60% time) prepares maintenance orders, updates plant records and prepares work order reconciliations. The charge hand lineman, meterperson and technician now prepare new service and service change estimates. A District Financial Assistant prepares purchase orders, pays invoices after reconciliation and approval, and prepares monthly budget summaries. The Financial Assistant also now takes routine material orders directly from the truckdriver/groundman.

Material specifying, receiving quotes, and arranging delivery is a significant time function. Larger utilities such as B.C. Hydro and Fortis have specific materials and purchasing people. They also centrally stock almost all material needs. Some materials particularly transformers and underground cables and connectors can have significant delivery times. This can make material delivery, particularly transformers, an issue in meeting customer in-service deadlines.

One of the significant issues the office could face is long term leave by inside office personnel. This staff shortage could be handled in a couple of different ways. One option would be to bring in an electrical technician and train the person during the leave. The new technician would be retained upon the staff person's return providing both more estimating and technical capability. This would provide more metering capability needed for the AMI project. Another option would be to have the Financial Assistant work a half day in the department and become more involved with material ordering and pricing including significant training and understanding of technical specifications. It is believed this would help the Financial Assistant to become more a part of the electrical department and provide the Financial Assistant with a much better understanding of the department needs.

For meter work, the linemen can do residential work but larger commercial installations may need to be contracted.

Supervisor/ Foreman

The supervisor/ foreman focuses most time on work scheduling, design, estimating, and subdivision applications. The exceptional amount of development over the last five years has made this position very busy. Regular duties of time card approval, crew interaction, and electrical contractor interaction occupy significant amounts of time. Recent changes have moved designing and estimating new and changed residential services to the charge hand, technician, and meterperson. This was done to provide more time for the other design and administrative duties.

When construction is busy during the May to November period, co-ordinating physical construction with contractors, inspecting civil works in new subdivisions, as well as the crew scheduling, designing, and estimating duties can make this a challenging position.

Summary

The peak load growth calculated in this report is based upon 2% to 5% peak load growth by circuit over the next 25 years. Over the past 5 years, Summerland Power has realized a 4.4% overall load growth. The 2008 Official Community Plan indicates that population growth will slow slightly after 2010 and it is for this reason that the load growth has been lowered slightly from the actual 4.4% to a 4% average.

The major development areas expected in the next 25 years are the downtown core, Summerland Vistas, Cartwright Mountain, Rattlesnake Mountain, and Summerland Hills. Comments on servicing the Jersey Lands are also included although it is unclear whether they will proceed in the timeframe studied.

The major issue identified and discussed is how to bring more capacity from the Prairie Valley substation. Recommendations include both increasing some circuit capacities out of the substation and increasing the number of circuits in the substation. The recommendations for the Prairie Valley substation cost \$700,000, 42% of the total \$1,650,000 recommended in the report. To resolve the existing capacity problems, it is recommended that the substation improvements be constructed from 2009 to 2011. The report calls for \$250,000 to be used in 2009 for the Prairie Valley underground crossing, \$90,000 to be spent in 2010 for new circuit cables, and \$360,000 to be spent in 2011 for new circuit breakers in the substation. There is considerable benefit in expanding this substation. Because of the tariff serving Summerland, Fortis is responsible for increasing the substation transformer and other high voltage equipment. These costs could well exceed \$1,000,000 if the District were required to do the work themselves. Because of the tariff, this expenditure will not be required by the District. Another side benefit is that the civil works crossing Prairie Valley Road will be built in conjunction with the Prairie Valley Road upgrade currently being planned.

Several circuits require some upgrading and stronger links with other circuits. This is being done to increase capacity in certain areas and provide stronger links between the circuits when switching is necessary. The total cost of this is \$655,000 spread over the 25 year study period. The report calls for \$80,000 to be spent in 2009 to resolve some more immediate issues. In 2010, \$290,000 would be spent to support the Wharton Street development including undergrounding one section of Wharton Street. In 2012, \$150,000 should be spent on downtown undergrounding and load transfer to reinforce the downtown area electrical supply and provide more security for the downtown businesses, schools, and institutional buildings.

Growth in the Trout Creek and Giant's Head areas will require a new circuit in 2023. The report recommends that a new circuit be brought out from Trout Creek substation in 2023 at a cost of \$295,000. The Jersey Lands could be serviced by a fourth Trout Creek substation feeder when the project proceeds but is not included in this report because of unknown timing.

Summerland Hills is a 1600 unit residential subdivision and golf course. To service this development a new substation will be required near the development. Currently it is proposed to build a three circuit substation near the Water Treatment Plant. Preliminary cost estimates are \$8 million. This substation will be required two to three years after the Summerland Hills project begins construction.

With 4% growth, a number of circuits will need reinforcing beyond 2030 particularly circuits #249, #549, #649 and #749. Since no more capacity will be available from Prairie Valley substation, a new substation will be required whether the Summerland Hills proceeds or not. The substation could be placed near the Water Treatment Plant or in the municipal lands on Cartwright Mountain. This master plan should be reviewed and updated every five years. After the 2023 review a decision should be made whether it is necessary to begin planning for this substation. Planning and construction will likely take five years.

There is a desire to complete the Downtown undergrounding. This is expected to cost \$1.4 million but can be done in five stages costing \$250,000 to \$300,000 per stage. Each stage can be done as council makes funds available.

Council wants to encourage electrical energy reduction and green electrical generation initiatives. Proposals to support this include develop metering standards to allow electricity from individual customer green projects such as solar panels or microturbines to flow onto the electric system, modify rates and rewards to encourage reduced electric consumption, and identify sites for green wind and dam projects.

The annual maintenance/improvement budget of \$125,000 is not a part of the other capital improvement costs listed in this document. These funds to change poles, wires, transformers, and do routine tree trimming are necessary to safely maintain the electric distribution system. It is recommended that a small annual fund of \$35,000 be established from 2010 to 2014 to support customer undergrounding required in other than the downtown areas. This would expedite some undergrounding where there presently is some duct in the ground but not enough to allow overhead lines on the street to be placed underground.

An organization review recommends remaining with three working linemen for both productivity and trouble response purposes. As well, a design technician should be added in the future when there is an opportunity.

Summerland Electric Master Plan Expenditure Timetable

<u>Year</u>	<u>Circuit</u>	<u>Project</u>	<u>Amount</u>	<u>Total</u>
2009	Prairie Valley Substn.	New underground civil exit	\$250,000	\$330,000
	Cct #149	Re-establish #349 link	\$35,000	
	Cct #249	Reconductor one section	\$20,000	
	Cct #379	Giant's Head loadbreak switch	\$25,000	
2010	Prairie Valley Substn.	New underground cables	\$90,000	\$380,000
	Cct #749	Brown/Kelly civil & electric	\$140,000	
		Wharton U/G civil & electric	\$150,000	
2011	Prairie Valley Substn.	New circuit breakers/controllers	\$125,000	\$400,000
	"	New substation disconnects/steel	\$100,000	
		Overhead cables and switches	\$100,000	
		Fortis to move capacitor bank	\$35,000	
		3 Phase Jubilee Ave.	\$40,000	
2012	Cct #849	Downtown U/G civil & electric works	\$150,000	\$150,000
2014	Cct #149	Build tie to #249 and move load	\$45,000	\$45,000
2015	Cct #449	Cartwright/Rattlesnake Mtn. Dev	\$25,000	\$25,000
2023	Trout Creek Substn.	New breaker and controller	\$65,000	\$295,000
	"	Substation rearrangements	\$80,000	
	Cct #479	Double circuiting to Gartrell Rd.	\$150,000	
2029	Cct #279	Load transfer to #949	\$25,000	\$25,000
				\$1,650,000
Beyond 2030		New Substation	\$8,000,000	

Appendix A

Prairie Valley Substation 2008 Configuration

Appendix B

Prairie Valley Substation 2012 Configuration

Appendix C

Trout Creek Substation 2008 Configuration

Appendix D

Trout Creek Substation 2023 Configuration

Appendix E

Downtown Area 2012 Circuit Configuration