District of Lake Country
Hydroelectric Generating Station

GMF PROJECT COMPLETION REPORT
File Number 9165

June 2010

District of Lake Country

Hydroelectric Generating Station

GMF Project Completion Report:
A summary of Key Project Components per GMF Reporting Requirements

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1 Project and Community Context

1.1 Project Objectives

The District of Lake Country designed the Lake Country Hydroelectric Generating Station to utilize the municipality's existing water supply infrastructure to generate renewable energy for sale to BC Hydro. Protection of the natural environment and rural character of the local area were important considerations during project implementation. The generating capacity of the hydroelectric project is 1.1 megawatts and the average annual energy production is expected to be 3871 megawatt hours (MW.h)

The project provides multiple benefits to the municipality, including an annual revenue of roughly $367,745, an opportunity to collect Green Credits that can be used to offset greenhouse gas emissions within the municipality, and increased operating efficiency within the Eldorado Reservoir (by recovering energy that would otherwise be wasted within a pressure reducing system in the form of heat, noise, and mechanical erosion).

1.2 Project Relationship to Sustainability

District of Lake Country's official community plan (OCP) outlines guiding principles for development and decision making. The OCP presents specific goals that target sustainability and environmental protection within the municipality, including the reduction of greenhouse gas emissions and the minimization of environmental impacts of new development. The Lake Country Hydroelectric Generating Station demonstrates movement toward these goals through offsetting CO_2 emissions, and by maximizing the use of pre-existing infrastructure to implement the project. Given the municipality's commitment to the BC Provincial Climate Action Charter, which requires that the municipality become carbon neutral in their operations by 2012, this hydroelectric project represents an important milestone in the quest for creative and sustainable energy solutions.

1.3 Community Description

The District of Lake Country is located between Kelowna and Vernon in the Okanagan Valley of British Columbia. The District is comprised of the four historic communities of Oyama, Winfield, Carr's Landing and Okanagan Centre and is home to approximately 11,000 residents. Lake Country remains a predominately agricultural and rural region and its three main lakes, Kalamalka Lake, Wood Lake and Okanagan Lake combine to give both residents and visitors tremendous access to the water for boating, fishing and swimming and provide much of the draw to the region. The area lies within the traditional territory of the Okanagan (Suknaquinx) Indian Band.

2 Project Team

2.1 Principal Contact

Jack Allingham
Utility Manager, District of Lake Country
10150 Bottom Wood Lake Road
Lake Country, BC V4V 2M1
jallingham@lakecountry.bc.ca
Tel: (250) 766-5650

2.2 Implementation Team

Jack Allingham
Utility Manager, District of Lake Country
10150 Bottom Wood Lake Road
Lake Country, BC V4V 2M1
jallingham@lakecountry.bc.ca
Tel: (250) 766-5650

Graham Horn
President, Planit Management
200 - 1260 Hamilton Street
Vancouver, BC V6B 2S8
Responsible for day to day project management and development (feasibility, funding, permitting, marketing and interconnection)
ghorn@planit.bc.ca
Tel: (604) 641-2877

Construction:
Jason Moulton, Project Manager
Maple Reinders Inc.
225 Lougheed Road
Kelowna, BC V1V 2M1
Tel: (250) 765-8892
Fax: (250) 765-8832

Engineering:
EES Consulting
Jack Snyder, P. Eng
570 Kirkland Way, Suite 200
Kirkland, WA 98033
Tel: (425) 889-2700
Fax: (425) 889-2725

Fisheries Assessment:
David Hayward, B.Sc., R.P.Bio
Summit Environmental Consultants Ltd.
#200 - 2800 29th Street
Vernon, B.C. V1T 9P9
Tel: (250) 545-3672

2.3 Project Champion

Jack Allingham, Utility Manger for District of Lake Country (DLC), provided key guidance on the project. By controlling the pace at which the project was introduced amongst other District priorities, he was able to maximize the chance of it being approved and supported by Council.

2.4 Public Participation

During the early stages of project planning, the project was presented to Council four times. Every effort was made to include and inform community stakeholders. For example, on June 1, 2006, over 40 representatives of interested groups (including: Interior Health, Ministry of Environment, Okanagan Indian Band, Oceola Fish and Game Club, Eldorado Ranch, DLC Water Advisory Commission, as well as ranchers, range users, and DLC councillors and staff) participated in a field tour of the Upper Vernon Creek intake and Eldorado Reservoir site, which resulted in increased interest and support of the project.

Throughout the planning process the DLC has maintained close relations with Chief Fabian Alexis and the Okanagan Indian Band Council (OKIB). The DLC and OKIB have a protocol agreement and meet as Council to Council regularly to discuss issues of mutual concern.

3 Project Implementation

3.1 Project Timeline

From the project's conception in 2003, to the official commercial operation date on June 12, 2009 the project required 6 years to implement. The table below details the project timeline and presents planned vs. actual timing of key project tasks.

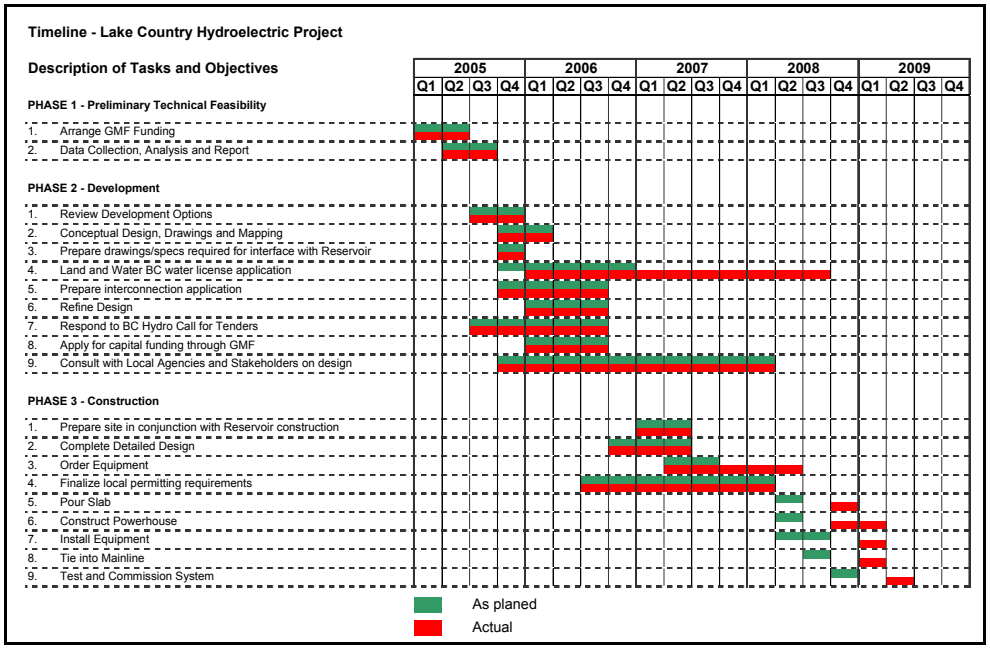


Table 1 Timeline – Lake Country Hydroelectric Project

3.2 Project Innovation

Due to barriers and costs, the concept of utilizing a hydroelectric generator to reduce water pressure within a municipal water system is still very rare and innovative, despite the multiple benefits this method can offer.

3.3 Project Implementation

Unanticipated circumstances resulted in several significant changes to the project implementation plan:

- The overall cost of the project was higher than initial estimations. The original 1995 Reconnaissance Report identified a project using a turbine producing 0.6 MW of power at a cost of $2.1 million. In 2007 the project was increased to 1.1 MW to take advantage of economics of scale and to meet minimum production levels required for green energy funding eligibility. This, along with increased construction, interconnection and regulatory costs raised the estimated cost of the project to $3.6 million. The final cost further increased to $4.1 million, due to upgrading the quality of some system components, BC Hydro interconnection and specification changes, permitting and commissioning delays, and changes in currency exchange rates that affected purchases made in US dollars.
- When the project was conceived, it was thought prudent to operate the facility with a partner under a design, build, operate arrangement in order to insulate rate payers from the risks associated with construction and operation. Once an energy purchase agreement was signed with BC Hydro and greater regulatory clarity emerged, it became clear that potential risks were within the municipality's capabilities and the project was built using a conventional design, bid, build process.
- Due to unanticipated regulatory requirements and permitting delays the initial construction was delayed several months, which resulted in a later than anticipated commissioning date.

4 Project Budget and Financing

The $4.1 million cost of the project was funded using a variety of sources. The table below details these funding sources.

Source	Source Name	Description/Notes	Amount
Municipal	District of Lake Country	20-year loan, borrowing through the BC-MFA	$500,000
	District of Lake Country	Reserves and current revenue	$655,338
Federal	Gas Tax Agreement – Innovations Fund	Grant	$1,931,882
	Gas Tax Agreement – Community Works Fund	Grant	$512,780
Green Municipal Fund	Green Municipal Fund	10-year low interest loan	$500,000
		Total	$4,100,000

Table 2 Funding Sources – Lake Country Hydroelectric Generating Station

5 Environmental Benefits

5.1 Renewable Energy Production

This project is expected to produce an average of 3,871 MW.h of renewable electricity per year, roughly equivalent to the electricity consumed by 400 average BC homes.

5.2 Emissions Reduction

In producing this renewable energy, the project will displace the combustion of a mix of gas and coal (the marginal resource in the BC region) and the emissions produced by these generation sources. An average emission rate of 0.50 tonnes of CO_2 per MW.h is typically used for this region, as it represents a middle ground between combined cycle gas turbine production at 0.3 tonnes per MW.h and coal at 1 tonne. Therefore, for every MW.h of green energy generated by this project, 0.50 tonnes of CO_2 emissions will be avoided. (NOx and SOx will also be avoided, but CO_2 reduction is the primary benefit). At the expected average annual production of 3,871 MW.h, a reduction of 1,936 tonnes of CO_2 per year will be achieved. With the assumption that this generating plant will be in operation for at least 35 years (although plants generally last longer than this), this amounts to a total CO_2 reduction of approximately 67,760 tonnes over the life of this project.

5.3 Enhanced Instream Flow Management

- The installation of automated level monitoring and flow controls at the intake allows for maximized resource utilization and improved instream flow management.
- As part of the Project's Development Plan Application, a fisheries assessment was completed to determine the quality and quantity of fish habitat, and to recommend a defensible minimum instream flow in the bypassed reach of Vernon Creek. Based on this assessment the minimum fish conservation flow has been increased to 0.06 m^3/s from the previous 0.025 m^3/s. Flows will be increased to a minimum 0.09 m^3/s during the months of May and June to mimic natural increases in stream flow during fry emergence. For a one week period in May, flows again will be increased to a minimum of 0.150 m^3/s to allow annual channel maintenance.
- Additional studies and monitoring will be done within the next five years to assess the effects of improved flows.

5.4 Energy Recovery

Because project infrastructure eliminates the need for a pressure reducing system that would otherwise be necessary within the Eldorado municipal waterworks, this project recovers energy that would otherwise be wasted as noise, heat and mechanical erosion.

6 Social and Economic Benefits

6.1 Social Benefits

- Throughout the planning process the DLC has maintained close relations with Chief Fabian Alexis and the Okanagan Indian Band Council.
- The project will provide excellent technical training for the DLC employees who are involved. Due to the high efficiency in terms of operating cost, the project will only provide a modest amount of additional employment in terms of actual person-years (roughly .1 person on an ongoing basis). However, development and implementation of the project resulted in approximately 10,000 person-hours of labour, roughly $300,000 in wages to community members, and utilization of approximately $1.5 million worth of local resources and inputs.
- The project has become a source of community pride. Through this project, the municipality was able to achieve revenue from clean energy production while protecting and enhancing the natural environment. The project is therefore included in the most recent version of the municipality's Official Community Plan as a positive example of sustainable development.

6.2 Economic Benefits

- Under a 20 year Energy Purchase Agreement with BC Hydro, the DLC will receive $329,035 per year in revenue escalated annually by 50% of the Consumer Price Index. This contract was awarded to the municipality under a Competitive Request for Proposals during the 2006 Open Call for Power.
- Through the ecoEnergy program, Natural Resources Canada will contribute $10 per MW.h of electricity generated, for 10 years from the commercial operation date. This contribution to the municipality will not exceed $38,816 in any given year and shall not exceed $387,312 in total.
- The municipality will save approximately $15,000 per year on maintenance activity that would no longer be required for the pressure reducing station. A pressure reducing valve experiences high wear and tear because it dissipates hydraulic energy by friction, whereas a turbine dissipates hydraulic energy by converting it efficiently to electricity.
- The municipality can anticipate additional cost savings because the hydroelectric plant shares infrastructure with the reservoir. Actual cost savings are too uncertain to quantify, but would arise from the two projects sharing the costs of site preparation, the bypass channel, power lines, and a control system.
- Further operational cost savings for the municipality associated with the installation of remote intake monitoring are real, but too uncertain to quantify. The installation of automated level controls at the middle intake will save municipal staff time that would otherwise be spent driving daily up and down to check water levels and make gate adjustments. An additional automated valve at the upper lake may be installed in the future.
- This project has enabled the DLC to pass a bylaw to establish a Climate Action Reserve Fund, to be used to support long term funding of green initiatives within the municipality (Appendix A).
- This project provides a valuable economic and environmental case study for other municipalities across Canada. The innovative application of environmental technologies achieved here can be utilized at two additional sites within Lake Country and at approximately 15 additional sites in BC. A similar project is presently progressing in the Metro Vancouver area.

7 Lessons Learned

7.1 Reflection on Positive Contributing Factors

The DLC had an excellent team that worked together to facilitate the successful completion of the project. The Mayor and Council provided unwavering support for the project and led the way in communicating the project's benefits to the community as a whole, thereby generating community support for the project. The lead consultant for the project, Graham Horn of Planit Management, and a number of other consultants and contractors, were able to skilfully navigate the project through a myriad of technical and regulatory challenges. The retention of the services of experienced professionals and community support for the project were major factors in the successful completion of the project.

7.2 Reflection on Negative Contributing Factors

Within the DLC, work associated with the project was in addition to the regular duties of municipal staff. Consequently, project demands sometimes strained available resources. For example, diverse aspects of the project required regulatory approval from several different agencies. At times, regulatory requirements were found to be ambiguous or impractical. Navigating through these requirements took much more time and human resources than initially anticipated. Should a similar project be initiated in the future, it is recommended that the allocation of more time and resources be made at the concept, approval and budgeting stages of the project, in order to enhance overall cost effectiveness and to reduce pressure on municipal team members.

7.3 Barriers Encountered and Overcome

The initial and major barrier was to convince the senior staff and municipal decision makers that the project was viable and that the timing was right for such an initiative. Once Mayor and Council believed in the project and fully endorsed it, support structures developed that allowed the municipality to complete the project and take full control of its operations.

As previously noted, the project required numerous approvals from a wide range of statutory authorities. The early involvement of the community allowed some of our stakeholders to help us to respond during the application process and expedite approvals. For example, the local fish and game club President replied to Transport Canada regarding the Navigable Waters Protection Act in a humorous manner, pointing out how misplaced the requirements were in this case. (The project does not affect navigable waterways). Approval was received within a week.

7.4 Advice for Other Communities

Projects of this type need a champion, someone who can work with or within the municipality to bring the various points of view, engineering requirements, financial realities and regulatory requirements together and work through to the common goal. Perseverance will pay off – if the community believes that they have a good project, don't give up! There is always a way.

7.5 Sharing Project Learning

The DLC has given numerous tours, media interviews and presented at workshops and conventions to explain how the project was conceived through to construction and operation (Appendix B).

8 Publicity and Photos

8.1 Awards

At the 2009 Union of B.C. Municipalities Convention the District of Lake Country won in the Corporate Operations category for the Lake Country Hydroelectric Generating Station. Also at that convention, the project was awarded the Community Excellence Award for Leadership and Innovation for a mid-sized community. The awards are organized annually by the Community Energy Association in partnership with the Province of British Columbia, Union of British Columbia Municipalities and BC Hydro.

8.2 Project Publicity

The project has been reported on by local and provincial media. (Appendix C)

8.3 Project Photographs

Photo 1 - Site view from the North

Photo 2 - Site view from the South

Photo 3 - Completed Generating Station from the South

Photo 4 - Completed Generating Station from the North

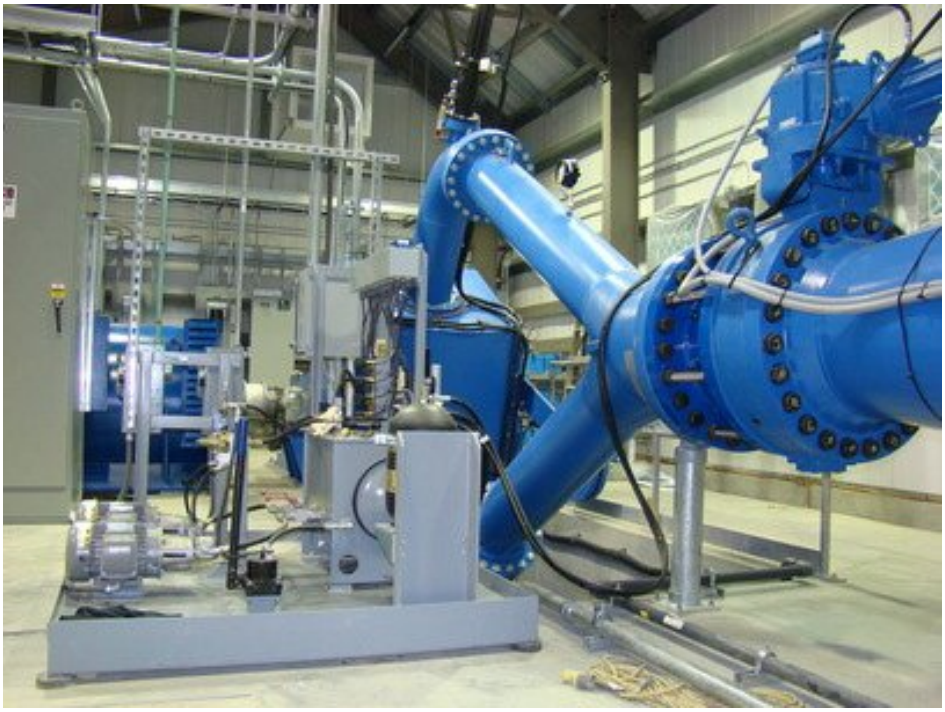


Photo 5 - Incoming Penstock, Turbine Housing and Generator

This project was carried out with assistance from the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

Appendix A:

Bylaw 734, 2009: Bylaw to establish the Climate Action Reserve Fund

DISTRICT OF LAKE COUNTRY

BYLAW 734, 2009

A BYLAW TO ESTABLISH THE CLIMATE ACTION RESERVE FUND

WHEREAS the *Community Charter* provides Council with the authority to adopt a bylaw to establish a reserve fund for a specified purpose and direct that money be placed to the credit of the reserve fund.

NOW THEREFORE the Council of the District of Lake Country in open meeting assembled, enacts as follows:

1. There shall be and is hereby established a Reserve Fund, pursuant to the provisions of the *Community Charter*, to be known as the "Climate Action Reserve Fund".

2. The monies set aside shall be recorded and maintained in a separate account and, until required to be used, may be invested in the manner provided by the *Community Charter.*

3. Money from current revenue, from general revenue surplus, or as otherwise provided in the *Community Charter* may from time to time be paid into the Reserve Fund.

4. Money from the net revenue earned by the Lake Country Hydroelectric Generating Station, from the Climate Action Revenue Incentive grant program, and from an equivalent of what would be paid to purchase carbon offsets for the carbon produced by the District's operations on an annual basis, is to be paid into the Reserve Fund.

5. The monies in the Reserve Fund, and any interest earned thereon, shall be expended in accordance with the *Community Charter* for the following purposes:

    a. Capital expenditures for District buildings, infrastructure and fleet to increase energy efficiency, reduce greenhouse gas emissions or improve sustainability;

    b. Principal and interest or redemption of debenture related to (a);

    c. Plans or programs to promote, study or implement greenhouse gas emission reduction strategies on a community and corporate basis.

6. This bylaw may be cited as the "Climate Action Reserve Fund Establishment Bylaw 734, 2009".

READ A FIRST TIME this 1st day of December, 2009.
READ A SECOND TIME this 1st day of December, 2009.
READ A THIRD TIME this 19th day of January, 2010.

ADOPTED this 2nd day of February, 2010.

Original signed by James Baker
Mayor

Original signed by Hazel Christy
Clerk

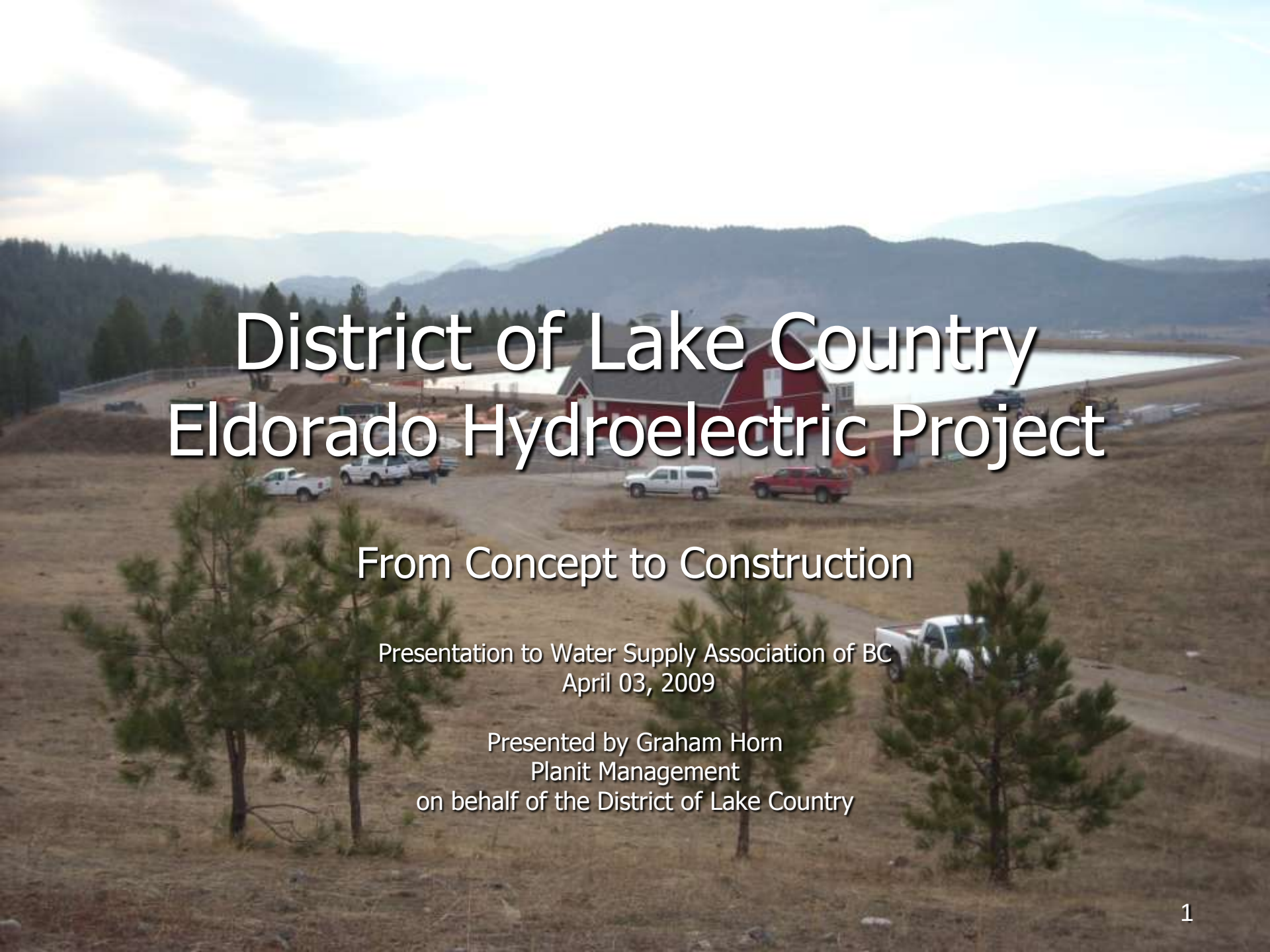
I hereby certify the foregoing to be a true and correct copy of the bylaw cited as "Climate Action Reserve Fund Establishment Bylaw 734, 2009" adopted by Council on the 2nd day of February, 2010.

Date at Lake Country, BC

Clerk

Appendix B: Project Presentations

1) Presentation to the Water Supply Association of BC April, 2009
2) Presentation to the 6th BC Rural Communities Summit March 2010



District of Lake Country
Eldorado Hydroelectric Project

From Concept to Construction

Presentation to Water Supply Association of BC
April 03, 2009

Presented by Graham Horn
Planit Management
on behalf of the District of Lake Country

Outline

- Background
- Physical Overview
- Timeline
- Development Steps of a Hydro Plant
  - Step 1: Verify Economic and Technical Feasibility
  - Step 2: Find a Market for the Energy
  - Step 3: Obtain Permits, Approvals, Licenses, Reviews
  - Step 4: Raise Funds / Financing
  - Step 5: Procure Services and Equipment
  - Step 6: Construct Plant
  - Step 7: Test, Commission and Operate System
  - Step 8: Return Value for Ratepayers
- Summary

Background

- Project Decisionmakers:
  - Mayor Baker and Council
- Project Lead:
  - Jack Allingham, Utility Manager
- Project Control:
  - Senior Administrators (Randy Rose, Stephen Banmen, Michael Mercer, Hazel Christy)

- System Uses existing flow and pressure within District of Lake Country water system

- Power concept was first considered in the early 1900s in the formation of the early water system

- Brought forward again in 1991/92

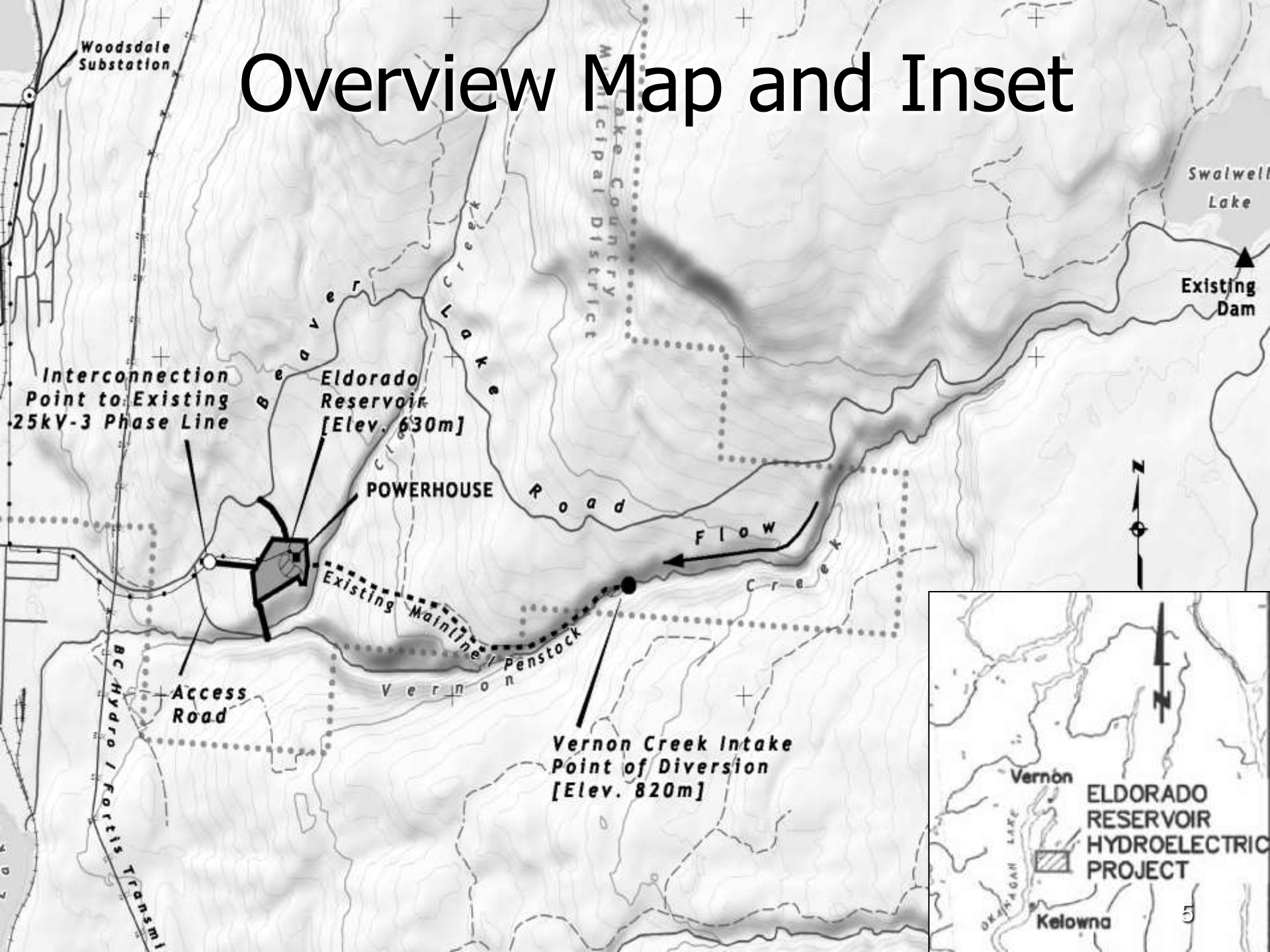
- This latest effort began in 2005

Physical Overview

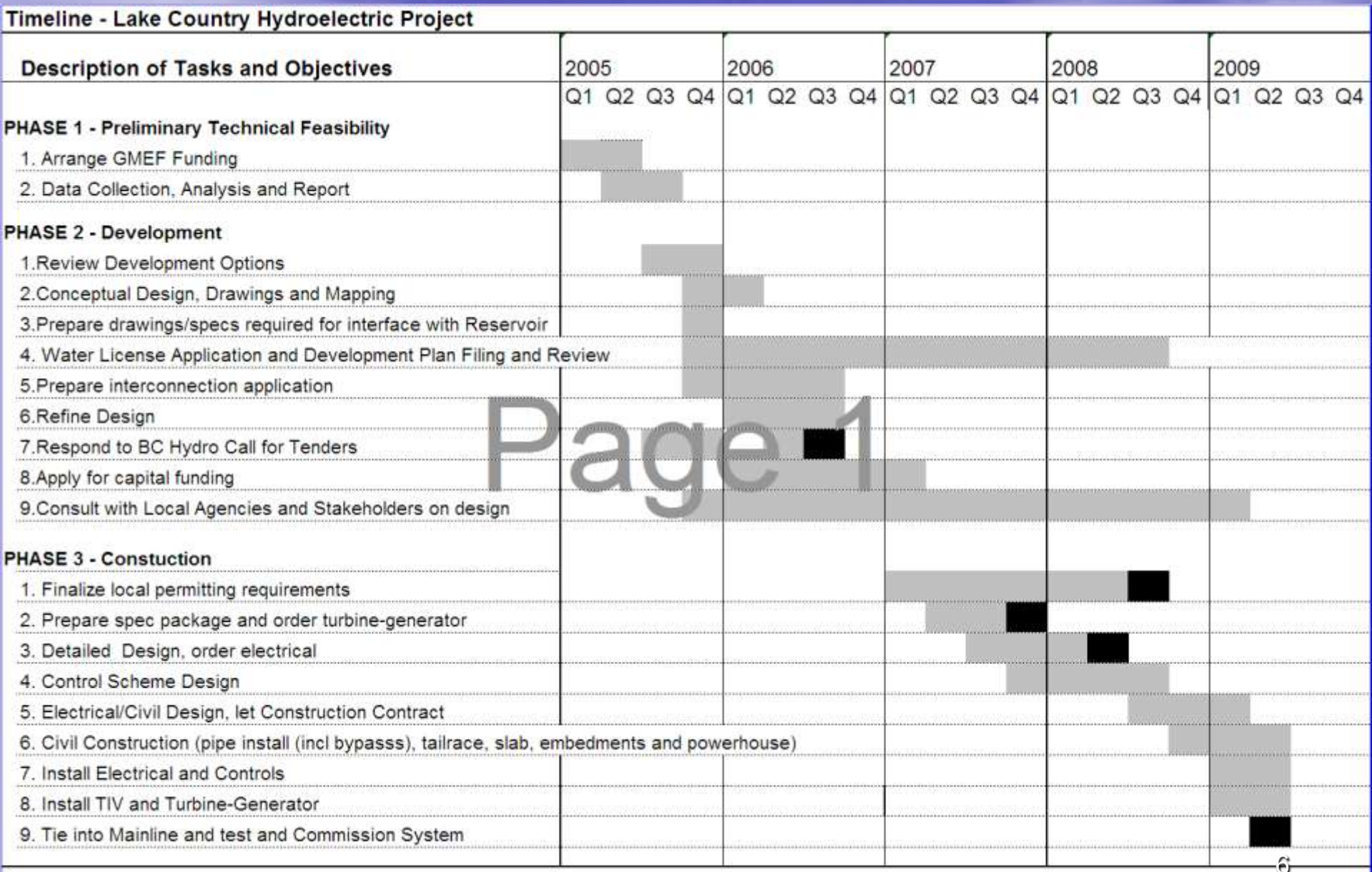
- 1.1 Megawatt Hydroelectric Plant – "Pelton" Design

- Will generate enough electricity to power 400 homes for the life of the project (35+ years)

Overview Map and Inset



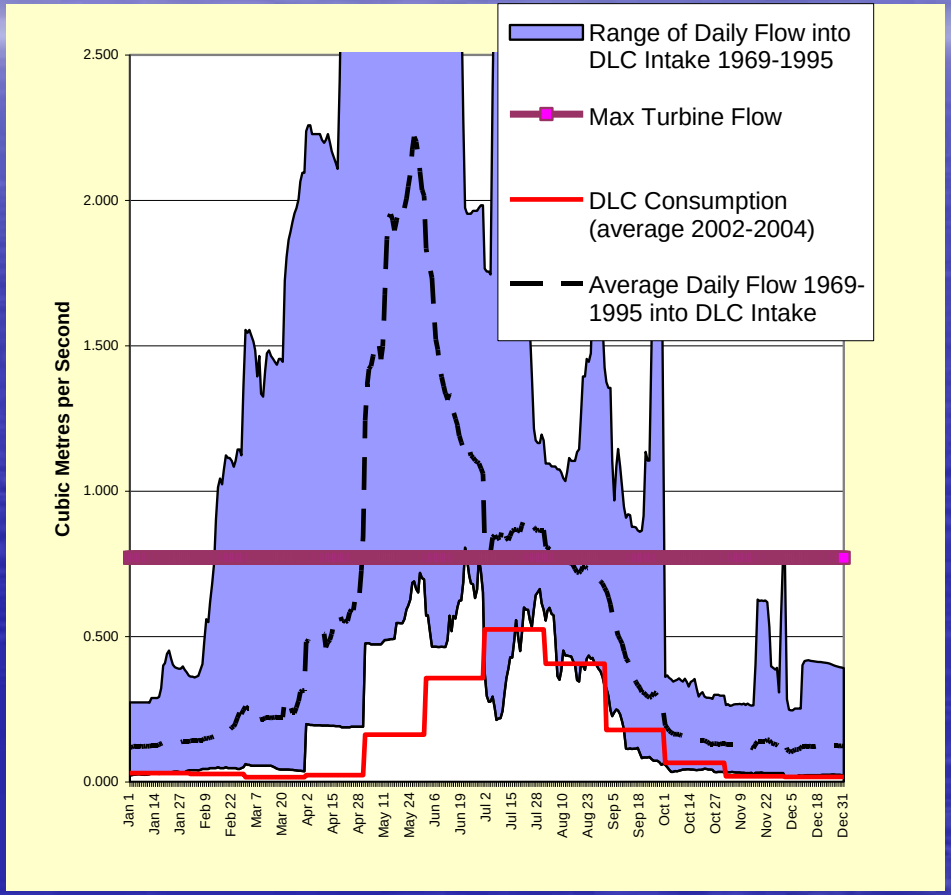
Timeline



Step 1: Economic and Technical Feasibility

- Key Characteristics
  - Flow
  - Head (elevation difference)
  - Price of Energy
  - Capital Cost
  - Environmental Impacts

- DLC had three potential sites – we decided only one was viable at this time



Step 2: Find a Market

- BC Hydro Competitive Call for Tenders (over 10MW)
- BC Hydro Standing Offer Program (under 10MW)
- Electricity Purchase Agreement with other utilities (Fortis, Kelowna)
- Power Smart Load Displacement Program
- Powerex
- Wheeling to Industrials under Stepped Rates

Excerpt from BC Hydro Report to BC Utilities Commission the 2006 Call for Tender Results

Table 3 - Levelized Bid Prices for the Large and Small Projects

$/MWh	Levelized Bid Price – Plant Gate	
	Large Projects	Small Projects
Projects awarded an EPA	59.7	55.8
	66.7	59.8
	68.3	62.6
	68.8	62.6
	69.0	66.0
	71.0	66.3
	71.2	66.5
	72.3	66.5
	74.0	67.0
	75.2	68.5
	76.3	69.3
	77.3	69.4
	82.2	69.4
	84.4	71.7
	90.7	71.8
	95.1	73.2
	--	73.9
	--	74.8
	--	77.2
	--	78.0
	--	84.5
	--	85.6
Projects not awarded an EPA	81.3	77.0
	86.2	77.3
	90.6	80.1
	--	91.8
	--	95.4
	--	120.2

Step 3: Permits, Approvals, Licenses and Reviews

- Provincial Water License
- First Nations Consultation
- DFO
- Navigable Waters Protection Act
- Crown Land Tenure
- Interior Health Constuction Permit
- Interconnection Agreement
- Electrical Service Agreement
- Leave to Commence
- Leave to Divert
- BCUC Exemption

Step 4: Raise Funds (total cost = $3.5 million)

- Grants
  - $75,000 Green Municipal Enabling Funding (GMEF)
  - $2,000,000 Gas Tax Funding
- Borrowing
  - $1,000,000 loan authorization
- DLC Capital
  - $500,000 Municipal Reserves
- NRCan Production Credit
  - $380,000 (Total Revenue Increase over 10 years)

Step 5: Procure Services and Equipment

- Contract 1:
  - Engineer (EES Consulting)
- Contract 2:
  - Turbine, Generator, Hydraulic Power Unit (Canyon Industries)
- Contract 3:
  - Switchgear, Transformers, Protection, Control (Phoenix Power Control)
- Contract 4:
  - General Contractor to Construct and Install the Plant (Maple Reinders)

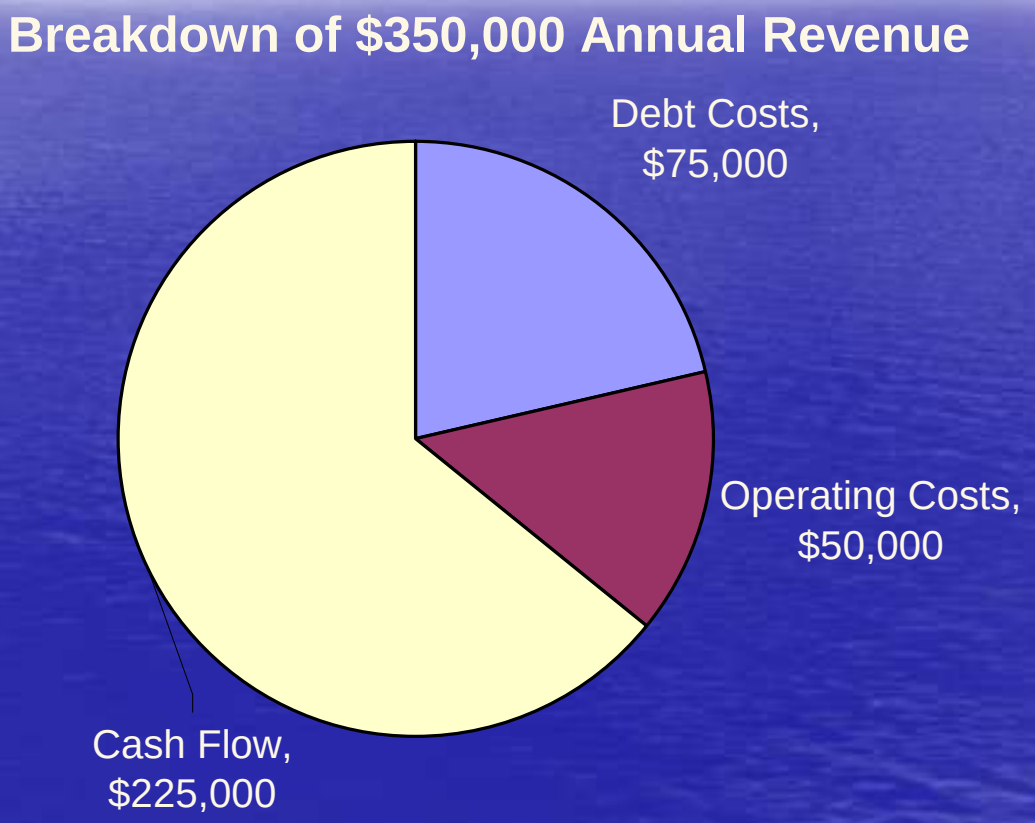
Step 5: Construct Plant

Step 7: Test and Commission Plant

- 100 plus internal testing procedures
  - Communications
  - Protection and Control
  - Turbine
  - Generator
  - Building Electrical
  - HVAC etc.
- 30 plus BC Hydro Tests and Procedures
  - Metering
  - Scada
  - Protection and Control
- MOE oversight

Step 8: Create Return for Ratepayers

- Financial
  - Annual Revenue $350,000
    - ($250,000 in dry years, $400,000 plus in Wet years)
  - 5.4 Year Payback
  - Net Present Value $2.3 million
- Greenhouse Gas Credits which can be applied against other facilities



Potential Risks

- Development Risk
  - permitting, financing, bidding
- Construction Risk
  - procurement delays, accidents, surprise costs
- Operating Risk
  - performance problems, "fuel" problems
- Mitigation measures
  - good planning, workable schedule, experienced service providers, high quality suppliers, warranties and performance guarantees.

Summary

- Complete
  - Step 1: Verify Economic and Technical Feasibility
  - Step 2: Find a Market for the Energy
  - Step 3: Obtain Permits, Approvals, Licenses, Reviews
  - Step 4: Raise Funds / Financing
  - Step 5: Procure Services and Equipment
- Nearly Complete
  - Step 6: Construct Plant
- To be completed
  - Step 7: Test, Commission and Operate System
  - Step 8: Return Value for Ratepayers

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District of Lake Country
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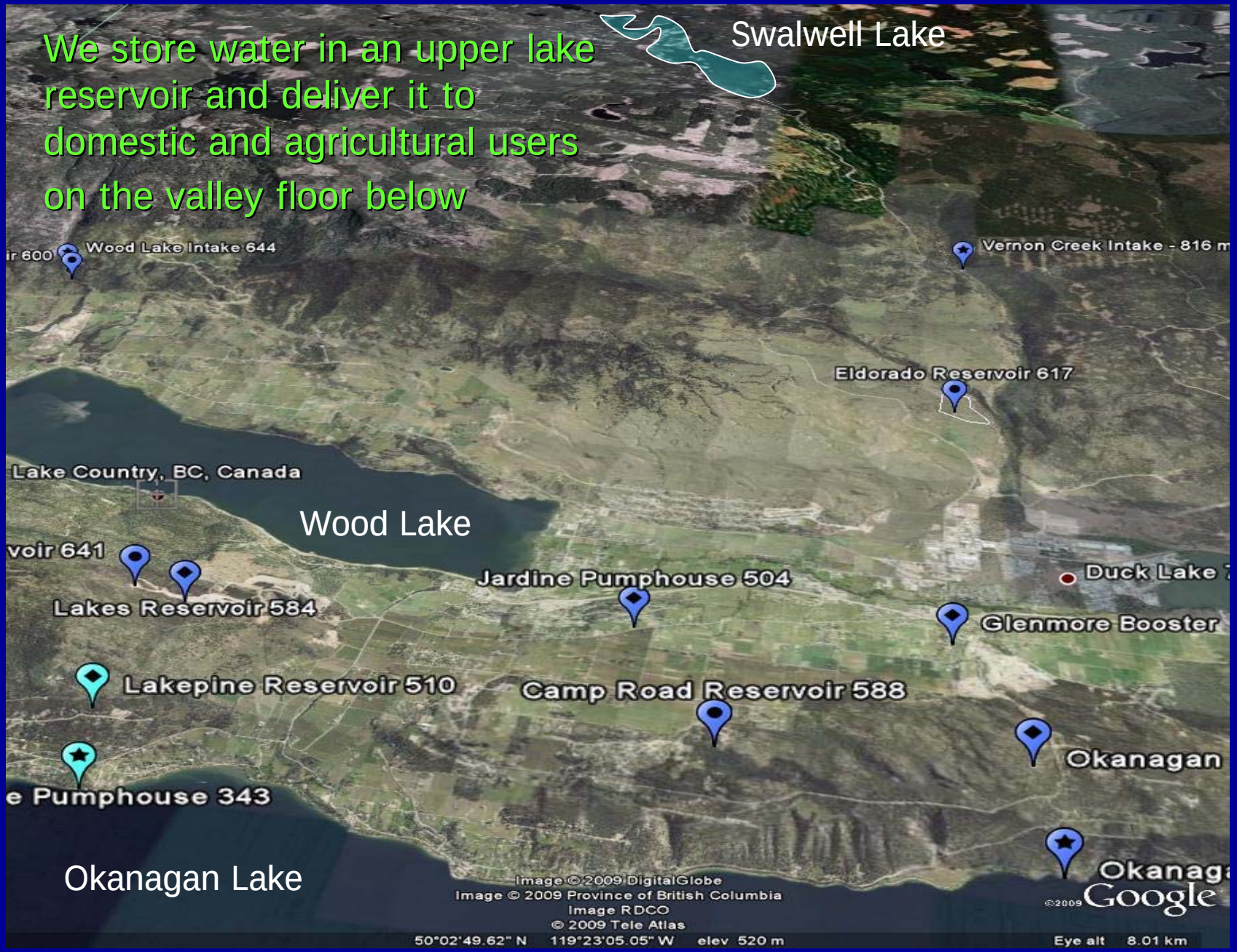
District of Lake Country Community Power Project

Hydroelectric Generating Station

Outline

- History
- The Opportunity
- Physical Overview
- Timeline
- Potential Risks
- Development Steps of a Hydro Plant
  - Step 1: Verify Economic and Technical Feasibility
  - Step 2: Find a Market for the Energy
  - Step 3: Obtain Permits, Approvals, Licenses, Reviews
  - Step 4: Raise Funds / Financing
  - Step 5: Procure Services and Equipment
  - Step 6: Construct Plant
  - Step 7: Test, Commission and Operate System
  - Step 8: Have a Party
  - Step 9: Return Value for Ratepayers
- Summary

Our water system - 100 years of history

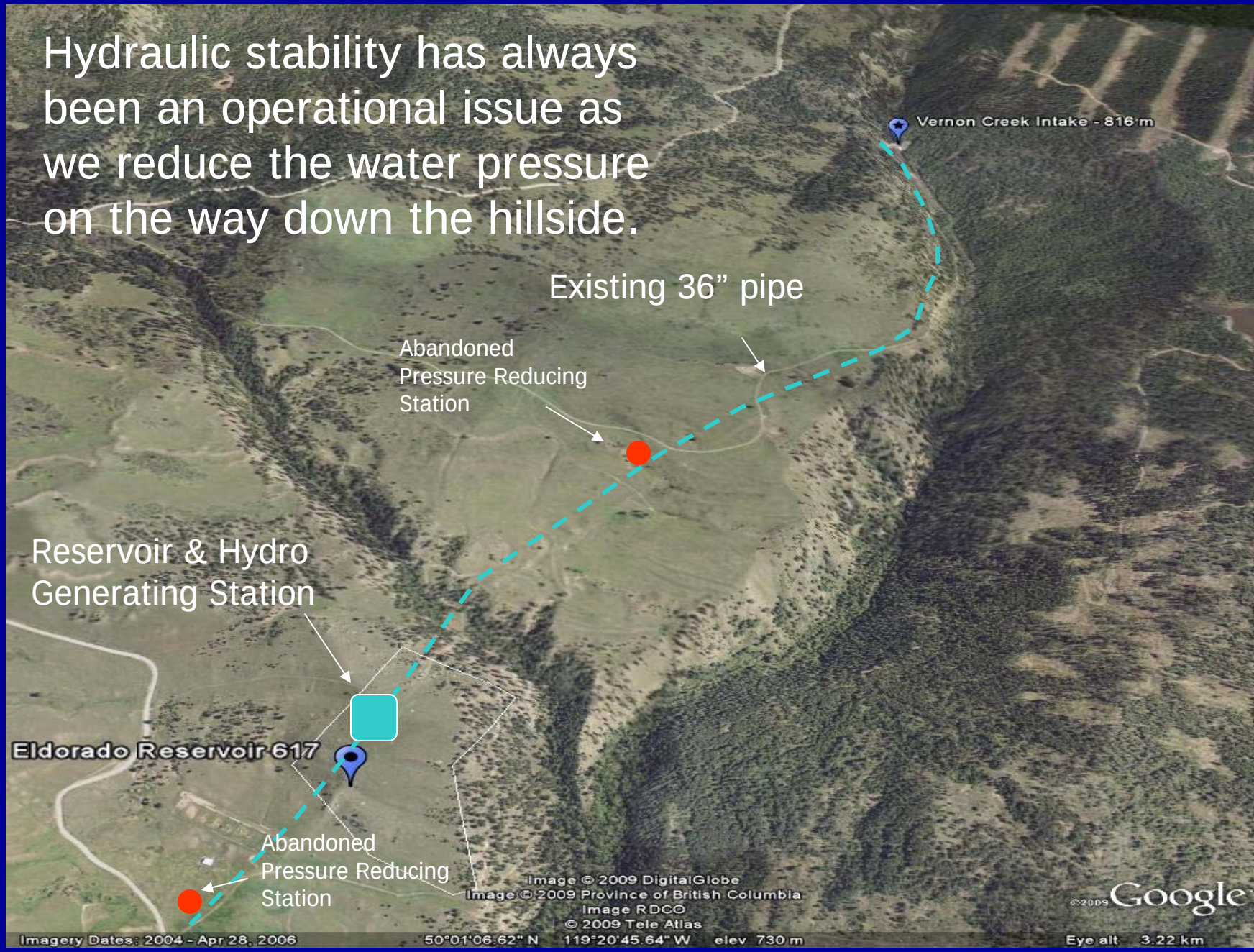

We store water in an upper lake reservoir and deliver it to domestic and agricultural users on the valley floor below
Swalwell Lake
Wood Lake Intake 644
Vernon Creek Intake - 816 m
Eldorado Reservoir 617
Lake Country, BC, Canada
Wood Lake
Jardine Pumphouse 504
Duck Lake
Lakes Reservoir 584
Glenmore Booster
Lakepine Reservoir 510
Camp Road Reservoir 588
Okanagan
Okanagan Lake
Image © 2009 DigitalGlobe
Image © 2009 Province of British Columbia
Image RDCO
© 2009 Tele Atlas
50°02'49.62" N 119°23'05.05" W elev 520 m
Eye alt 8.01 km
Google

Some things can’t wait until Monday...

6” blown air valve in a 32” pipe @ high pressure = 100’ tower of water

The Opportunity

- System Uses existing flow and pressure within District of Lake Country water system
- Power concept was first considered in the early 1900s in the formation of the early water system
- Power generation was considered in 1991/92 and included in the Master Water Plan updated in 2004
- We actively pursued the power generation concept starting in 2005

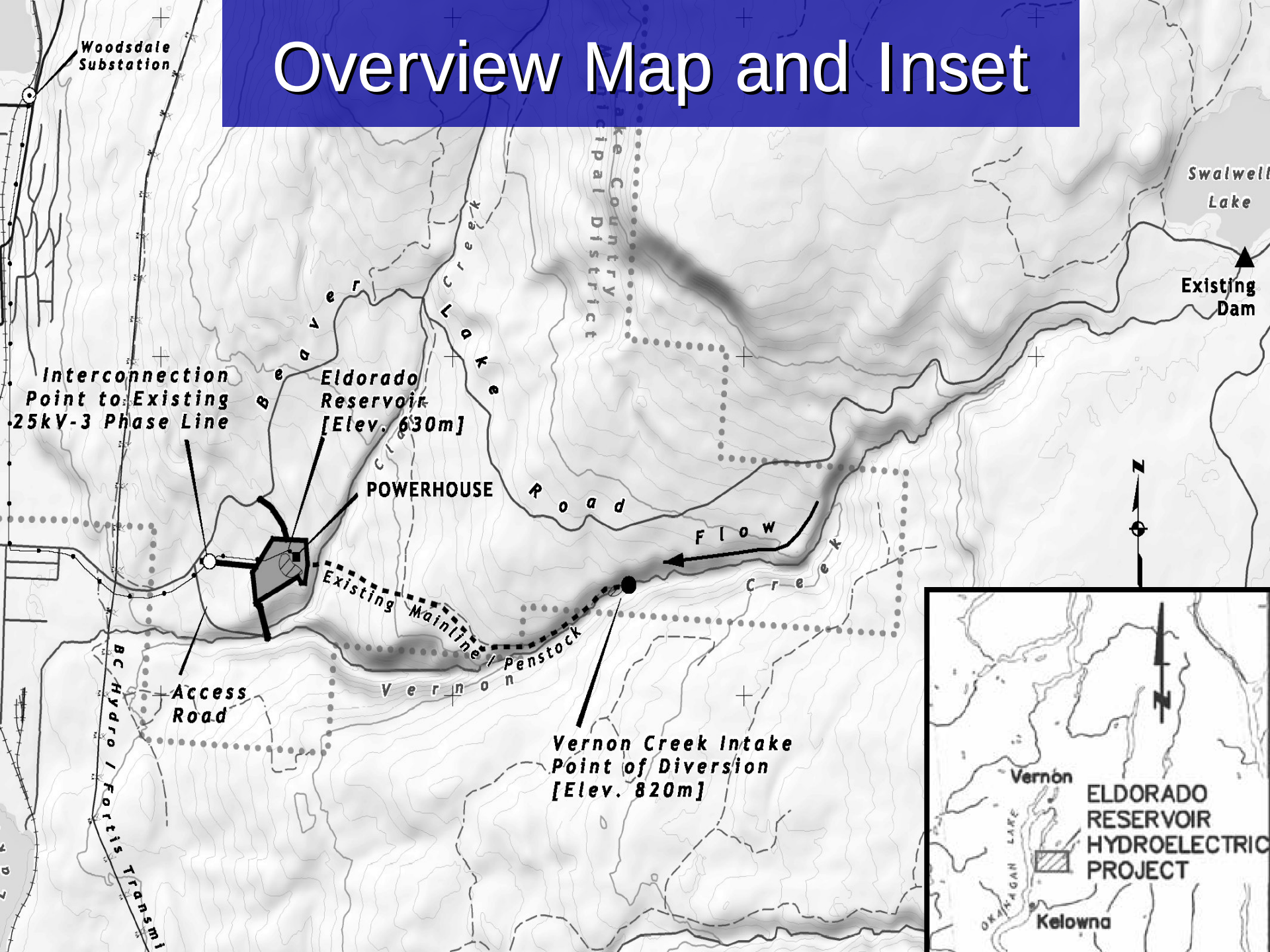

Hydraulic stability has always been an operational issue as we reduce the water pressure on the way down the hillside.
Vernon Creek Intake - 816 m
Existing 36” pipe
Abandoned Pressure Reducing Station
Reservoir & Hydro Generating Station
Eldorado Reservoir 617
Abandoned Pressure Reducing Station
Image © 2009 DigitalGlobe
Image © 2009 Province of British Columbia
Image RDCO
© 2009 Tele Atlas
Google
Imagery Dates: 2004 - Apr 28, 2006
50°01'06.62" N 119°20'45.64" W elev 730 m
Eye alt 3.22 km

Physical Overview

- 1.1 Megawatt Hydroelectric Plant – “Pelton” Design

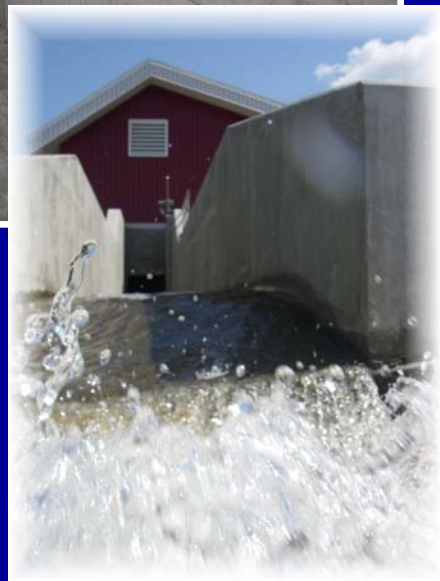
- Will generate enough electricity to power 400 homes for the life of the project (35+ years)

Overview Map and Inset

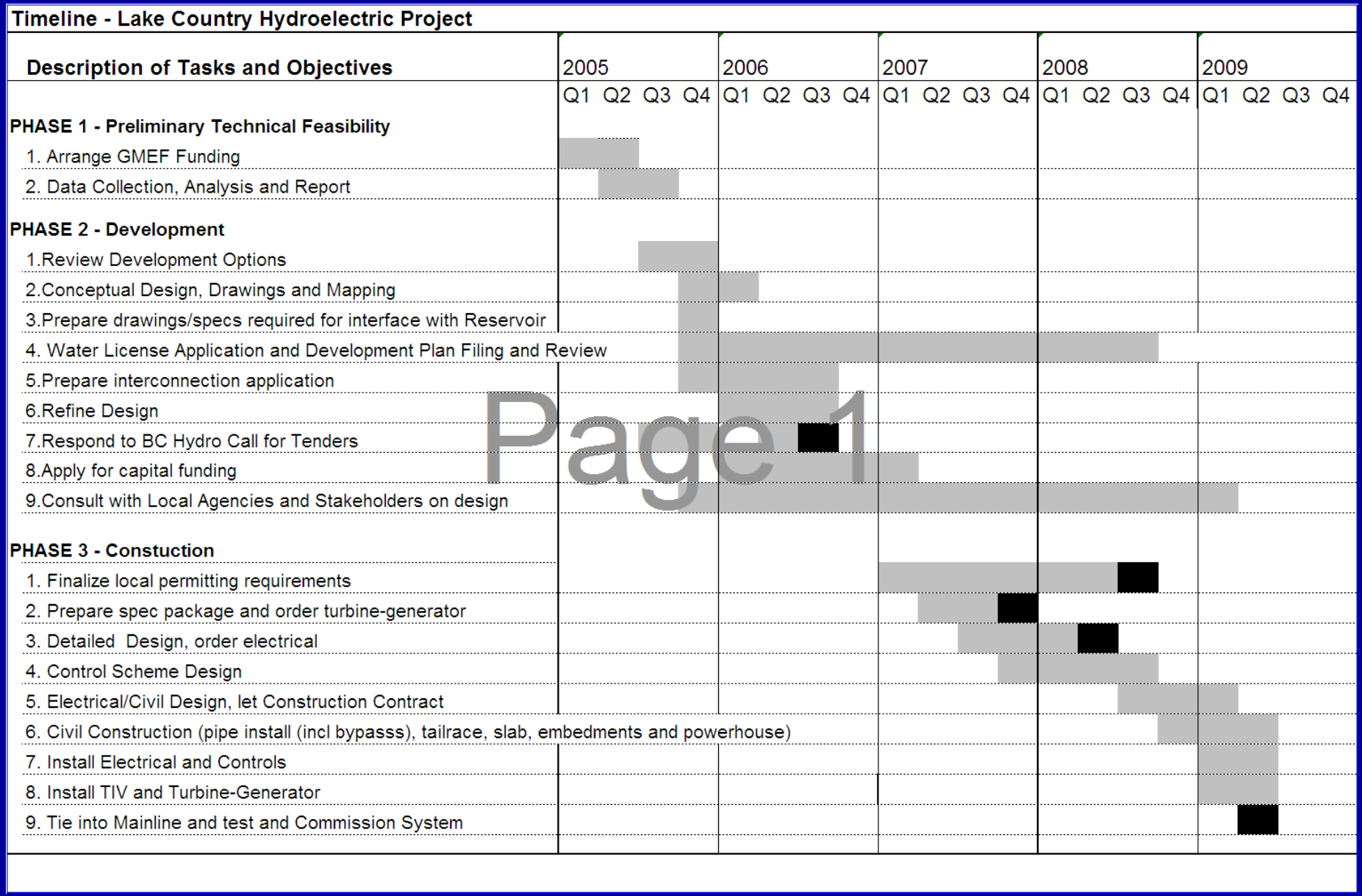


Potential Risks

- Development Risk
  - permitting, financing, bidding
- Construction Risk
  - procurement delays, accidents, surprise costs
- Operating Risk
  - performance problems, “fuel” problems
- Mitigation measures
  - good planning, workable schedule, experienced service providers, high quality suppliers, warranties and performance guarantees.



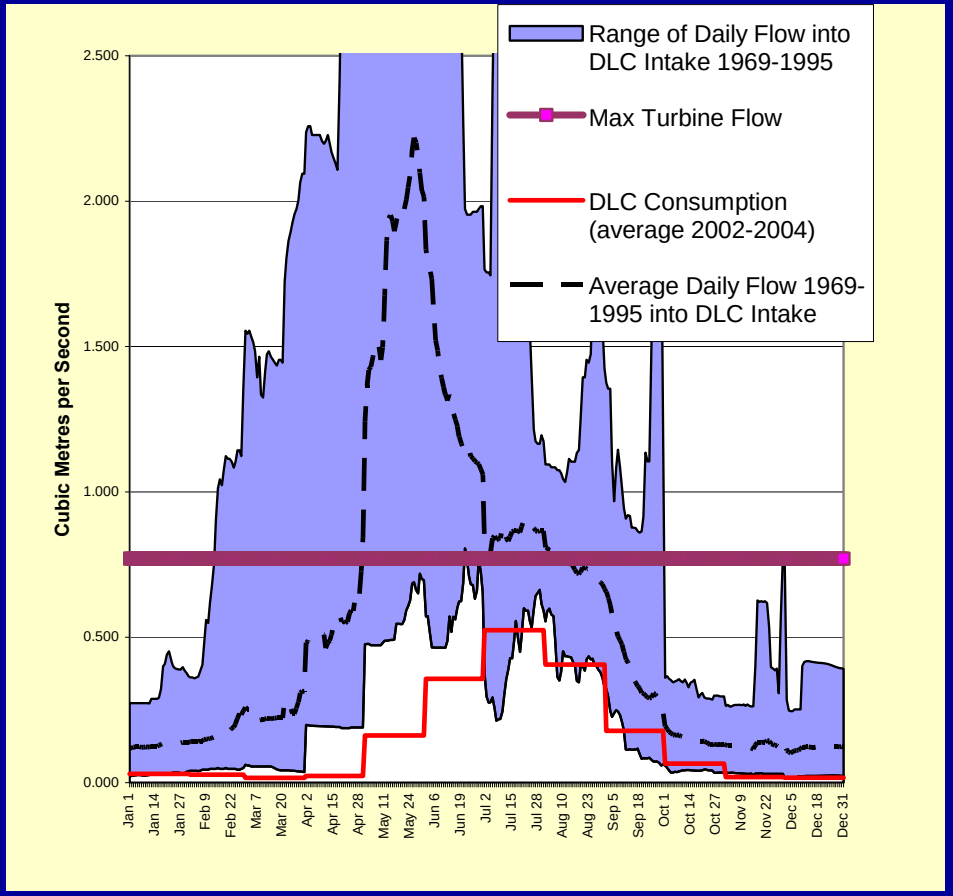
Timeline



Step 1: Economic and Technical Feasibility

- Key Characteristics
  - Flow
  - Head (elevation difference)
  - Price of Energy
  - Capital Cost
  - Environmental Impacts
  - Money Maker?

- DLC had three potential sites – we decided only one was viable at this time



Step 2: Find a Market

- BC Hydro Standing Offer Program (under 10MW)
- Electricity Purchase Agreement with other utilities (Fortis, Kelowna)
- Power Smart Load Displacement Program
- Powerex
- Wheeling to Industrials under Stepped Rates

Table 3 - Levelized Bid Prices for the Large and Small Projects

$/MWh	Levelized Bid Price – Plant Gate	
	Large Projects	Small Projects
Projects awarded an EPA	59.7	55.8
	66.7	59.8
	68.3	62.6
	68.8	62.6
	69.0	66.0
	71.0	66.3
	71.2	66.5
	72.3	66.5
	74.0	67.0
	75.2	68.5
	76.3	69.3
	77.3	69.4
	82.2	69.4
	84.4	71.7
	90.7	71.8
	95.1	73.2
	--	73.9
	--	74.8
	--	77.2
	--	78.0
	--	84.5
	--	85.6
Projects not awarded an EPA	81.3	77.0
	86.2	77.3
	90.6	80.1
	--	91.8
	--	95.4
	--	120.2

Excerpt from BC Hydro Report to BC Utilities Commission the 2006 Call for Tender Results

After all the reports and options were reviewed, the risks considered, and the opinions expressed, Council decided to proceed with the project as it was the right thing to do from an environmental perspective – making money would be a bonus.

Step 3: Permits, Approvals, Licenses and Reviews

- Provincial Water License
- First Nations Consultation
- DFO
- Navigable Waters Protection Act
- Crown Land Tenure
- Interior Health Construction Permit
- Interconnection Agreement
- Electrical Service Agreement
- Leave to Commence
- Leave to Divert
- BCUC Exemption

Step 4: Raise Funds (total cost = $4 million)

- Grants
  - $2,000,000 Innovations Fund
  - $500,000 Community Works Fund
- Borrowing
  - $500,000 MFA Loan
  - $500,000 FCM Loan
- DLC Capital
  - $500,000 Municipal Reserves
- NRCan Production Credit
  - $380,000 Operating revenue over 10 years - ecoEnergy for Renewable Power Program

Step 5: Procure Services and Equipment

- Contract 1:
  - Engineer (EES Consulting)
- Contract 2:
  - Turbine, Generator, Hydraulic Power Unit (Canyon Industries)
- Contract 3:
  - Switchgear, Transformers, Protection, Control (Phoenix Power Control)
- Contract 4:
  - General Contractor to Construct and Install the Plant (Maple Reinders)

Step 6: Construct Plant

Step 7: Test and Commission

- 100 plus internal testing procedures
  - Communications
  - Protection and Control
  - Turbine
  - Generator
  - Building Electrical
  - HVAC etc.
- 30 plus BC Hydro Tests and Procedures
  - Metering
  - Scada
  - Protection and Control
- MOE oversight

Step 8: Have a Party

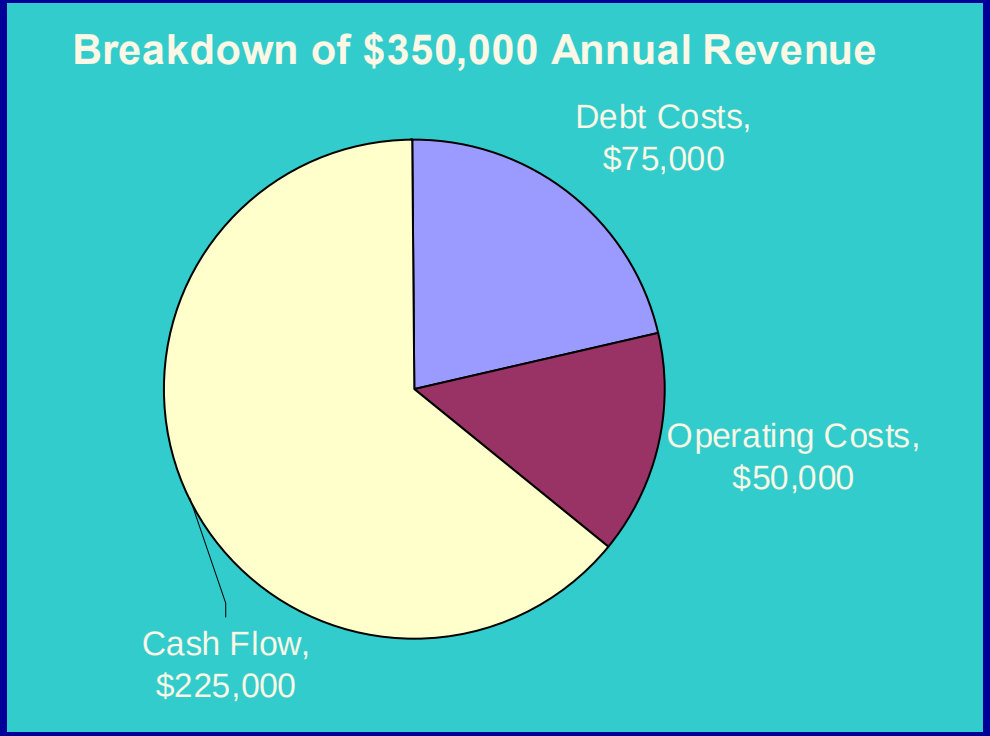

Hey! A water slide!


Celebrating Green Energy!


LAKE COUNTRY HYDROELECTRIC GENERATING STATION
Building Canada: Federal Gas Tax Funds at work in your community
Chantiers Canada: Les fonds de la taxe fédérale sur l'essence à l'œuvre dans votre collectivité
BRITISH COLUMBIA
The Best Place on Earth
DISTRICT of LAKE COUNTRY
Canada
FCM
Green Municipal Fund
Fonds municipal vert
UBCM

Step 9:
Create Return for Ratepayers

- Financial
  - Annual Revenue $350,000
  - ($250,000 in dry years, $400,000 plus in Wet years)
  - 5.4 Year Payback
  - Net Present Value $2.3 million
  - Expect profit of $4.5 million over 20 years – lifespan of infrastructure is 35 – 45 years
- Greenhouse Gas Credits which can be applied against other facilities?
- After 7 months operating, we are slightly below revenue projections



Daily Totals

POWER SMART e.metering

All days start and end at 12 AM PST

Customer Information

Name: Lake Country - ELD
Address: Eldorado ELD
10150 Bottom Wood Lk
Acct. No:
Meter No:

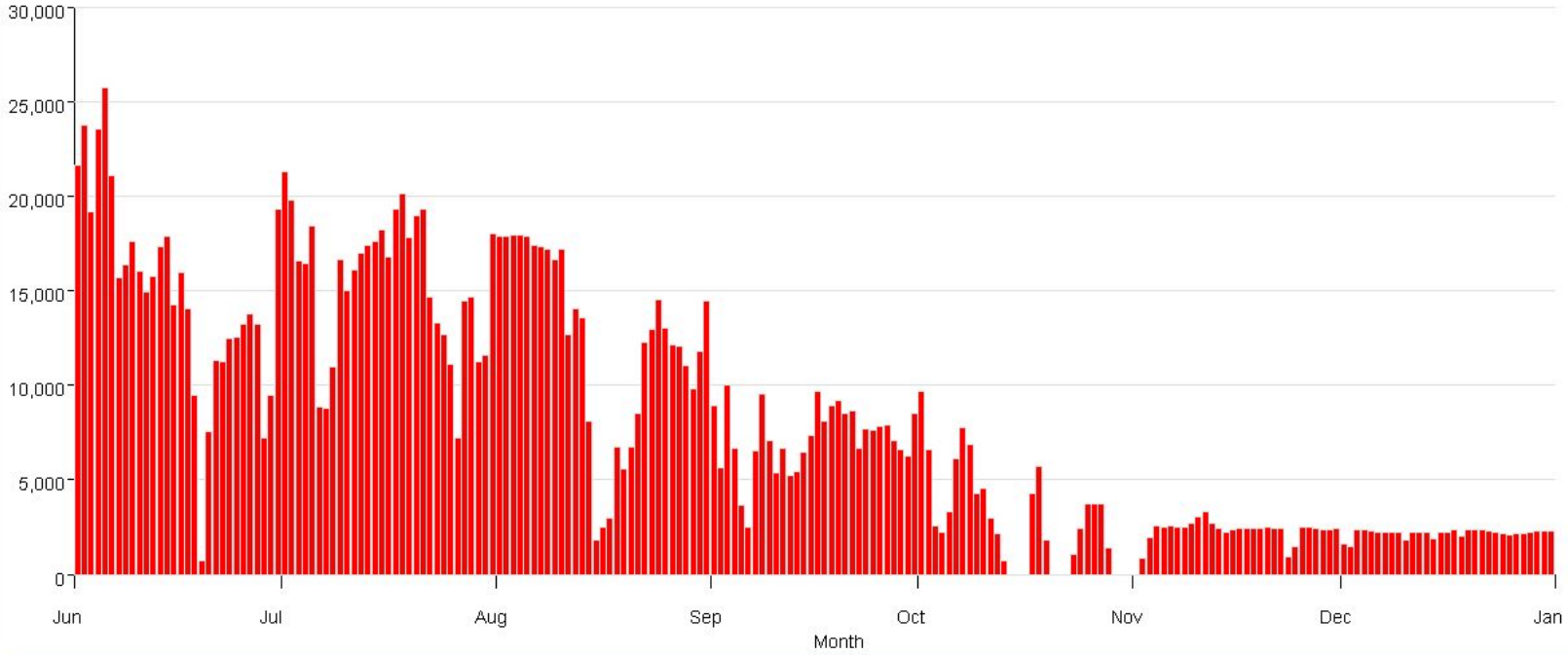
Mon Jun 1 2009 to Thu Dec 31 2009

Total Usage:	1,754,443.20 KWH
Max Demand:	1,077.12 KW
Occurred On:	Jun 4 2009 13:05
Load Factor:	31.714%
Date Range:	Jun 1 To Dec 31

KWH (channel: 4 Set: 0)

Daily Totals

SB09 85001



Thu Aug 20 2009 00:05 = 6,762.72

LAKE COUNTRY HYDROELECTRIC GENERATION

POWER STUDY

February 2006

PLANIT MANAGEMENT & SIGMA ENGINEERING LTD.

Case A	Determine available power based on design flows of up to 0.4 m^3/s matched to system (consumption) demands.
Case B	Determine available power based on utilizing available Vernon Creek flows up to 0.4 m^3/s.
Case C	Determine available power based on utilizing available Vernon Creek flows up to 0.77 m^3/s.

	Average Monthly Energy (1969-1995), MW-hr			**Actual 2009 Energy Produced, MW-hr**
Month	**Case A**	**Case B**	**Case C**	
Jan	25.02	78.97	78.97	
Feb	24.39	102.02	112.92	
Mar	29.43	169.78	196.31	
Apr	43.34	309.04	421.19	
May	167.7	436.69	761.71	
Jun	428.5	428.5	754.82	473.6
Jul	441.74	441.74	762.05	498.1
Aug	442.78	442.78	713.44	391.4
Sep	244.31	308.51	353.46	225.9
Oct	43.30	103.03	103.03	87.7
Nov	16.38	73.87	73.87	69.8
Dec	15.63	71.61	71.61	69.5
Avg. MW-hr per year (1969-1995)	1922.51	2966.56	4403.39	
Total MW-hr (1969-1995)	51908	80097	118891	
Avg. kW (12969-1995)	218.35	337.66	500.53	

2006 GMF FUNDING APPLICATION

The average energy has been calculated by running a simulation over all complete years of water survey data records.

Mean Monthly Flow Into Vernon Creek Pond Intake (1969-1995)					
Month	WSC 08NM 022 m^3/s	Catchment Runoff at Intake m^3/s	Total Mean Monthly Flow m^3/s	**Expected Average Total Energy for Each Month, MW.h**	**Actual 2009 MW.h**
Jan	0.117	0.012	0.129	79.00	
Feb	0.157	0.013	0.171	107.10	
Mar	0.219	0.024	0.243	181.10	
Apr	0.369	0.188	0.556	369.80	
May	1.348	0.473	1.821	573.40	
Jun	1.008	0.313	1.321	567.80	473.6 83%
Jul	0.772	0.085	0.857	585.50	498.1 85%
Aug	0.720	0.024	0.744	585.10	391.4 67%
Sep	0.373	0.025	0.398	331.61	225.9 68%
Oct	0.126	0.024	0.150	103.00	87.7 85%
Nov	0.104	0.025	0.129	73.90	69.8 94%
Dec	0.107	0.012	0.119	71.60	69.5 97%
Average	0.452	0.102	**0.553**		
Total				3628.91	

June to December Projected: **2,318.5 MW.h**

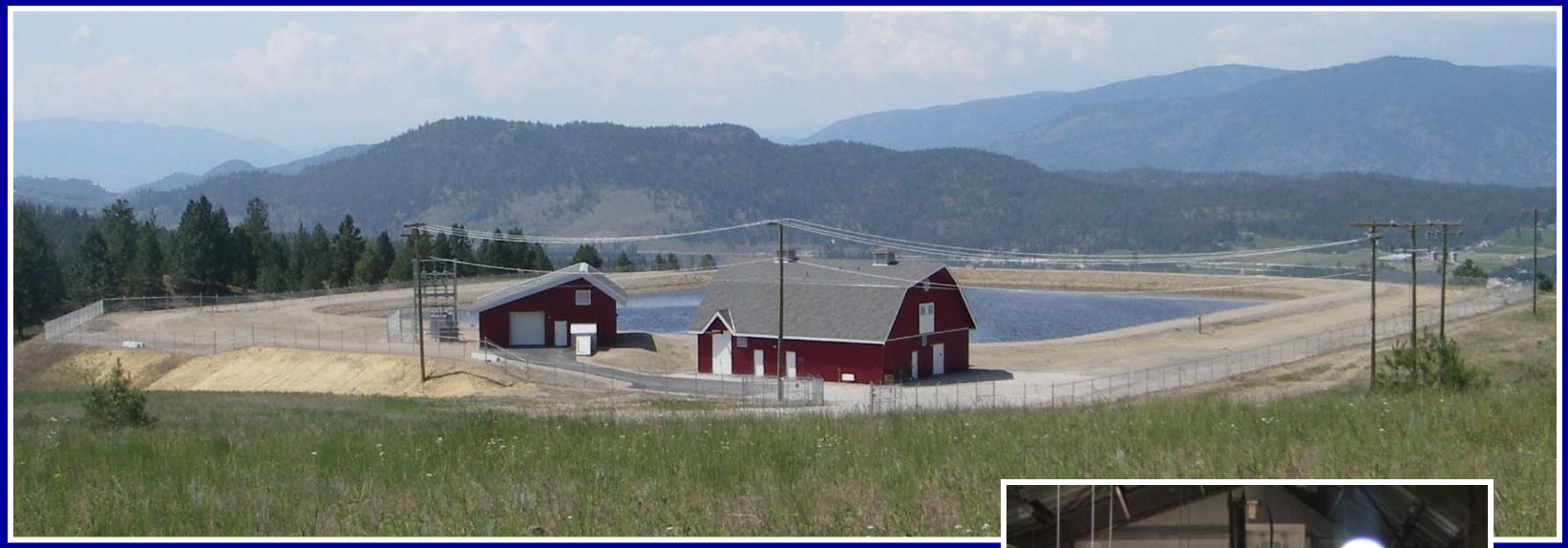
2009 June to December Actual: **1,816.0 MW.h (78% of projected)**

Lake Country Climate Action Fund

The District is creating a fund from the community power project to cover the cost of future projects and initiatives that help to reduce greenhouse gas and mitigate the impact of climate change. ($4.5 million over 20 years)

This will include such things as:

- environmental studies (watershed)
- feasibility studies (such as a second community power project)
- retrofit buildings and municipal infrastructure
- plant trees in parks



If you look hard enough at your municipal operations, there are all kinds of revenue generating ideas...

Summary

- Step 1: Verify Economic and Technical Feasibility
- Step 2: Find a Market for the Energy
- Step 3: Obtain Permits, Approvals, Licenses, Reviews
- Step 4: Raise Funds / Financing
- Step 5: Procure Services and Equipment
- Step 6: Construct Plant
- Step 7: Test, Commission and Operate System
- Step 8: Have a Party
- Step 9: Return Value for Ratepayers

Contacts for more information...

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Stephen Banmen
Director of Finance
District of Lake Country
Tel: 250 766 5650
treasurer@lakecountry.bc.ca

Appendix C: Media

1) Kelowna Daily Courier article - February 19, 2008
2) Kelowna Daily Courier article - May 22, 2009
3) BC Hydro/DLC Grand Opening Informational - June 25, 2009
4) BC Climate Action Toolkit Success Story Article

From www.kelownadailycourier.ca

LOCAL

Power is in the pipe

By CHUCK POULSEN
Tuesday, February 19, 2008

Lake Country's go-green pipe dream will probably take another step forward tonight.
Municipal council is expected to vote on the awarding of a contract for the design and construction of a hydro-generation project that would harness the power of water as it flows downhill in a pipe from an intake to the Eldorado Reservoir.
A turbine-generator from Canyon Industries in Washington state, placed inside the pipe, will turn the water flow into electricity.
"We're at the point where we are hiring our design engineers," said Lake Country administrator Randy Rose. "There are four proposals we are still reviewing, but, hopefully, we'll have a recommendation for council (today).
"It a pretty unique project, so we have to make sure they have the right expertise."
The intake is up a hill near Vernon Creek, with the pipe running down to the reservoir.
"Right now, there is all this energy in the pipe going to waste," said Rose.
"Our paybacks should be relatively short, some time between five and 10 years. It's part of our green initiatives. Like a lot of municipalities, we are looking at ways to do things more efficiently and reduce greenhouse gasses."
The electricity will be sold to B.C. Hydro and put on its grid for general distribution for at least the next 20 years. It's the equivalent of a supply for about 200 households per year.
"Longer term, we also have the ability to use it ourselves if we wanted," said Rose.
The budget for the project is $3.1 million. The municipality is expected to get $350,000 in eco credits from the federal government over the next 10 years as well as $200,000 per year from B.C. Hydro for the electricity.

From www.kelownadailycourier.ca

LOCAL

Lake Country ready to roll out power

By Daily Courier Staff
Friday, May 22, 2009

A municipally-owned hydro-electric system will start generating power in Lake Country by mid-June.
Testing is nearly complete on the $3.6-million system, which will generate about $215,000 in revenue for the District of Lake Country every year.
“That extra money coming in will be a big bonus for us,” Lake Country Mayor James Baker said Wednesday. “It‘s equivalent to the revenue that would have been provided by a three per cent tax increase.”
“Just this year, we had a wish list of projects totalling about $300,000 that we didn‘t approve because we didn‘t want to raise taxes that much higher,” Baker said. “This additional revenue from the hydro-electric station will give us more flexibility in the future.”
BC Hydro has entered into a 20-year-contract with the District of Lake Country to buy the electricity, town administrator Randy Rose says. “Council might decide to use the money for projects related to the environment, such as improving water quality,” Rose said.
The project is designed to harness the power of water as it flows down from Beaver Lake. A turbine generator has been placed in a pipe, turning the water pressure into electricity. The drop in elevation from Beaver Lake to Lake Country‘s built-up areas is more than 800 metres. So-called run-of-river power generation schemes emerged as something of a controversial topic during the recent provincial election, with the Opposition NDP saying the projects pointed toward greater privatization of hydro-electric resources.
But Baker said no such controversy surrounded the Lake Country project, because it‘s municipally owned and is also one of the smallest power-generation systems in the province.
“The dam structure up at Beaver Lake already exists,” Baker said. “All we‘re doing basically is using the water that comes down a pipe to produce electricity.”

This Week At BC Hydro

BC hydro
FOR GENERATIONS

James Baker, Mayor of Lake Country, and Norm Letnick, the MLA for Kelowna-Lake Country, helped inaugurate the Lake Country micro-hydro project

June 25, 2009

Lake Country's positive power

Posted by Jeanette Hoft

LAKE COUNTRY – Excitement was in the air with the inauguration of the Lake Country Hydroelectric Generating Station on June 25. Whether called a PPP: Positive Power Project or a CPP: Community Power Project, (courtesy of Lake Country Councillor Noreen Guenther) the official unveiling of the Lake Country Hydroelectric Generating Station reflected the positive spirit, energy and innovation of this great Okanagan community and its leaders.

Lake Country's Eldorado Reservoir was originally awarded an electricity purchase agreement in the 2006 Open Call for Power by BC Hydro.

Although there are other projects done in partnership with local governments, this 1.1 megawatt micro-hydro project is only the second using the municipal water reservoir, and the first where the municipality is the seller of the electricity to BC Hydro. The District of West Vancouver has a similar project.

The excitement was not only generated by the thought of green energy but also by thoughts of green dividends. The new project will provide a financial dividend to local taxpayers thanks to a long-term contract with BC Hydro. Lake Country will sell the anticipated 3,900 megawatt-hours per year (enough renewable energy to supply 400 homes per year) to BC Hydro, supporting its goal to achieve electricity self-sufficiency in B.C. by 2016.

The project was made possible by a nearly $2.8-million investment from the Government of Canada through the Gas Tax Fund and the ecoENERGY for Renewable Power initiative, and a $500,000 low -interest loan and $30,000 grant from the Federation of Canadian Municipalities' Green Municipal Fund, which is funded by an endowment from the Government of Canada.

A unique aspect of this project is that existing water infrastructure is utilized to generate power. The District of Lake Country will produce emission-free renewable energy from existing waterworks currently supplying water to the community. In this way, Lake Country can help to reduce the collective carbon footprint while minimizing environmental impact and generating revenue for the district.

Mayor Baker thanked the teams of BC Hydro and British Columbia Transmission Corporation (BCTC) for the successful completion of this interconnection project on time and budget. Taking advantage of the peak water use season by going into operation on June 3, the dollars started flowing in with the water flowing through.

Lake Country Hydroelectric Generating Station is a great example of the potential for communities to create renewable energy from everyday operations.

For further information on the Government of Canada's infrastructure investments in British Columbia visit www.creatingjobs.gc.ca. To learn more about Canada's Economic Action Plan, visit www.actionplan.gc.ca. For information on FCM's Green Municipal Fund, visit www.fcm.ca/gmf.

Last Modified: Jul 2, 2009

Lake Country's Positive Power Project

June 25, 2009

Lake Country, British Columbia – Excitement was in the air with the inauguration of the Lake Country Hydroelectric Generating Station on June 25, 2009. Whether called a PPP: Positive Power Project or a CPP: Community Power Project, (courtesy of Lake Country Councillor Noreen Guenther), the official unveiling of the Lake Country Hydroelectric Generating Station reflected the positive spirit, energy and innovation of this great Okanagan community and its leaders!

James Baker, Mayor of Lake Country obviously thinks that Norm Letnick, the Member of the Legislative Assembly for Kelowna—Lake Country is right on track singing the praises of this great initiative.

Lake Country's Eldorado Reservoir was originally awarded an Electricity Purchase Agreement (EPA) in the Financial Year 2006 Open Call for Power by BC Hydro.

Although there are other projects done in partnership with local governments, this 1.1 Megawatt micro-hydro project is only the second using the municipal water reservoir, and the first where the municipality is the seller of the electricity to BC Hydro. The District of West Vancouver has a similar project.

The excitement was not only generated by the thought of Green Energy but also by thoughts of Green dividends! The new project will provide a financial dividend to local taxpayers thanks to a long-term contract with BC Hydro. Lake Country will sell the anticipated 3,900 megawatt-hours per year (enough renewable energy to supply 400 homes per year!) to BC Hydro supporting its goal to achieve electricity self-sufficiency in BC by 2016.

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A unique aspect of this project is that existing water infrastructure is utilized to generate power. "The District of Lake Country is pleased to be able to produce emission free renewable energy from existing waterworks currently supplying water to the community," said James Baker, Mayor of Lake Country. "In this way we can help to reduce our collective carbon footprint while minimizing our environmental impact and generating revenue for the District."

"Our Government, under the leadership of Prime Minister Stephen Harper, understands the importance of supporting infrastructure projects that create jobs, stimulate the economy and improve our environment," said MP Ron Cannan. "This new Hydroelectric Generating Station will not only provide more cost effective energy, but will also support environmentally sustainable energy generation."

Lake Country's Positive Power Project

June 25 2009

Lake Country Deputy Fire Chief Brent Penner, MP Ron Cannan, Ken Guido EMPAC and Kathy Shaw and Muhammad Butt, both from BC Hydro

"Investing in green technology through the Gas Tax Fund allows B.C. communities to meet the needs of residents while protecting the environment and supporting sustainable growth," said MLA Norm Letnick. "This micro-hydro project will generate renewable energy for hundreds of Lake Country homes."

BC Hydro's Jeanette Hoft and Lake Country Councillor Noreen Guenther. Noreen is also UBCM's representative on BC Hydro's Electricity Conservation and Efficiency (EC&E) Advisory Committee

Mayor Baker thanked the teams of BC Hydro and BCTC for the successful completion of this interconnection project on time and budget! Taking advantage of the peak water use season by going into operation on June 3, the dollars starting flowing in with the water flowing through!

Some of BC Hydro's team members on the project: Eugen Bienias, Mike Hill, Muhammad Butt and Kathy Shaw

The federal Gas Tax Fund is a tripartite agreement between Canada, British Columbia and UBCM delivering infrastructure funding to local governments for capital projects that lead to cleaner air, cleaner water or reduced greenhouse gas emissions. UBCM administers the Gas Tax Fund in B.C. in collaboration with Canada and British Columbia.

"Lake Country's project is a great example of the potential for communities to create renewable energy from the everyday operations," said UBCM President Robert Hobson. "The initial investment for a project like this is steep, so the support from senior levels of government is appreciated."

And that's all for today folks! Until we have a happy announcement from Lake Country again!

BC CLIMATE ACTION TOOLKIT

An Old Idea Gets New Life: District of Lake Country's Turbine Generator

An Okanagan region is enjoying the benefits of hydroelectric generation from their reservoir.

The concept of the turbine generator project for the District of Lake Country (DLC) was first envisioned a century ago when the irrigation systems were being installed to water the newly planted orchards in the Okanagan. More recently (1992) interest was rekindled by a local electrical engineer who saw the benefits of the project and had the opportunity to incorporate it into the existing water system. The idea of hydroelectric generation didn't float, however, because of the element of financial risk[i] and hydraulic instability of water flow within the distribution system. The idea was not predictable enough and resources weren't available to garner the construction of a turbine.

In 2003, District Utility Manager Jack Allingham was approached by hydroelectric consultant Graham Horn about the possibility of starting a hydroelectric generation project using funding available from new government programs. The District was in the initial stages of planning a balancing reservoir to help stabilize water flow for irrigation and domestic use; this infrastructure was ideal for the development of a turbine. The predictable water flow would provide the hydraulic stability required for the use of a turbine. Allingham and Horn were able to conduct a feasibility study for a generation unit with funds from the Green Municipal Enabling Fund. While he was planning the reservoir, Allingham kept in mind the requirements of the turbine so that it may be built in conjunction with the reservoir or afterwards.

Planning for Power

As plans for hydroelectric generation began to take form, Allingham started to bring others into the planning process and began the development plan for a water license for the facility. A 2006 call for energy proposals from BC Hydro was the final push to encourage the project. By April of 2006, with the balancing reservoir committed to and in the preconstruction stage, the hydroelectric project went to district council and won support and approval. By August of the same year, DLC was able to sign an energy production contract with BC Hydro.

A large amount of work went into the studies and licenses that were needed to ensure that the project would be a success. Allingham and the development consultants played a key role in bringing this project to fruition, as things got underway individual councilors, additional staff and consultants, public advisory committees and outside agencies all became stakeholders. "We did a process of consultations, with government agencies and with First Nations, and we had to review a lot of policy around this kind of project. We looked at the Navigable Waters Protection Act and the Crown Land Tenure. We needed and Interior Health Construction Permit, an Interconnection Agreement and the Electrical Service Agreement," explained Allingham.

Over time, the project was brought into public view and discussed with residents and planners from other municipalities. Stories were run in the paper and tours were run for government agencies, municipalities, and First Nations leaders. Allingham says "the more people understood the project and the idea of hydroelectric generation from the reservoir, the more support we got."

Success Stories

Financial Flows of Hydroelectric Generation

The project did have its challenges, though. One of the major concerns around the generation project was the risk[i] involved in investing in such a large infrastructure which may not generate enough money to cover operating costs. Staff had initially shown concern that the project would leave them financially exposed. “The recommendation from the staff was not to do it,” Allingham said. Excited about the turbine, Allingham, took a step out and spoke up for the project. “I went to the water services advisory commission and urged them to go for the project. In the end it was ten against the project and one for, so it went to council, who voted unanimously in favour.”

The hydroelectric generation project cost a total of $4 million. The DLC received a two million dollar grant from the federal Gas Tax and another half a million through the Community Works Fund. The remainder of the capital was covered through low interest municipal loans and a 10 year production grant from Natural Resources Canada. The project finance committee has taken advantage of short term loans which will be paid off through the sales of electricity generated by the turbine.

Even in light of the financial risk that the project faced, DLC council was enthused about the hydroelectric generator from the get go. “District council wanted to be green and reduce their greenhouse gas (GHG[i]) emissions. The whole thing wasn’t primarily profit driven,” says Allingham.

It was three years after the bid to BC Hydro that the turbine was completed and commercially operative. The effort was worthwhile. Now the generator sells electricity to BC Hydro and runs with little supervision.

“As soon as we bid for a contract with BC Hydro,” says Allingham, “everyone from the District staff started to contribute and the whole organization get involved. Doing all the contract work meant that we needed legal support, and we got it.”The efforts of staff have meant that the District hasn’t had to hire on new personnel to run the facility. "In the summer, when the turbine was running for the first time, we may have shorted staff from other areas to manage the project. But now that we are through the start-up bugs we don’t expect the project to be onerous.”

This project was initiated, in part, to help the district meet its GHG reduction targets. The GHG targets were initiated by Mayor and Council and with that commitment they were prepared to take some risk with the construction of the hydro project. “Council began its commitment to GHG reduction and number of years ago and this commitment gave them the strength to go ahead on this project,” says Allingham.

Generating Power, Generating Profit

Though the project wasn’t profit driven, the revenue generated from the sale of electricity has been welcome by the municipality. Currently, much of the money generated is used to pay off the project, while some of the surplus revenue is being used to further green goals. The District is creating a fund from the community power project to cover the cost of future projects and initiatives that help to reduce greenhouse gas and mitigate the impact of climate change[i]. DLC expects to be able to contribute $4.5 million over 20 years.

Allingham notes that “the real money is going to be made when the loans are paid back. Much of the current income is going to pay for the project, which will take roughly 7 years. The life span of the turbine and generators is comfortable 35 years. We spent extra money so that it will last a long time. And, when the 20 year operating agreement with BC Hydro ends, we will have options around who we can sell energy to, and then we can really make some money.”

The hydroelectric turbine now produces enough electricity to power 400 homes and represents a reduction in the GHG[i] emissions of the District.

The generator is managed directly by the DLC. “When we started this project,” says Allingham, “I never envisioned council running the project. But at each step of the way the council had enough confidence to take on the project themselves.” The project has also been an opportunity for new and existing staff to learn about green technologies. “There is a whole new level of knowledge that the staff had have to rise to,” says Allingham. “For a number of staff this has been an awesome challenge.” The turbine has been a draw for one new employee, who was excited to work for DLC and get to learn more about hydrogenation.

Houston's green community initiatives.

Grand Forks is cycling its way to lower GHG emissions

Green power lights up the Alberni Valley

Naramata's Energy Efficient Water Treatment

T’Sou-ke Nation Community Hot Spot for Solar Power

Allingham notes that “this project has changed the district. The Official Community Plan now includes the hydroelectric turbine as a first step towards greening the community.” (see the Draft Official Community Plan April 16, 2010 here)

Source(s):

Contact: Jack Allingham, Utility Manager: T: (250) 766-5650 jallingham@lakecountry.bc.ca

"This project has changed the district. The Official Community Plan now includes the hydroelectric turbine as a first step towards greening the community."