# QUALIFYING REPORT ON: A HIGH-GRADE GEOTHERMAL RESOURCE IN THE CANADIAN ROCKIES; CANOE HOT SPRINGS, VALEMOUNT, BRITISH COLUMBIA

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### **SCHEDULES**

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Schedule BApplication for Geothermal Well Authorization
Schedule CLetter From Minister of Natural Resources (dated March 12, 2007)
Schedule DCarbon Credits (newspaper article)
Schedule EMap of BC Showing location of Valemount
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Schedule HFrequently Asked Questions on Geothermal Energy (7 pages)
Schedule I General Outlook of Environment Benefits by Mory M. Ghomshei, P.Eng., P.Geo.

# EXECUTIVE SUMMARY

This report provides a summary of geothermal resources associated with the Kinbasket Lake (Canoe Hot Springs) geothermal permit #55274 for Comstock Energy Inc. who holds 100% interest in the permit. See page 9

The geothermal permit area is located at about 32 km southeast the Town of Valemount, along the banks of the Canoe River (between the Malton Range of the Monashee Mountains and the Canoe Range of the Rocky Mountains).

The geothermal permit area includes a series of high-temperature geothermal manifestations (known as Canoe Hot Springs), spread over 1.5 kilometres along the Kinbasket Lake. The permit area is 550 hectares (consisting of 7 PNG grid units) and contains all the so far discovered hot springs along the Canoe Reach in the area.

The temperature of the fluids as they appear at the surface reaches 70oC to 80°C (at the bottom of some of the mud pots). These thermal issues are among the highest-temperature hot springs discovered in British Columbia (Ghomshei and Sadlier Brown, 1996). Based upon discharge rates and temperature, the undeveloped Canoe Hot Springs appear to exceed both Radium and Fairmont in geothermal potential.

Chemistry of Canoe Hot Springs suggests that the original geothermal fluids are probably at a much higher temperature (above boiling).

Conceptual geothermal modeling indicates the presence of an extensive geothermal reservoir with high permeability at a relatively shallow depth.

High temperature geothermal fluids can be brought to surface by production wells that can be drilled vertically or directionally from a platform within the permit area above the Kinbasket Lake.

The temperature of the resource at depth is probably high enough to warrant power generation (either by flash steam or by binary cycle).

The resource also offers an excellent potential for "direct use" applications in hot spring resorts, in greenhouse growing, aquaculture, district heating, hot spring hotels, many other recreational and industrial applications.

Extracted hot waters can be transported by a hot water pipeline to users located within a reasonable distance (e.g. new Valemount ski and tourist, real estate development, health spa facilities in the area). A market for the produced hot waters needs to be identified as part of a feasibility study.

### CLEAN GREEN RENEWABLE ELECTRIC ENERGY FROM GEOTHERMAL RESOURCE

In order to confirm and delineate the deep geothermal reservoir, it is recommended to conduct a more extensive exploration program. The corporation has made an application (with the Ministry of Energy, Mines and Petroleum Resources) for drilling a deep rotary well.

(Section 10.0 - Schedule B).

For confirmation of power potential a deep rotary hole is initially required (to a depth of 1,500 meters to 3,000 meters) in basement rocks. Particulars are set out in the application to drill for a Geothermal Well in the vicinity of Champagne Bay (within the permit area). The cost for a rotary hole and feasibility study (for power generation) is estimated at \$4,000,000 to \$7,000,000 depending on whether or not directional drilling is required.

The revenue from power generation depends on the reservoir temperature and available power existing capacity of the resource.

- (1) Assuming a 50 MW net power generation potential, the revenue from power sales can exceed \$35,000,000 per year potential
- (2) The Federal Government is granting an incentive of one cent per kilowatt hour for up to 10 years to eligible new projects that generate clean electricity from renewable sources which would exceed. \$8,000,000 (Section 10.0 Schedule C)
- (3) There is an undetermined profit on the sale of the transfer of carbon credits (Section 10.0 – Schedule D).
- (4) There is also a benefit in initial stages of drilling and exploration to purchase or sale of flow thru shares which has a major income tax advantage in the initial stages

### (5) A ready market for GREEN BASE LOAD ELECTRIC ENERGY FROM GEOTHERMAL RESOURCE to BC Hydro

(6) Condition to discovery of a high-temperature geothermal resource in the permit area, the capital cost for development of a 50 Megawatt flash steam power facility is estimated at \$120,000,000.

Other Potential Income from available Geothermal Resources include heat and hot water supply to:

(1) Hotsprings/health spa

- (2) Possible Hotel development site
- (3) Possible Real Estate Subdivisions
- (4) Current project Canoe Mountain Resort Inc. Master Plan
  (Section 10.0 Schedule F) for ski, gondola area and residential subdivision, which is influencing the over all area
- (5) Development is only 1<sup>1</sup>/<sub>2</sub> hours drive from the Jasper BC area and presently this area has an overflow of tourists.
- (6) Commercial Greenhouse developments

### 1.0 Introduction

### TERMS OF REFERENCE

I, Dr. Mory M. Ghomshei, P.Eng., P.Geo. was retained in March of 2006 (and again in June 15, 2007 as to reassessing the company's project) as a qualified consultant to compile and summarize the existing geological, geochemical, geophysical and geothermal information in connection with the geothermal potential of the Canoe hot springs (located in the geothermal permit #55274) and report on behalf of Comstock Energy Inc.

I, Mory Ghomshei, P.Eng. P.Geo. have conducted field investigations of the Property in 1994 and have recently reviewed various reports and made various recommendations, since 1994.

I, Mory Ghomshei, P.Eng. P.Geo. have performed exploration work on this Property and particularly the area where the geothermal permit #55274 issued by the Department of Energy and Mines, and Petroleum Resources, British Columbia, Canada, and have been researching this area specifically for geothermal potentials over the past 13 years

This study is intended to evaluate the geothermal potential of the geothermal permit #55274 near Valemount, British Columbia. (approximately one hour and thirty minutes drive west of Jasper, Alberta (Canada)). The spring's outlets are in the valley occupied by the Canoe Reach of Kinbasket Lake (Fig. 1), a reservoir controlled by Mica Dam. Prior to the dam construction, the hot springs were reported to be near the banks of the Canoe River, which has since been flooded by the reservoir (McDonald, 1978, 1991).

The reservoir level varies between 707m to 755m-asl (above sea level). The elevation of surveyed hot springs is 718.5m-asl to 723.5 m-asl.

The geothermal permit #55274 area is located at about 32 km (20 miles) southeast of the Town of Valemount (British Columbia) Canada on the west bank of the Canoe River (Kinbasket Lake). The permit area is 550 hectares (1350 +/- acres) and contains all the hot spring vents known as "Canoe Hot Springs".

Canoe Hot Springs are located in the Rocky Mountain Trench on the West bank of the Canoe River. Since the early 1970's they have normally been submerged beneath the surface of BC Hydro's Kinbasket Lake (reservoir). When the lake level drops below 723 m-asl, the hot springs start to emerge. The spring outlets were fully surveyed in April 1994 by the author (when the lake was at 716m-asl).

The present report provides a summary of the earlier findings from a geothermal energy perspective and evaluates possible applications of the resource potential, including co-production of green heat and power.

In pre-1994 studies, the temperature of the Valemount (Canoe) Hot Springs was recorded at 50°C and the discharge rate was estimated at about 3 L/s (e.g. Fairbank and Faulkner, 1992).

The 1994 survey provided a comprehensive temperature and flow survey, reporting temperatures as high as 67°C (as average of a cluster of springs) and a total flow rate of at least 14 L/S (Piteau Associates Engineering Ltd., 1994). In some individual mud pots (where hot water bubbles out in a muddy bed), the temperature reaches 70°C to 80°C.

Due to recent escalation of energy prices and scheduled reduction in greenhouse gas (GHG) emissions in Canada, there is a renewed interest in geothermal prospects, both for power generation and for direct use applications.

Within this context a geothermal permit was acquired in the Canoe Hot Springs area. This report reviews the geothermal energy potential (including geothermal power) of the acquired geothermal permit (55274). Recommendations are made to conduct further exploration (to confirm the extent and quality of the resource) and carry out a drilling program for varied development options.

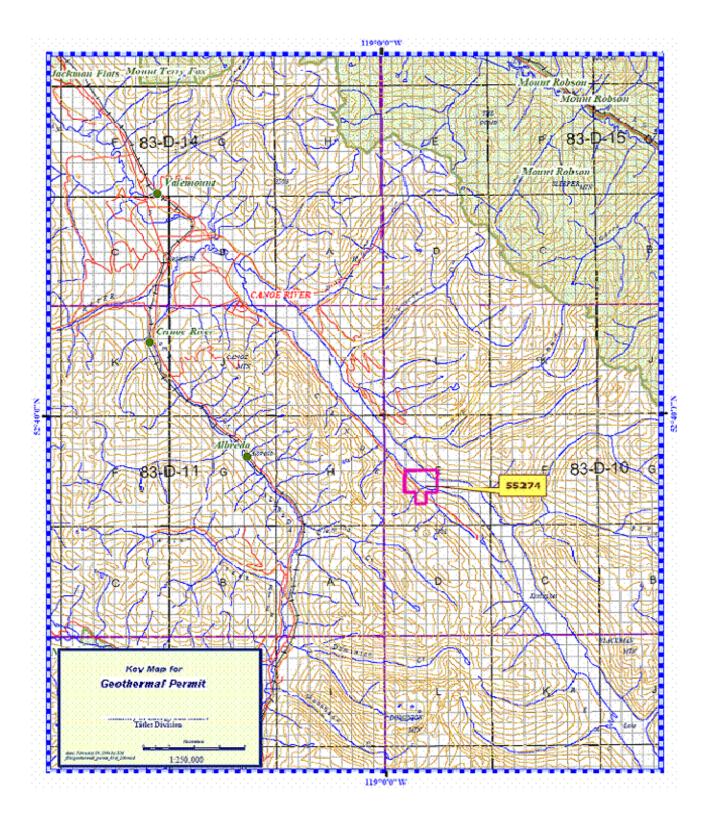


Fig. 1 Key Map for Geothermal Permit #55274

### 2.0 Property

2.1 Location, access, climate, and physiographic

The permit area (Property) is 550 hectares, consisting of 7 PNG grid units (Fig. 1 and 2) and contains all the hot spring vents known as "Canoe Hot Springs".

The Canoe Hot Springs are located 32 km south of Valemount (Fig. 1) on the west shores of the Kinbasket Lake Reservoir. They are accessible from the Yellowhead Highway #5 by 5 km of municipal road and then 27 km of upgraded forestry road (known as Canoe River West Forest Service road). This logging road is managed and maintained by Western Specialty Lumber of Valemount and is accessible year round subject to winter snow conditions.

The hot springs vents are located below the road accessible through about 1 ½ km of steep (40% slope) downhill descent, at the 26.7 km point on the Canoe River West Forest Service Road (The north and east coordinates of the springs are approximately 368,000mE and 5830,500mN on the NTS D/10 Ptarmigan Creek map ).

The hot spring area may also be reached by boat from the Valemount Marina or other points along the Kinbasket Lake, (which is the reservoir created by B.C. Hydro's Mica Dam). A boat launch access point can be reached at the 21.8 km point (from Valemount) along the East bank of the Canoe River. (this access was used in the 1994 survey).

Driving distances to Valemount from:

Jasper	= 120 km
Prince George	= 300 km
Kamloops	= 320 km
Edmonton	= 495 km
Vancouver	= 675 km
Victoria	= 722 km
(Section 10.0 – Schedule E)	)

The estimated elevation of the hot spring outlets range from 718.5m to 723.5m. The water level in the lake is subject to substantial seasonal fluctuations (from a springtime low of about 707 metres ASL to a summer high of about 755 metres ASL).

All hot spring vents are therefore submerged except in a period between March and June when the water level is at its lowest.

The average annual temperatures in the area range from a low of  $-15^{\circ}$ C to a high of  $-7^{\circ}$ C in January and a low of  $8^{\circ}$ C to a high of  $24^{\circ}$ C in July.

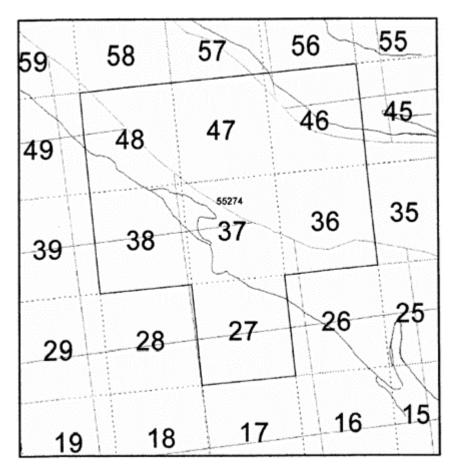


Fig. 2: Reference Map of Permit No. 55274 and PNG grid units

Based on a 50 year statistics, average daily minimum temperatures in the area range from -10.3°C in January to 9.4°C in July. Average daily maximum temperatures range from -5.2°C in January to 24.1°C in July. The average daily mean annual temperature is 4.9°C. The annual rainfall averages 713.4mm, the annual snowfall averages 653.1 cm, and total precipitation is a cumulative 1367.2mm.

Physiographically, the area is considered as high relief, with Mountain peaks at both sides of the lake (around the permit area) exceeding 2100m. The topographical relief provides a considerable hydrological head to push the low-density hot waters up in the valleys (i.e. on the banks of the Canoe River).

### 2.2 Geological Setting

The Canoe hot springs are located at the bottom of the valley formed by the "Rocky Mountain Trench", between the Malton Range of the Monashee Mountains and the Canoe Range of the Rocky Mountains (Fig. 1 and 3). The area is underlain by Upper Proterozoic rocks of the Malton Complex. These comprise quartz mica schist, amphibolite, hornblende and/or biotite quartz-feldspathic gneiss, quartzite, and granitic orthogneiss.

The area is also underlain by basement orthogneiss and mantling quartzite and marble (presumed Cambrian age). In the Canoe River Valley, the gneiss consists of well foliated granitic to quartz dioritic orthogneiss with porphyroblastic potassium feldspar and dykes of garnet amphibolite (Murphy 1990).

The basement rocks are overlain by a pebble to boulder conglomerate with normal and graded bedding (Simony et al., 1980).

The contact of the conglomerate with the basement gneiss is inferred to be an unconformity rather than a fault zone. (e.g. Campbell, 1968; Murphy, 1990).

Pell and Simonly (1981) describe the major northerly trending regional scale fault along the North Thompson River Valley to be a structural and metamorphic discontinuity between the Cariboo Mountains and the Monashee Mountains to the east.

Pell (1987) divided the Omineca Alkaline Province into three belts. Pell notes that the central belt extends 50 km westerly and approximately parallel to the Rocky Mountain Trench, and refers to this belt to be the Central Carbonatite Belt.

The area generally hosts multiply deformed and metamorphosed, sill-like bodies hosted by Late Precambrian to Early Cambrian metasedimentary rocks. The Rocky Mountain trench, a linear system of valleys, extends for approximately 1600 km from northern Montana to the British Columbia-Yukon border. In the southern Canadian Cordillera, Miocene lake deposits have been found in the southern Canadian part of the trench, indicating that the southern Rocky Mountain trench fault is significantly younger than the Mesozoic compressional structures of the Rocky Mountains. Thermal anomalies along the trench may be related to a younger tectonic which appear to be of extensional nature.

The Canoe Hot Spring area is bounded by three major faults (Fig. 3).

- (a) To the west the area is bordered by the North Thompson-Albreda Fault (normal with westerly dip).
- (b) The Purcell fault, striking east-west and dipping south, is located 5km to 10 km north of the Canoe Hot Springs.
- (c) To the east, the South Rocky Mountain Trench fault strikes NW-SE (along the Canoe River) and dips 70 degrees southwest. This fault appears to provide a conduit, bringing deep thermal waters to the surface.

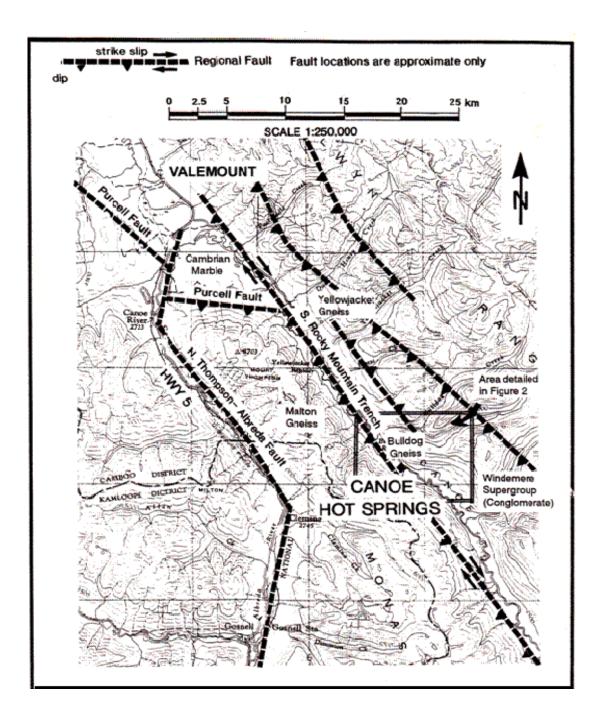


Fig.3: Main structures in the Canoe Hot Spring area. The Rocky Mountain Trench is possibly the main structure acting as a deep conduit for geothermal fluids.

### 2.3 Origin of the heat

There is no visible recent magmatic (plutonic or volcanic) activities in the vicinity of the hot springs. Nevertheless, quaternary basaltic flows have been reported at about 50 km southeast of the hot springs (e.g. Price et al., 1973). Recent magmatic activates (of basaltic nature) can therefore be considered as a possible heat source for the Canoe geothermal field

A second source, (In the absence of a young volcanic origin) for the heat can be the old basement gneiss (rich in natural radioactive elements) which may be considered as a plausible candidate for radiogenic heat source in the area.

A third plausible heat source may be related to the rising mantle in the Southern Rocky Mountain Trench (SRMT) (Personal communication with C. Hickson, from Geological Survey of Canada).

A fourth arguable heat source is the deep sedimentary basin in the SRMT which may allow deep hydrological convection regimes brining gradient heat from depth to the surface. This scenario is, however, less probable as chemical signatures of the hot springs indicate very high temperatures which are not common in sedimentary basins.

### 3.0 Field Observations

There are a large number of hot springs and mud pots on the west bank of the Canoe River (Fig. 4 to 7). The hot water streams commonly result from the joining of a cluster of mud pots and hot spring vents with different temperatures.

In the main cluster of mud pots (Fig. 5), located in a small area of about 5m2 (at the entrance of the main pool), recorded temperatures in individual issues varies between 40oC and 70oC (an exceptional temperature close to 80°C was measured by the author in the core of one of the mud pots) The total discharge of this cluster of hot pots is about 3L/s.

The temperature variations within the cluster are evidently due to different degrees of mixing of a single high-temperature brine with shallow cold waters. The evidence of such mixing at a larger scale is provided by geochemical data. Many of the hot spring issues in the permit area emerge from beneath a cover of forest debris and the lake silts. The presence of these issues is marked by erosion of the silt. The thermal issues visible on the ground are mostly in the form of "mud pots" (i.e. hot water bubbling and pouring out in a muddy bed). The mud pots are distinguished by a continuous bubbling noise associated with hot water and gases passing up through the mud. Green to blue-green algal mats were noted downstream of all hot mud pots and hot spring vents.

The North Zone springs (Fig. 5) are distributed primarily in a north trending localized depression, measuring 20m x 100m in plan, and about 4m below the surrounding ground.

A mixture of cold to warm springs (5oC to 26oC) issues from the west wall. At the base of the valley there are numerous "mud pots" (in a small depression). Temperatures measured in these mud pots varied from 6.7oC to 61oC. Waters issuing from these vents coalesce to form a small stream, with an average temperature of 23.6°C.

About 10 meters north of the western end of this depression, there is a group of very hot thermal vents, designated the North Pool springs zone (Fig. 4), which issue from an area approximately 3m in diameter. These springs have an average measured temperature of 65oC. The water from these springs appears to have been diverted into a dug-out pool for public use.

Between the depression and the lake, extends a low peninsula, approximately 120m wide. At the tip of the peninsula, several warm springs (approximately 15oC) were noted.

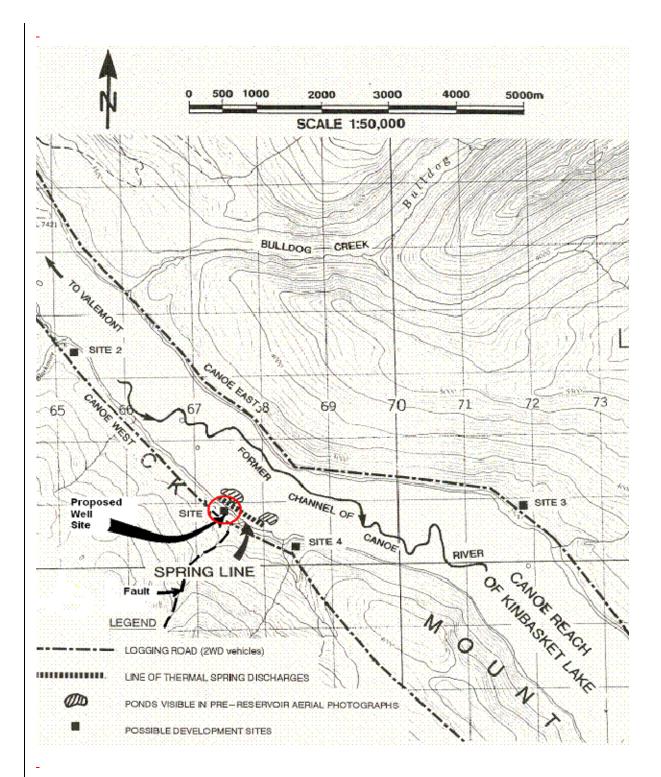


Fig. 4. Location of hot spring vents and a possible fault (acting as geothermal conduit)

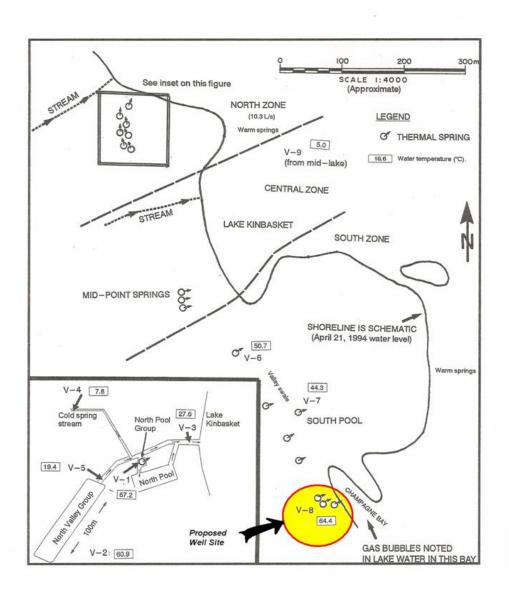


Fig. 5 - Location of the surveyed hot springs in the permit area. Hot springs are clustered in several locations along 1.5 km shore line in the permit area. Two pools are present in the north clusters. The pools are cooled by cold springs and used by local peoples. 18



Fig. 6 - Overview of northern hot spring area; looking south east

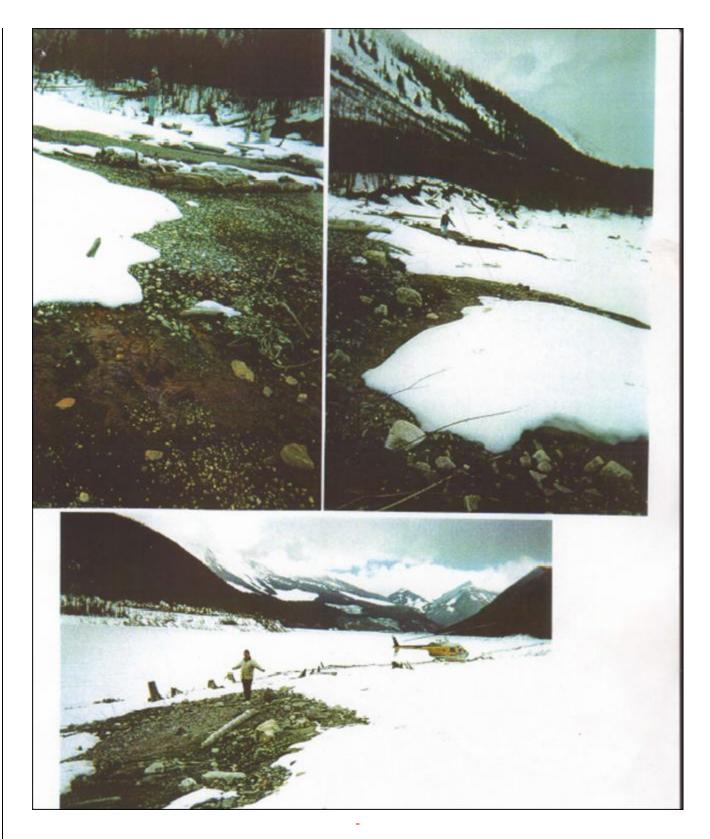


Fig. 7 Patrick McBride on site winter 1999 near North Pool

4.0 Flows and Samples

There are at least 100 hot springs and mud pots (see photographs) visibly spread over 1.5 km (Fig. 4 to 7). These hot springs are often clustered (Fig. 5). Samples were taken from combined clusters (pool) and also from cold waters to assess the degree of mixing. Water samples were taken from the following groups of hot spring vents and cold waters in the permit area (Fig. 5):

V-1:	North pool group
V-2:	Individual very hot mud pot in valley
V-3:	Stream combining all north zone springs
V-4:	Cold spring above the hot springs
V-5:	Stream from north group valley
V-6:	Very hot springs from south zone, emerging beneath stump
V-7:	South pool water
V-8:	Very hot spring above Champagne Bay in south zone – The location where the
	proposed well will be drilled

V-9: Kinbasket Lake from mid-lake

A variety of field methods have been applied to measure the discharge rates for each group (or cluster) of hot springs (Piteau, 1994). Mixing models (based on temperature and hydrogeochemical data) have been used to correct the measured flow data. At the time of site visit the combined flow from the hot North Pool group (V1) was estimated to be 3 L/s. The flow was visibly increased in late afternoon. The cause of observed diurnal variations may be related to solio-lunar effects and or barometric pressure (e.g. Leaver, 2005).

Flow from the South Group valley/swale group, including a cold spring, was 41 L/s. The estimated cumulative flow from all hot springs in the North Zone was estimated at 10.3 L/s. In the south area, most springs were isolated hot pots, issuing at rates of less than 1 L/minute.

The accumulated discharge from all inspected hot springs is conservatively estimated at about 14 L/s. Considering the numerous warm springs, noted throughout the area.

Considering the observed underwater discharges (e.g. in Champagne Bay where the corporation plans to drill the initial hole, Fig. 5), the total discharge of hot water in the permit area is believed to be higher than this estimation. A conservative estimation of the total emerged hot issues on the banks is possibly more than 20 L/s. Adding all submerged hot issues, the total geothermal fluid discharge from the area is possibly more than 50 L/s.

#### 5.0 Analytical Data

Temperature, pH and conductivity of the samples were measured at the field. Major ions (cations and anions) were analysed at A.S.L. (a Vancouver based laboratory, presently "A.L.S"). The field and laboratory data are given in table 1.

Judging the geothermal system by the hottest vents (V1, V2, V6, and V8), the fluids can be considered as being neutral (pH values between 6 to 8) and fairly conductive (1.4 to 1.6 S/cm). The fluids are, however, reducing, as indicated by low oxidation reduction potential (generally negative) and low dissolved oxygen at less that 10% of saturation at local elevation (see Piteau, 1994 for details).

Canoe River Hot springs, major ions and geothermometers															
		CN –	Т										Silica	Na/K	Na/Li
smpl	pН	F	°C	Cl	SO4	Ca	Li	Mg	K	Si	SiO2	Na	T °C	T °C	T °C
V1	7.97	1523	67.2	318	227	30.7	0.813	0.774	30.9	30.3	64.93	306	114.4	239.6	273.8
V2	7.3	1442	60.9	316	219	25.2	0.802	0.601	33.7	37.3	79.93	318	125.0	244.0	268.2
V3	7.78	526	27.6	108	79.9	15.4	0.279	0.613	11.9	12.5	26.79	106	74.8	249.3	272.7
V4	7.8	58	7.8	0.05	4.5	11.9	0.015	0.816	2	2.09	4.48	2	15.2	NA	NA
V5	8.08	282	19.4	52.6	40.5	10	0.154	0.491	6.7	8.53	18.28	58.7	60.1	250.9	272.4
V6	8.03	1580	50.7	310	220	27.9	0.747	0.907	25	21.1	45.21	293	97.2	224.9	269.3
V7	8.14	1156	44.3	244	184	28.2	0.612	1.07	22.6	21.8	46.71	233	98.7	236.0	272.5
<mark>V8</mark>	<mark>6.01</mark>	<mark>1376</mark>	<mark>64.4</mark>	<mark>266</mark>	<mark>219</mark>	<mark>25.9</mark>	<mark>0.722</mark>	<mark>0.61</mark>	<mark>25.3</mark>	<mark>30</mark>	<mark>64.29</mark>	<mark>281</mark>	<mark>113.9</mark>	<mark>229.5</mark>	<mark>270.1</mark>
V9			5	1.3	9.8	12.4	0.015	2.62	2	2	4.29	2	14.0	NA	NA
CN = I	Electric	conducti	vity, L=	= Labora	atory m	easuren	nent, F =	field mea	asureme	ent (mic	ro-S)				
all concentration in mg/L, all temperatures (T) in deg C															
V4 = cold spring above the hot															
springs															
V9 = F	Kinbask	et Lake (	Canoe I	River)											

Table 1: summary of analytical data and calculated chemical temperatures (geothermometers). Silica geothermometer is possibly affected by extensive mixing with cold waters.

### 5.1 Comparison with Other Hot Springs

Compared to the Canadian Coastal range hot springs (e.g. Meager Creek; Ghomshei et al., 1986, 1993), the Canoe Hot Spring waters demonstrate a low salinity despite their relatively high temperature. The waters are characterized by relatively low concentrations of sodium and chloride, similar to hot springs in, Monoram Utah, Steamboat, Nevada (in the United States), and Rotorua in New Zealand (e.g. Glover and Mroczek, 1997, Wright, 1991). The springs also demonstrate medium concentrations of bicarbonate (Piteau, 1994) and sulphate. The waters demonstrate neutral to slightly basic pH. No silica or carbonaceous precipitates were visible in the inspected area.

There are several hot spring systems within or very close to the Rocky Mountain Trench (Souther and Halstead, 1973; Van Everdingen, 1972; Fairbank, 1992; Jessop et al., 1991) which include Radium and Fairmont Hot Springs. Radium Hot Springs has a temperature of 45.5oC, and a flow of about 25 L/s issuing from a prominent fault zone. The Fairmont hot springs comprise six main springs that range in temperature from 30oC to 45oC and have a combined flow of about 6.3 L/s.

Based on discharge rates, fluid temperatures, and extent of surface manifestations, the undeveloped Canoe Hot Springs appear to exceed both Radium and Fairmont in geothermal potential.

# 5.2 Hydrogeochemistry and Geothermometers

All the samples collected from the 1.5 km long inspected area, demonstrate relatively similar chemistry (Table 1). Constant elemental ratios and linear correlation of chemically conservative elements (e.g. Na and Cl) with conductivity and temperature (Fig. 8) suggest that there is a single brine at the origin of all surface manifestations. This single brine has reached equilibrium with the reservoir rocks. Fast ascent to the surface has not allowed a second near-surface re-equilibration. Elemental concentrations in different vents, are therefore the result of a simple concentration-dilution process (i.e. different degrees of mixing with cold waters and or different degrees of steam loss). This is evidenced in the elemental correlation by a regression line passing through the origin of the coordinates (Fig. 8).

It is therefore suggested that a chemically uniform reservoir is at the origin of all sampled hot spring outlets. The chemistry and temperature of this reservoir can be calculated using the correlation between enthalpy and elemental concentrations. Crosselemental linear correlations combined with linear correlations between enthalpy of the fluids and some of the major ions (e.g. Na, Cl, SiO2) were used to calculate the mixing rates. It is useful to note that values of temperature in degrees Celsius are approximated by values of enthalpy in cal/gm in the range of 0 oC to 2000C (Ghomshei et al., 1986).

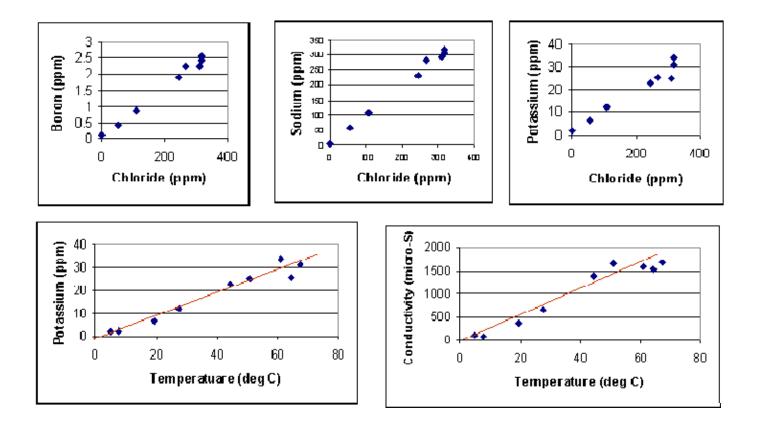


Fig. 8 In Canoe hot springs, linear elemental correlation (passing by the origin) combined with linear correlation between temperature and chemistry indicates that mixing with cold (non-saline waters) is the main reason for reduced temperatures.

### 6.0 Reservoir Temperature

Considering that Canoe Hot Spring waters have been subjected to extensive mixing (with cold water), the silica concentration will be considerably less than that of a chemically equilibrated reservoir. The silica geothermometer of individual samples (Fig. 9) will therefore provide only a low temperature estimate of the original brine.

Sodium/potassium and sodium/lithium Geothermometers (Fournier, 1981, Fournier and Truesdell, 1974), on the contrary, are not affected by any concentration-dilution process and can be indicative of the highest temperature at which the waters have reached chemical equilibrium with the reservoir rocks.

High surface temperatures and relatively high flow rates, suggest that the geothermal fluids have been rising rapidly to the surface. Under these conditions, re-equilibration of potassium during ascent seems unlikely. Also, the fact that Na-K-Cl correlations are linear and pass by the origin, proves that potassium has not been re-equilibrated and that Na-K geothermometer can reflect the reservoir temperature.

.While maximum silica (quartz) temperature of individual samples is 135oC (Fig. 9), the Na/K temperatures converge towards 230oC and Na/Li temperature approaches 260oC (Fig.9).

The discrepancy between the silica and alkaline geothermometers are to some extent due to mixing. (i.e. dilution). Silica geothermometer can, however, be corrected for mixing or possible steam loss (Ghomshei et. Al.,1986). A more accurate estimation of reservoir temperature based on silica concentrations can be obtained from extrapolating the quartz-temperature regression to the quartz saturation curve. This temperature which is about 170oC is based on a simple mixing scenario (PIteau 1994).

Assuming a maximum steam loss (i.e. adiabatic cooling to 100oC) prior to mixing with shallow cold waters, a lower reservoir temperature of 135oC can be obtained from silica geothermometer (Fig. 9).

This scenario is however unlikely, due to relatively high sulphate and bicarbonate values which imply lack of extensive steam loss. One can yet assume the presence of a transitional reservoirs at shallower levels, where the ascending deep waters are subjected to extensive mixing. Considering the extensiveness of the surface manifestations, it is possible that the shallower

reservoir is associated with a geothermal convective cell, rising to the surface. The maximum temperature of this near-surface reservoir will be boiling temperature at surface (i.e. about 100oC).

Discrepancies between the maximum quartz temperature and alkali temperatures (Table 1) may also be related to the fact that silica is less conservative than alkali elements, especially in a fracture dominated reservoir (e.g. Glover and Mroczek, 1997). This is evidenced by comparing chloride correlations with silica, sodium and potassium (Piteau, 1994).

Considering that alkali metals (Na, K, Li) are generally aquaphilic and their ratio is not affected by the kinetics of the reservoir, they can be reliable indicators of water/rock equilibrium conditions (e.g. Banks et al., 1999).

The deep reservoir temperature may therefore be as high as 230oC to 260oC, as inferred by Na-K and Na-Li geothermometers, respectively (Fig. 9). This estimation, however, needs to be re-evaluated by more extensive hydrogeochemical and geophysical surveys.

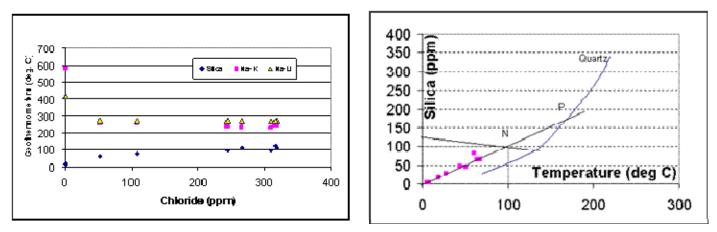


Fig. 9. Silica and multi element (Na/K, Na/Li) geothermometers for different samples indicate that the original geothermal fluids are possibly fit for power generation (i.e. above 200°C)7.0 Permeability of the Reservoir

Relatively high surface temperatures and lack of evidence for potassium re-equilibration indicates rapid fluid movement in the geothermal system. It is therefore suggested that the permeability at depth is controlled by open fracture systems. In this case, the reservoir permeability is possibly related to the Purcell fault (and other faults parallel to it), SRMT, and local fault systems perpendicular to the river (Fig. 3 and 4). Moreover, the spread of the outlets over a large area indicates that either the reservoir permeability extends to the surface, or an uncapped near-surface transitional reservoir (with a convective regime) reaching the surface dilutes the deep waters and brings them to the surface. The latter appears to be a plausible scenario, considering the extensive near-surface mixing, as indicated by the chemistry of the outlets.

#### 8.0 Summary of Reservoir Evaluation

Canoe Hot Springs are associated with a shallow and a deep fracture-controlled reservoirs. The deep reservoir temperature may be about 230oC to 260oC, as inferred by Na/Li and Na/K geothermometers. A near-surface geothermal cell appears to connect the rising deep fluids to the surface hot spring manifestations. The temperature of the uncapped shallow reservoir is estimated at close to 100oC (boiling temperature).

The permeability necessary for a productive geothermal reservoir appears to be available in the conglomerate overlying the basement gneiss. Considerable secondary permeability is also expected to be present in the Purcell Fault (and other faults parallel to it), SRMT and local faults perpendicular to the river. Detailed bedrock geology, structural mapping and drilling are, however, necessary for confirmation, delineation and characterization of a productive reservoir.

The deep high temperature waters may be targeted for power generation by flash steam technology.

The shallower reservoirs can be tapped into, for resort development, health spa, direct use applications and also power generation (using binary cycle technology).

CLEAN GREEN RENEWABLE ELECTRIC ENERGY FROM GEOTHERMAL RESOURCE 9.0 (A) Power Generation Development Prospects

The prime objective for the reservoir temperatures and permeability assessment, is to justify deep exploration for geothermal power development.

The deep reservoir (which remains to be confirmed) can be used for power generation. In case of power generation, the waste heat from the power plant can be used for a variety of direct use energy applications.

If the deep reservoir waters are above  $180^{\circ}$ C (as inferred by chemical geothermometers), there would be a potential for power generation through common flash steam technology. The cost of electricity generation in this case would be competitive (i.e. 5 cents to 7 cents per kWh).

Note that due to proximity of BC Hydro Power lines and a substation (a few kilometers from the site), the cost of connecting to the grid is expected to be as low as \$5 - \$10 million (for a 50 MW operation), Included in the overall projection. (Section 10.0 – Schedule G)

9.0 (B) Alternate Development

Commercial development prospects of the site include resort health spa, recreational, hotel site, subdivisions, greenhouses and other "direct use" applications. A shallow reservoir may be tapped into for direct use applications and possible power generation by binary cycle.

The heat from the site can be transported via hot water pipelines (up to 15 km) to different facilities.

Any facility set up for commercial power development will requires terrain that is either currently relatively level or gradable to level for supporting buildings and parking areas. Elevation of such level areas should be close to the elevation of the spring (or close to the wellheads) in order to minimize pumping costs.

From topographic maps, there appear to be several flat areas sufficiently close to the resource area to be potentially developable (approximately 200 acres). This site is shaded - see Fig 10 (the white area on the map indicates the development land for such a project within the permit #55274 area). Relatively the area is approximately 1½ km south of well site along the west shore road south of the spring access point. This site can be ideal for resort development.

Based on the existing, knowledge of subsurface conditions at the site, the optimum site for deep drilling may be located on the hillside immediately above Champagne Bay, just above the highest anticipated maximum lake elevation of 758m-asl.

In the case of a lower reservoir temperature (about 80 to120°C), binary cycle can be used to generate electricity. The price of power generation in this case would be higher (but still viable for small scale generation, up to 10 MW).

Based on the existing data, the resource appears to present potential for direct use applications and power generation. Deep drilling is, however, necessary to confirm the power generation potential of the resource.

Regardless of power generation potential, a variety of direct use applications make the resource commercially viable for its heat energy potential. Presently about 20 L/s of hot waters (at a temperature of above 50°C) is present in the form of surfaced hot springs. With drilling into the reservoir, it is estimated that much larger volume of medium grade geothermal fluids (with temperatures of 70°C to 90°C) can be produced.

Schedule A Copy of Geothermal Permit #55274



April 18, 2006

File: T23279

Patrick McBride Comstock Energy Inc. 11-170 Rutland Rd Kelowna BC V1X 3B2

Dear Patrick McBride:

TRANSFER: Geothermal Permit 55274 OUR REGISTRATION NUMBER: T23279 YOUR FILE NUMBER: na

Please find enclosed:



Transfer Summary page

Yours truly,

Christine McCarthy Examiner Oil and Gas Titles Branch. (250) 952-0341

Enclosures

Ministry of Energy, Mines and Titles Division Petroleum Resources

Mailing Address: PO Box 9326, STN PROV GOVT VICTORIA BC V8W 9N3 Location: 6lh Floor, 1810 Blanshard Street VICTORIA BC

Telephone: (250) 952-0542 Facsimile: (250) 952-0331

### Schedule A – Geothermal Permit #55274 (2 pages)

# SHIEL LE CORNA

# Province of British Columbia Ministry of Energy and Mines ASSIGNMENT GEOTHERMAL RESOURCES ACT

Know all men by these presents that:

SEA TO SKY ONSEN INC. - P.O. Box 1515, Squamish, British Columbia. VON 3G0 Phone: (604) 932-7871

(Name of Transferrer)

for and in consideration of the sum of One Dollar (\$1.00) in hand, the receipt whereof is hereby acknowledged, DO BY THESE PRESENTS bargain, sell, assign, and transfer unto

COMSTOCK ENERGY INC. - #11 170 Rutland Road N., Kelowna, British Columbia. VIX 3B2

Phone: (250) 765-5116	Fax: (250) 765-5142		BL.
	(Pearing of Transferree)	the second second to an interval the second s	P
its heirs, executors, administrators, and	assigns an undivided <u>100</u> % right	, title, and interest in and	100

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	-	2015 20-205 40-40 33Z14

(Insert title number and type (pents), losse or delling license), or indicate schedule of title attached).

as described in the said title(s), issued at Victoria, BC, and the transferor hereby covenants that it has good title to the aforesaid and right to transfer the same.

IN WITNESS WHEREOF the parties have executed this Assignment as of the day of

/ cerel , 20 06 at Squamish , in the Province of British Columbia

TRANSFEROR:

Name and Title Mike Sulo President

hlame deand Address of Company Sea Personal country Retired

515 McDoneki Ronet Eckman, BC VIX NB

TRANSFEREE:

to altic time of Securitory Patrick J. McBride President

15

-0-Av Name, Title and Address of With is or Company Sea **Browd Lymphi** 

Retired 515 McExceld Road Extonte: EC VIX 90 Schedule B



Titles Division P.O. Box 9326,Stn Prov Govt 6th Floor, 1810 Blanshard St Victoria, BC V8W 9N3 ATTN: Mr. Greg Wagner

Phone: (250) 952 -0542 Fax: (250) 952 -0331

# APPLICATION FOR GEOTHERMAL WELL AUTHORIZATION

orm must be submitted under the authority of the Geothermal Resources Act. R.S.B.C 1996, c. 171, Petroleum and Natural Gas Act.R.S.B.C. 1996, c. 361, Seothermal Drilling and Production Regulation, to the Ministry of Energy and Mines, at the address noted above, accompanied by the required fee (as pecified in Section 2 of the Geothermal Resources Administration Regulation) and survey plan. Information collected on this form will be used for public ecord in accordance with of the Geothermal Drilling and Production Regulation.

						For Officia	Use Only			
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Directionally Drilled?	Well Authorization No.:									
Surface Coordinates:	approx: 367000	)mE 5831	1300mN on	the NTS [	D/10			Ground Elevation: 7	85 m asl	
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Commencement Date May 2007	Hole Location UTM	S 1 87	Objective mation(s)		nterval or oth (mTVD)	N	mTVD	mMD	Total Depth	
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de:: January 17 <sup>p</sup>	2007.	Ph	one No. (6	04) 780 8	599		FAX No.	(604) 822 55	599	
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### Schedule B - Application for Geothermal Well Authorization

Schedule C

Minister of Natural Resources Canada

Ministre des Ressources naturelles Canada

Ottawa, Canada K1A 0E4

MAR 1 2 2007

Mr. Patrick J. McBride President Comstock ENERGY Inc. 106–145 Asher Road Kelowna, British Columbia V1X 3H5

Thank you for your letter of February 3, 2007, in which you provided information on the Canoe Hot Springs geothermal project in British Columbia.

On January 19, 2007, the Prime Minister, the Right Honourable Stephen Harper, announced that the Government of Canada will invest \$1.5 billion to encourage the development of low-impact renewable electricity sources such as geothermal, wind, small hydro and biomass. Under the ecoENERGY for Renewable Power program, the Government will provide an incentive of one cent per kilowatt-hour for up to 10 years to eligible new projects that generate clean electricity from renewable sources.

Details on the ecoENERGY for Renewable Power program will be released in early April 2007. I would encourage you to visit the government's ecoENERGY Web site at <u>www.ecoenergy.gc.ca</u> to obtain future information on this and other ecoENERGY programs.

Again, thank you for writing on this important matter. Please accept my best wishes with your project.

Yours sincerely,

un

The Honourable Gary Lunn, P.C., M.P.



Schedule I

General Outlook of Environmental Details by Mory M. Ghomshei, PEng, PGeo.

Environmental benefits

Both Federal and Provincial governments have recently announced significant funding for alternate energy programs to reduce Canada's and British Columbia's emissions of Greenhouse Gases. The funding is mostly aimed at reducing Canadian Greenhouse gas emissions. Geothermal energy (in the form of electric power or heat energy) is considered as the most important clean alternative energy in British Columbia, to contribute to GHG reduction.

B.C. has the potential to add 3,000 MW of geothermal electric power capacity over the next decade with an accompanying displacement of 4,000 MW of fossil-fuel burning for space-heating requirements by developing its Geothermal Energy Systems resources and technology. This is equivalent to ~75% of BC-Hydro's current hydro-generation capacity. Demand for such clean and "green" electricity will be high in the United States and in Alberta. It can off-set some of the very high greenhouse gas emissions from coal-burning power plants in the U.S. and from oil-sands operations in Alberta.

The time has never been better for British Columbia Geothermal Energy resources to claim their rightful place as a major contributor to greenhouse gas reduction. While Canada's high-temperature geothermal power-generating resources are predominately within British Columbia, the generated power can be cost-effectively wheeled to Alberta and the Prairies. Canoe Hot springs are specially well located to provide clean power to Alberta (should a cosmetically viable geothermal power resource be confirmed and developed at the site).

BC Energy Plan

Two Elements of the B.C. Energy Plan relate extremely well to Geothermal Energy Systems:

- 1. A levy of less than one percent on domestic consumer utility bills will be used to collect \$25 million each year for the "Innovative Clean Energy Fund". The fund will be used to "encourage commercialization of alternative energy solutions and new solutions for clean remote energy";
- 2. To encourage the use of biomass energy and wood killed by the mountain pine beetle, a bio-energy strategy will include a BC Hydro call for proposals for electricity from sawmill residues, logging debris and beetle-killed timber.

The 2007 BC Energy Plan confirms many of the ideas contained in a recent report from the GLOBE Foundation that shows how B.C. can become energy self-sufficient by 2025 from renewable sources alone, while simultaneously reducing greenhouse gas emissions to levels well below those of the year 2000. The Endless Energy Report states that a sustainable energy economy in B.C. based on renewable energy sources is more than simply possible, it is essential. The renewable energy potential is such that B.C. can be 100% energy self-sufficient within 20 years without undue social or economic hardship. Moreover, as well as providing long-term, secure, and stable energy supply for B.C.'s economy, this policy will insulate the province from world energy shocks yet to come.

Geothermal Energy Resources can provide B.C. with economic opportunities to supply clean and green" energy to customers both inside and outside. British Columbia. With tapping into these resources, B.C. is poised to become the North American capital of "Green Energy" production and to play a major role in demonstrating how using geothermal energy can impact on the Climate Change crisis.

Of all the alternative sources of energy, none is as clean as Geothermal Energy Systems. Virtually no emissions of the so-called greenhouse gases are created by geothermal resource exploitation. In addition, geothermal has zero NOx and CO emissions

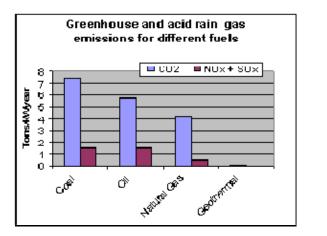
### Canada EcoTrust Program

On February 12, 2007, Prime Minister Stephen Harper announced a new Canada ecoTrust program to support provincial projects that will result in real reductions in greenhouse gas emissions and air pollutants. Quebec will be supported with \$349.9 million while the province of B.C. will receive \$220 million. All provinces will receive appropriate funding based on their current populations. The Canada ecoTrust for Clean Air and Climate Change is designed to allow each province and territory to develop technology, energy efficiency, and other projects to provide real results towards reducing GHG emissions. Canada ecoTrust was established using part of the 2006-07 budgetary surpluses. The resources for the Canada ecoTrust initiative consist of 1.5 billion dollars of new funding on a national basis as contained in the March 2007 Federal Budget.

The Government of British Columbia will dedicate its share of the Trust Fund to environmental initiatives that make real, measurable contributions to reducing air pollution and greenhouse gas emissions that include:

- Providing clean electricity in remote rural areas now fuelled by diesel;
- Supporting new geothermal and bio-energy projects, including capture of biogas from landfill sites;
- Extracting energy from sawmill scrap and wood infested with pine beetles;
- Conducting hydrogen fuel cell R&D for both stationary and mobile uses;
- Development of the "hydrogen highway" from Vancouver to Whistler in time for the 2010 Winter Olympics and eventually, stretching all the way from BC to California.

Assuming 50 MW geothermal power and 10 MW direct use heat generation at the Canoe Hot springs, the project will contribute to more than 300,000 tonnes of GHG reduction per year. Presently this has a at least a value of 4 million dollars per year (considering the present Canadian GHG market of \$12/tonne). The real environmental value of the project is significantly higher than this (see Fig. 11 below).



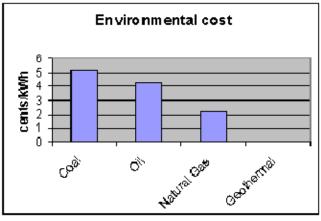


Fig. 11. - Real environmental value of the project

### 11.0 Conclusions and Recommendations

Information available on the resource should be based on all geophysical survey and information for drilling to date, and the Directors of Comstock Energy Inc. are of the opinion that they have sufficient information to proceed ahead with deep geothermal drilling and possible directional drilling if required, An application for deep drilling has been sent to the government authorities and the drilling permit is in process. (Section 10.0 - Schedule B)

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# CERTIFICATION

in this report entitled "QUALIFYING REPORT ON: A HIGH-GRADE GEOTHERMAL RESOURCE IN THE CANADIAN ROCKIES; CANOE HOT SPRINGS, VALEMOUNT, BRITISH COLUMBIA (CANADA)" I am the independent Geologic Engineering Consultant that was retained during March 2006 by Comstock Engineering Inc. i surveyed and sampled the hot springs in the permit area in 1994 and contributed to the 1994 report by piteau associates engineering Itd, AND REVIEWED DOCUMENTS PERTAINING TO SAME.

i hereby grant comstock energy inc. of kelowna, british columbia (CANADA), permission to use this report as a qualifying report for the canoe hot springs property.

I, Mory M. Ghomshei, P.Eng., P.Geo., of 4623 Byrne road, burnaby, british columbia, canada, v5j 3h6 certify and declare I am a Professional Geoscientist and Professional Engineer registered in the Province of British Columbia (Canada). I have a Master's of Engineering Degree (in Mining) from the University of British Columbia (canada) and a Doctor of Engineering Degree (in Geothermics) from the University of Paris. I am a Registered Member of the Association of Professional Engineers and Geoscientists of British Columbia, canada since 1992 with double status (P.Eng., P.Geo). i have been director of the Canadian Geothermal Energy Association since 1986 and teaching a graduate course on Energy resources at the university of British columbia since 1999, and, as such, am a qualified person for the purposes of this report.

I have been working as a geoscientist and a mining engineer in canada since 1984. most of my work has been on geothermal energy. My experience includes conducting geological/geochemical studies, in B.C. and yukon in relation with the cordilleran geothermal (and canoe hot spring resources, 1994). I have conducted reservoir engineering, geological and hydro-geochemical studies, well-logging, core analysis and geostatistical ANALYSIS IN relation with several geothermal prospects in Canada (such as meager creek geothermal project) and around the world

i have no interest, direct or indirect, in the properties that are the subject of this report or securities of comstock energy inc. and the canoe geothermal permit

M. Ghamshei

MORY M. GHOMSHEI, P.ENG., P.GEO.

Vancouver british columbia, canada June 15, 2007 mory m. ghomshei, p.eng., p.geo.

Curriculum Vitae Mory M. Ghomshei Email: mory@interchange.ubc.ca P.O. Box 4301, Vancouver, B.C., V6B, 3Z7 Tel : 604 – 780 8599

SURNAME: Ghomshei (Mohieddin Ghomshei)

FIRST NAME: Mory (Morteza) MIDDLE NAME(S): Mohieddin

### POST-SECONDARY EDUCATION

University or Institution	Degree	Subject Area
University of Paris XI (Orsay) & Ecole Normale Supérieure de Paris	D.Eng. (Ph.D.)	Mineral and Energy Producing Materials
University of British Columbia	M.Eng.	Mining and Mineral Process Engineering
University of Tehran (Faculty of Engineering)	Master of Engineering (5yrs continuous Mining Engineer Program)	Mining Engineering

Professional Qualifications / Affiliations

Registered Professional Engineer (P.Eng.) and Professional Geoscientist (P.Geo.) with Association of Professional Engineers and Geoscientists of British Columbia (APEGBC). Chair of the Canadian Geothermal Energy Association (CGEA).

## EMPLOYMENT RECORD

University, Company or Organization	Rank or Title	Dates
Gasmaster Industries	Director of Business Development	2005 - 2006
University of British Columbia, Department of Mining Engineering	Adjunct Professor / Senior Research Scientist	1998 – Current
University of British Columbia, Department of Mining Engineering	Manager of Centre for Environmental Research in Minerals Metals and Materials (CERM3)	2001 to 2005
Freelance Consultant (Energy and Mining)	Freelance Consultant	1991 – Current
Orchard Resources	Director of Research (gold mining, geothermal energy))	1988 – 1991
University of British Columbia, Dep't. of Geophysics and Astronomy (now Earth and Ocean Sciences)	Post-Doctoral Fellow / Research Associate (in-mine geophysics/geology)	1985-1989
B.C. Hydro	Geothermal Reservoir Engineer	1984 - 1985
French Atomic Energy Commissary (CEA) & COGEMA	Miniing Engineer (Trainee)	1979 and 1982

### OTHER RELEVANT INFORMATION

As a Director of a public company ("North Pacific Geopower", presently "Western Geopower") from 2000 to 2002, I supervised deep (1200 m) core drilling projects in the Meager Creek area (near Pemberton, B.C.). I have continued to a member of the advisory committee of Western Geopower (2002 to present) in their deep rotary drilling and reservoir evaluation programs. Western Geopower has plans to enter the production phase in 2007 ( http://www.geopower.ca/technicalteam.htm ).

Presently I work with "Golder Associates" as an international expert on Geothermal Energy, preparing environmental guidelines for 'World Bank.

I have served as the chair of the Canadian Geothermal Energy Association (CGEA), since 1988. In Association with CGEA, I have organized numerous conferences, seminars, and workshops in Canada and abroad on Geothermal Energy. I have also led a number of Canadian Geothermal business delegations to the Pacific South East in 1993.

I served on the Steering Committee of the Renewable Energy Conference, 2001-Vancouver.

I prepared and presented workshops (in Canada and abroad) on Mining Environment and energy

I prepared educational material on geothermal energy for Natural Resources Canada (N.R. Can.)

In 1993, I headed a Canadian Industry delegation to the Philippines to negotiate contracts with the Pilipino Government in the areas of energy and environment.

I helped organize several IPMM conferences (Intelligent Processing and Manufacturing of Materials), 2001-Vancouver, 2003-Sendai, Japan.

Publications Record

### SURNAME: Ghomshei (Mohieddin Ghomshei)

FIRST NAME: Mory (Morteza) MIDDLE NAME(S): Mohieddin

## 1. REFEREED PUBLICATIONS

(a) Journals

- 1. F. Moreno, C. Anderson, R. Stewart, B. Robinson, M.M. Ghomshei, J.A. Meech, 2005. "Induced plant uptake and transport of mercury in the presence of sulphur-containing ligands and humic acids", Plant and Soil Journal, accepted for publication, pp.35.
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## 8. PAPERS IN PROGRESS

- 1. Stable isotope hydrology of Britannia Mine, British Columbia, Canada
- 2. Geothermal potential of Con Mine, British Columbia, Canada.
- 3. Geothermal Potential of Canoe hot springs

4. Review of Sabalan Geothermal Project

### 9. TECHNICAL REPORTS

Author/coauthor of more that 100 technical reports in areas related to Geothermal Energy, Mining/Mineral Exploration, Mineral Processing, Environmental Site Assessment, Environmental Risk Assessment, Mining Environment (ARD), Mining/Geophysical Instrumentation, and geostatistical analysis.