BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

H.A. Simons (International) Ltd. - Hat Creek Project - Report on Single Status Construction Camps - September 1977 and Revision May 1978

ENVIRONMENTAL IMPACT STATEMENT REFERENCE NUMBER: 42

SEPTEMBER, 1977 4142A

BRITISH COLUMBIA HYDRO
HAT CREEK PROJECT

REPORT ON
SINGLE STATUS CONSTRUCTION CAMPS

PRELIMINARY ENGINEERING

CAPITAL COST ESTIMATE

SCHEDULE

H. A. SIMONS (INTERNATIONAL) LTD.
CONSULTING ENGINEERS

425 CARRALL STREET
VANCOUVER, B. C.
CANADA V6B 2J6

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HASENG-VANCOUVER
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AREA CODE 604

September 16, 1977

British Columbia Hydro and Power
Authority
700 West Pender Street
Vancouver, B.C. V6C 2S5

Attention: Mr. C.K. Harman
Project Manager - Offsite Facilities

Dear Sirs:

Re: Hat Creek - Camp Facilities for Single Labour
Engineering Services

We are pleased to submit our preliminary engineering report on the above in accordance with the terms of reference set out in your invitation of June 24, 1977.

We would like to acknowledge the excellent co-operation which our staff has received from your personnel during this urgent assignment and we look forward to assisting you in the further development of this project.

Yours very truly,

H.A. SIMONS (INTERNATIONAL) LTD.

N.G. Andersen,
Manager - Site Development
and Transportation

BSR:lc

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May 31, 1978

British Columbia Hydro and
Power Authority
700 West Pender Street
Vancouver, B.C. V6C 2S5

Attention: Mr. C.K. Harman
Project Manager - Offsite Facilities

Dear Sirs:

Re: Hat Creek - Camp Facilities for Single Labour
Engineering Services

We are pleased to submit this update of our preliminary engineering report and construction estimate as requested in your letter of May 2, 1978.

The basic parameters for the design and location of the camps are unchanged from our original proposal. However, this revised report does incorporate any modifications of project concept that have developed since our initial submission in September 24, 1977. The principle modifications are:

- altered site layout with changes in camp location.
- substitution of ground water from a deep well as the water supply for both camps as well as for the Power Plant construction.
- increased camp's population.

We look forward to assisting you in finalizing the design for this project.

Yours very truly,

N.G. Andersen
Manager - Site Development
and Transportation Division

KAB:ksm

A. SUMMARY OF RECOMMENDATIONS

The proposed locations of the two camps as detailed on B.C. Hydro drawing 604H-Z31-X020001 R1 are in general agreement with the H.A. Simons concept developed in September 1977. Construction camps could be built at each of the proposed locations.

The power plant construction camp will be in use for 8-10 years. It is expected to have a peak population of 1,800 to 2,000 men for 2 to 3 years. Leasing camp units for more than 2 years becomes uneconomic. It is therefore recommended that B.C. Hydro purchases all buildings for this power plant camp. The proposed layout is suitable for starting the camp with a small core and expanding it as required by the manpower build-up.

The estimate is based on 42 men, straight line, single story bunkhouses. They appear to be the most economical choice when considering the purchase price, and they are being used in many recent camps.

For the mine camp, the original proposal, of purchasing the core buildings and residences and leasing additional residences as required, is still recommended.

The water from the deep well should be acceptable for camp use. Water softening equipment installed after the potable water pumps may be required to make the water acceptable for washing. The two water storage tanks should be located near to each camp to facilitate maintenance.

The sanitary effluent from both camps should be spray irrigated during the summer months and impounded the rest of the year. The original concept of deep well injection for the mine camp effluent now seems unacceptable as the main water source is a deep well located near to the mining camp.

The estimates of the capital cost of the facilities are as shown below. The details of these estimates are contained in this report.

Power Plant Construction Camp	$14,053,400
Mine Camp	$ 4,157,500
Water Supply	$ 512,500
Power Supply	$ 1,075,000

The construction schedules developed in the original report are still valid.

B. LOCATION AND LAYOUT OF THE CAMPS

The Power Plant construction camp is moved to sloping ground on the west of construction site, but still within walking distance of work areas. Because of the terrain, the camp buildings will have to be installed on terraces, stepping down the slope. This will minimize otherwise expensive grading costs.

The camp's kitchen/dining complex should be located near to the construction site, with an assembly area in front of it. A 500 man kitchen would be installed at the beginning with only one 500 man dining complex. It could be expanded as camp population increased. Two diners would be on opposite sides of the kitchen, allowing convenient phased construction.

The residence buildings would be located around the kitchen/dining complex farther away from the construction site. The most economical residential unit would be a single story complex housing about 42 men and built to Trades Council Standards. Each complex would be composed of 8 trailers connected together on site. These 42 man residences are lightly built and can be quite noisy, resulting in staff dissatisfaction. Therefore, when considering the long-term usage of the core of this camp and the potential cost to the project through worker turnover and general dissatisfaction, it may be advisable to reconsider the type of accommodation.

Due to the preliminary nature of this report, it was not possible to obtain meaningful cost data for other types of camp buildings. It is recommended that, when tenders are called for camp buildings during the detailed design phase, the specifications are worded in such a manner, as to solicit from vendors any proposals for potentially more satisfactory accommodation. The best type of camp buildings can then be selected, after considering all costs to the project.

Because of the larger population, it is recommended that concrete walks be installed. Covers over the walkways should not be required in the climate of the Hat Creek area.

The mine camp is in basically the same area as described previously. Also the camp population has not altered significantly from the July 1977 estimates. The general proposals to house and feed the mine workers would not change from the September 1977 report.

The main concern would be in the later stages of mine development that the reduced population (30) would make the central kitchen/dining complex very inefficient.

In 1990 when the camp population is reducing, the mining camp could be replaced with some alternate such as mobile homes, or at least, a smaller kitchen/diner complex might be substituted.

C. WATER SUPPLY AND DISTRIBUTION

The water system for the Hat Creek construction project is detailed on the attached schematic. Water will be supplied from a deep well located at 5,627, 473N and 599 507E. Assuming 50 gpd per capita, the power construction camp would require 109,200 gpd and the mine camp would use 30,000 gpd. In addition the power plant construction site would require 103,200 gpd. Therefore a proposed consumption of 242,400 gpd (168 gpm) is anticipated.

A pump in the deep well will transmit water at 200 gpm to a 200,000 gallon storage tank near the mine camp. This storage tank will act as the source of potable and fire protection water for the mine camp. A booster pump will also remove water from this tank and lift the water up to the 500,000 gallon reservoir near the construction camp site. This half million gallon reservoir will be a source of potable and fire protection water for the construction camp as well as being the source of construction water for the initial stages of the work. Later, the contractor may choose to erect further tanks on site to act as sources of construction and fire protection water. No allowance is made for piping the construction water to the site.

As in the original proposal, the lower 100,000 gallons of both tanks will be reserved for fire protection.

The water supplied from the deep well developed and tested by Goldem Associates can be classified as a hard highly mineralized water. (See attached test results). This water would require treatment of some type to make it acceptable for camp use. We propose water softening to remove the calcium and magnesium ions from the water. This would remove the 'hardness' which

cause scales in pots and reduces the efficiency of soaps. The water would still have a 'ground water' taste common to most rural supplies. The Ministry of Health, Kamloops branch, which has authority in the Hat Creek area, has given us verbal approval that the water would be safe and acceptable for human consumption.

To remove most of dissolved solids from the water would be quite expensive, and is normally not done with waters of 1230 mg/l T.D.S. Possible methods of removing the dissolved solids include:

- distillation of the drinking water
- reverse osmosis
- chemical treatment with sedimentation and/or filtration

An allowance to install one of the above systems would be in the range of $200,000 for the construction camp and $100,000 for the mine camp. In addition, an operating cost of about $3 to $6 per 1,000 gallons would be expected.

Chlorination of the entire water supply is recommended to eliminate bacterial contamination of the water in the distribution system and to minimize organic growths in the storage tanks. A taste problem should not develop as organic compounds are not present which the chlorine could react with.

D. SANITARY EFFLUENT TREATMENT AND DISPOSAL

The sanitary effluent treatment systems proposed in the September 1977 report can be used for the enlarged camps.

The disposal of the treated effluent however has to be reconsidered. Previously, the effluent from the power construction camp was directed to Harry Lake. By the time this construction camp had reached its peak population, the bottom ash disposal pond would be built at Harry Lake. The evaporation from the resulting large pond was to be the disposal method.

However, since the ash disposal pond has moved and the camp population has increased, the excess treated effluent should be disposed of by spray irrigation during the summer months. An allowance to construct a dam to raise the water level of Harry Lake has been included. The raised Harry Lake could then hold 6 months effluent from the 1820 man camp. It is proposed to raise the lake by 3 m, increasing its area from 1.8 Ha to 5.5 Ha.

Disposal of the treated sanitary effluent from the mine camp should also be by spray irrigation. The original concept of deep well injection is not recommended as the water source is not located near the mine camp area. To allow spray irrigation, an impoundment lagoon of six months capacity will have to be excavated.

If required it would be possible to pump the Mine Camp effluent up to Harry Lake for disposal with the construction camp wastes. However costs for this arrangement would be higher than separate spray irrigation systems.

E. POWER DISTRIBUTION

The Power Distribution system for the enlarged camps would be as detailed in our September 1977 report. The power would be supplied by B.C. Hydro at 12.47 Kv.

Resident heating should be electric. Street lighting would be provided as well as automobile block heaters for 50% of the population.

The expected winter loads are 9000 Kva for the Construction Camp, 2,400 Kva for the Mine Camp and 700 Kva for the Water Supply.

These loads have been modified from the previous report as the apparent load from the bunkhouses is reduced.

F. MISCELLANEOUS CONCERNS

Propane, Heating, Air-conditioning, Emergency Power and Catering are all handled as detailed in our original Proposal.

can test ltd.

1650 PANDORA STREET, VANCOUVER, B.C. V5L 1L6 • TELEPHONE 254-7278 • TELEX 04-54210

Report On Analysis of Water Samples File No. 5126 C

Report No.

Reported to Golder, Brawner & Associates Date April 5, 1978

224 W. 8th Avenue

Vancouver, B.C.

Attention: Mr. A. Dakin

We have tested the sample of water submitted by you on April 3rd 1978 and report as follows:

SAMPLE IDENTIFICATION:

The sample was submitted in a plastic bottle labelled:

Sample # 53

METHOD OF TESTING:

The analyses were carried out in accordance with procedures described in:

"Standard Methods for the Examination of Water and Wastewater (14th Edition)" published by the American Public Health Association, 1975.

RESULTS OF TESTING:

(on following page)

RESULTS OF TESTING:

pH		8.20	
Conductivity		1470.	micromhos/cm
Total Dissolved Solids		1230.	mg/l
Dissolved Anions			
Alkalinity			
Bicarbonate	HCO_3	464.	mg/l
Carbonate	CO_3	Nil	-
Chloride	Cl	8.0	mg/l
Sulfates	SO_4	392.	mg/l
Dissolved Cations			
Calcium	Ca	59.8	mg/l
Magnesium	Mg	59.1	mg/l
Potassium	K	24.5	mg/l
Sodium	Na	220.	mg/l
Iron	Fe	L 0.03	mg/l
Manganese	Mn	0.05	mg/l

L = Less than; mg/L = milligrams per liter (or parts per million for drinking water)

REMARKS:

The water as represented by the sample submitted can be characterized as a hard, highly mineralized water. It is noted that the sample meets the limit set by "Canadian Drinking Water Standards and Objectives, 1968" for the parameters tested, except total dissolved solid (limit 1000 mg/l). The dissolved manganese is noted to be borderline (limit 0.05 mg/l).

CAN TEST LTD.

(Ms) Judi M. Mitchell, B.Sc.,
Chemist

cp

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA SUMMARY

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	1820 MAN POWER PLANT CAMP					
	Site Preparation & Services		174,500	317,100	1,345,000	1,836,600
	Camp Buildings		8,476,700	845,800	2,894,300	12,216,800
	Capital Cost		8,651,200	1,162,900	4,239,300	14,053,400
	Catering and House Keeping			19,000,000	18,500,000	37,500,00
	(Not included in total)					
	500 MAN MINE CAMP					
	Site Preparation & Services		114,400	143,800	471,700	729,900
	Camp Buildings		2,247,600	283,700	896,300	3,427,600
	Capital Cost		2,362,000	427,500	1,368,000	4,157,500
	Catering and House Keeping			7,100,000	7,000,000	14,100,000
	(Not included in totals)					
	Water Supply		50,000	110,000	352,500	512,500
	Power Supply & Distribution		211,250	353,100	510,650	1,075,000
	Contingency (Capital Cost)		900,000	100,000	500,000	1,500,000
	Design & Construction Services		282,000			282,000
	TOTAL CAPITAL COST		12,456,450	2,153,500	6,970,450	21,580,400

ESTIMATED CATERING COST

POWER PLANT CAMP

Year	Men in Camp	Estimated Daily Rate	for 360 day/year	Cost per Year
1980	165	$20	$ 1,188,000	
1981	405	12	1,749,600	
1982	505	12	2,181,600	
1983	1,494	12	6,454,100	
1984	1,810	12	7,819,200	
1985	1,820	12	7,862,400	
1986	1,305	12	5,637,600	
1987	765	12	3,304,800	
1988	180	18	1,166,400	
			37,363,700	
		Say	37,500,000	

MINE CAMP

1981	60	20	432,000	
1982	170	18	1,101,600	
1983	170	18	1,101,600	
1984	480	12	2,073,600	
1985	500	12	2,160,000	
1986	345	12	1,490,400	
1987	305	15	1,647,000	
1988	305	15	1,647,000	
1989	300	15	1,620,000	
1990	30	25	270,000	
1991	30	25	270,000	
1992	30	25	270,000	
			14,083,200	
		Say	14,100,000	

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA POWER PLANT CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	SITE PREPARATION					
1	Surveying & Investigations		Not included			
2	Selective Clearing & Grubbing					
	39 Acres				44,000	44,000
3	Stripping of Top Soil				134,000	134,000
4	Grading - Allowance				22,000	22,000
5	Pit-run Gravel Fill Graded and					
	Compacted				250,000	250,000
6	Storm Drainage			9,000	25,000	34,000
7	Crushed Gravel Sub-base, Roads					
	and Parking			66,000	54,000	120,000
	Paving - 2"			82,000	60,000	142,000
	Concrete Walkway			10,000	16,000	26,000
	SITE PREPARATION TOTAL			167,000	605,000	772,000

Simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA POWER PLANT CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	WATER DISTRIBUTION & FIRE					
	PROTECTION					
1	Storage reservoir 500,000 Gal.		54,000	6,000	11,000	71,000
	Fabric Tank c/w accessories					
2	Pump House c/w sump			10,000	12,500	22,500
3	Fence			2,000	3,000	5,000
4	Fire Pump c/w diesel drive					
	1,000 GPM @ 100 psi		25,200	500	5,000	30,700
5	3-Potable Water pumps					
	500 GPM @ 80 psi		13,000	1,000	5,000	19,000
6	Starters and Controls		Under Power Distribution			
7	Valves & Piping in Pumphouse		4,000	7,000	6,000	17,000
8	Heater for Tank		3,000		1,000	4,000
9	Allowance for Water Softening		30,000	5,000	10,000	45,000
	and chlorination					
	SUB TOTAL		129,200	31,500	53,500	214,200

simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA POWER PLANT CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	WATER DISTRIB.& FIRE PROTECTION					
10	Distribution Piping			21,600	19,600	41,200
11	47" Risers 2" ø			17,600	12,000	29,600
12	6 Hydrants			5,000	4,000	9,000
13	8 Valves c/w Boxes			2,800	5,000	7,800
14	Car Wash		300	300	1,000	1,600
15	Excavation and Backfill				200,000	200,000
16	2 Hose Cart c/w Hose & Equip.					
	and Shelter		20,000		6,000	26,000
	SUBTOTAL		20,300	47,300	247,600	315,200
	WATER DISTRI.& FIRE PROTECTION TOTAL		149,500	78,800	301,100	529,400

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA POWER PLANT CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	SANITARY SEWER SYSTEM					
1	4" Risers, Including Cleanouts			23,000	26,000	49,000
2	6" Riser including Cleanout			600	700	1,300
3	6" Sewer Pipe			7,800	10,000	17,800
4	8" Sewer Pipe			8,300	9,000	17,300
5	10 Manholes			5,400	5,600	11,000
6	Excavation and Backfill				156,000	156,000
	SANITARY SEWER TOTAL			45,100	207,300	252,400

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA POWER PLANT CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	EFFLUENT TREATMENT & DISPOSAL					
	Lagoon including clay linings				40,000	40,000
	Aeration Equipment: 2-20 HP					
	Blowers, aerators and piping		20,000		4,000	24,000
	Blower Structure			1,500	3,000	4,500
	Chlorination			3,000	2,000	5,000
	Piping from lagoon to impoundment lagoon			10,000	36,000	46,000
	Blower MCC's and Wiring		(Included in Power Supply)			
	Dam & Overflow structure					
	at Harry Lake for impoundment				130,000	130,000
	Allowance for spray		5,000	9,000	14,000	28,000
	Irrigation:Sprinklers, pipings					
	and pumps.					
	Irrigation pumps, MCC & Wirings		(Included in Power Supply)			
	EFFLUENT TREATMENT TOTAL		25,000	23,500	229,000	277,500

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA POWER PLANT CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	PROPANE GAS					
1	3 Risers			400	200	600
2	Piping			2,000	2,000	4,000
3	Fence			300	400	700
4	Tanks & Vaporizer		By Gas	Vendor		
	PROPANE TOTAL			2,700	2,600	5,300

AREA: CAMP BUILDINGS 1820 MAN POWER PLANT CAMP

YEAR	MEN	NO. OF UNITS (42 MAN) TOTAL	ADD	PURCHASE $	MAINTENANCE REFURBISHING ALLOWANCE $ 3% year	TOTAL $
1980	165	5	5	914,000	27,400	
		Kitchen & 1st Dining		1,515,800	45,500	
		Recreation		173,600	5,200	
				2,603,400	78,100	2,681,500
1981	405	10			78,100	
			5	914,000	27,400	
					105,500	1,019,500
1982	505	13			105,500	
			3	548,400	16,500	
					122,000	670,400
1983	1494	36			112,000	
			23	4,204,400	126,100	
		2nd Dining		634,700	19,000	
		2nd Recreation		157,900	4,700	
				4,997,000	271,800	5,268,800
1984	1810	44			271,800	
			8	1,462,400	43,900	
					315,700	1,778,100
1985	1820	44	0		315,700	
					315,700	315,700
1986	1305	32	-12		249,900	
					249,900	249,900
1987	765	19	-13		154,800	
		Remove				
		2nd Diving				
		2nd Recreation				
					154,800	154,800
1988	180	5	-14		78,100	
					78,100	78,100
T O T A L				$10,525,200	$1,691,600	$12,216,800.

NOTE: It is assumed that salvage cost will cover removal of camp buildings at the end of the project.

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA MINE CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	SITE PREPARATION					
1	Surveying and Investigations		(Not included)			
2	Selective Cleaning & Grubbing					
	15 acres				13,000	13,000
3	Stripping of Top Soil				10,000	10,000
4	Grading				10,000	10,000
5	Pit Run Gravel Fill				30,000	30,000
6	Storm Drainage			2,000	3,000	5,000
7	Crushed Gravel Sub base,					
	Roads and Parking			21,000	17,000	38,000
8	Paving - 2"			26,000	19,000	45,000
9	Bituminous Walkway			1,000	1,000	2,000
	SITE PREPARATION TOTAL			50,000	103,000	153,000

Simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA MINE CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	WATER DISTRIB. & FIRE PROTECTION					
1	Storage reservoir 200,000 gal.					
	Fabric tank c/w accessories		32,000	5,000	8,000	45,000
2	Pump house			10,000	12,500	22,500
3	Fence			800	1,000	1,800
4	Fire pump c/w diesel drive					
	1000 GPM @ 100 psi		25,200	500	5,000	30,700
5	2-Potable Water Pumps					
	500 GPM @ 80 psi		8,400	500	3,000	11,900
6	Starters and controls		(Under Power Distribution)			
7	Valves & Piping in Pumphouse		2,500	5,000	4,000	11,500
8	Heater for tank		3,000		1,000	4,000
9	Allowance for water softening		13,000	2,000	5,000	20,000
10	Distribution Piping			18,000	18,000	36,000
11	14 Risers, 2" ø			5,400	3,600	9,000
	SUB TOTAL		84,100	47,200	61,000	192,400

simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 24, 1978

PROJECT No. 4142 A AREA MINE CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
12	4 Hydrants			4,000	3,000	7,000
13	6" Valves c/w Boxes			2,100	3,700	5,800
14	Car Wash		300	300	1,000	1,600
15	Excavation & Backfill				90,000	90,000
16	Hose Cart c/w Hose & Equipment					
	and Shelter		10,000		3,000	13,000
	SUBTOTAL		10,300	6,400	100,700	117,400
	WATER DISTR. & FIRE PROTECTION TOTAL		94,400	53,600	161,800	309,800

simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA MINE CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	SANITARY SEWER SYSTEM					
1	4" Risers, including cleanouts			7,000	8,000	15,000
2	6" Sewer Pipe			6,300	8,200	14,500
3	Grease Trap			2,000	3,000	5,000
4	5 Manholes			2,700	2,800	5,500
5	Excavation & Backfill				80,000	80,000
	SANITARY SEWER SYSTEM TOTAL			18,000	102,000	120,000

Simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA MINE CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	EFFLUENT TREATMENT					
	Lagoon including lining				9,000	9,000
	Aeration Equipment		15,000		2,000	17,000
	MCC's and Wiring		(Included in Power Supply)			
	Piping from lagoon to impoundment lagoon			10,000	36,300	46,300
	Chlorination			3,000	2,000	5,000
	Blower Housing			1,500	3,000	4,500
	6 months impoundment lagoon				40,000	40,000
	Allowance for spray irrigation : Sprinklers, pipings & pumps		5,000	5,000	10,000	20,000
	Irrigation Pumps MCC & Wiring		(Included in Power Supply)			
	EFFLUENT TREATMENT TOTAL		20,000	19,500	102,300	141,800

simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA MINE CAMP

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	PROPANE GAS					
1	3 Risers			400	200	600
2	Piping			2,000	2,000	4,000
3	Fence			300	400	700
4	Tanks & Vaporizer		By Gas	Vendor		
	PROPANE GAS TOTAL			2,700	2,600	5,300

B.C. HYDRO - HAT CREEK PROJECT — PROJECT NO. 4142 A

AREA: CAMP BUILDINGS — 500 MAN MINE CAMP

YEAR	MEN	NO. OF UNITS (42 MAN) TOTAL	ADD	PURCHASE OR LEASE $	MAINTENANCE REFURBISHING ALLOWANCE $ 3% year	TOTAL $
1981	60	2	2	365,600	11,000	
		Kitchen		673,500	20,200	
		Recreation		103,800	3,100	
				1,142,900	34,300	1,177,200
1982	170	5			34,300	
			3	548,400	16,500	
					50,800	599,200
1983	170	5	0	0	50,800	
					50,800	50,800
1984	480	12 (3 lease)			50,800	
			4	731,200	21,900	
			(3 lease)	261,600	7,900	
				992,800	80,600	1,073,400
1985	500	12 (3 lease)	0		72,700	
				120,900	3,600	
					76,300	197,200
1986	345	9		55,200 Removal	72,700	
			-3 (leased)		0	
					72,700	127,900
1987	305	8	-1		67,300	
					67,300	67,300
1988	305	8	0		67,300	
					67,300	67,300
1989	300	8	0		67,300	
					67,300	67,300
	T O T A L			$2,860,200	$567,400	$3,427,600
1990	30	1	-7		Assess removal of Kitchen and Recreation at that Time	
1991	30	1	0			
1992	30	1	0			

NOTE: It is assumed that salvage cost will cover removal of camp building at the end of the project.

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA WATER SUPPLY

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
1	DEEP WELL PUMPS					
	Deep Well Pumps		26,000	4,000	10,000	40,000
	200 GPM x 700' TDH					
	c/w 50 HP motors					
	(including non-installed spare)					
	MCC's and wiring		(Included in Power supply)			
	Pump Housing			4,000	6,000	10,000
	Valves and Piping			1,000	1,000	2,000
	Heating and Lighting			1,000	500	1,500
	Instrumentation			2,500	1,000	3,500
2	BOOSTER PUMPS AT MINE CAMP STORAGE					
	Pump Station Structure			4,000	4,000	8,000
	Two can-type pumps		24,000		8,000	32,000
	150 GPM x 1500' TDH					
	c/w 100 HP motors					
	SUB TOTAL		50,000	16,500	30,500	97,000

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA WATER SUPPLY

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	MCC's and wiring		(Included in Power Supply)			
	Valves and Piping			4,000	3,500	7,500
	Heating and Lighting			1,000	500	1,500
	Instrumentation			2,500	1,000	3,500
3	TO MINE CAMP					
	6" Carbon Steel Pipe			2,000	4,000	6,000
	4" Carbon Steel Pipe			20,000	72,000	92,000
4	TO POWER PLANT CAMP STORAGE					
	4" Carbon Steel Pipe			52,000	187,000	239,000
	6" Pipe			2,000	4,000	6,000
	Allowance for rock				40,000	40,000
	Anchors			10,000	10,000	20,000
	SUB TOTAL			93,500	322,000	415,500
	WATER SUPPLY TOTAL		50,000	110,000	352,500	512,500

SIMONS CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: May 25, 1978

PROJECT No. 4142 A AREA POWER SUPPLY & DISTRIBUTION

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
1	2,000 Man Camp (Power plant)					
	12 KV Line Extension		19,000		40,000	59,000
	Transformer Platforms -					
	12 KV/208V 3 phase - 300 KVA		98,800		100,000	198,800
	Service Wiring			159,000	87,400	246,400
2	500 Man Camp (Mining)					
	12 KV line extension		7,200		15,000	22,200
	Substation 12KV/208V 3 phase -					
	300 KVA		23,700		24,000	47,700
	Service Wiring		43,000		22,500	65,500
4	Water Pump Standards		6,000	17,500	25,500	49,000
	including Transformer Platforms					
5	Effluent Pump Standards		13,550	23,000	39,650	76,200
	including poleline ext. & trans.					
6	Street Lighting			7,500	12,000	19,500
7	Fire Alarms Const. Camps			12,300	14,200	26,500
8	Car Park Heating			81,000	86,000	167,000
9	Car Park Lighting			52,800	44,400	97,200
	POWER SUPPLY AND DISTRIBUTION TOTAL		211,250	353,100	510,650	1,075,00

SIMONS CONSULTING ENGINEERS

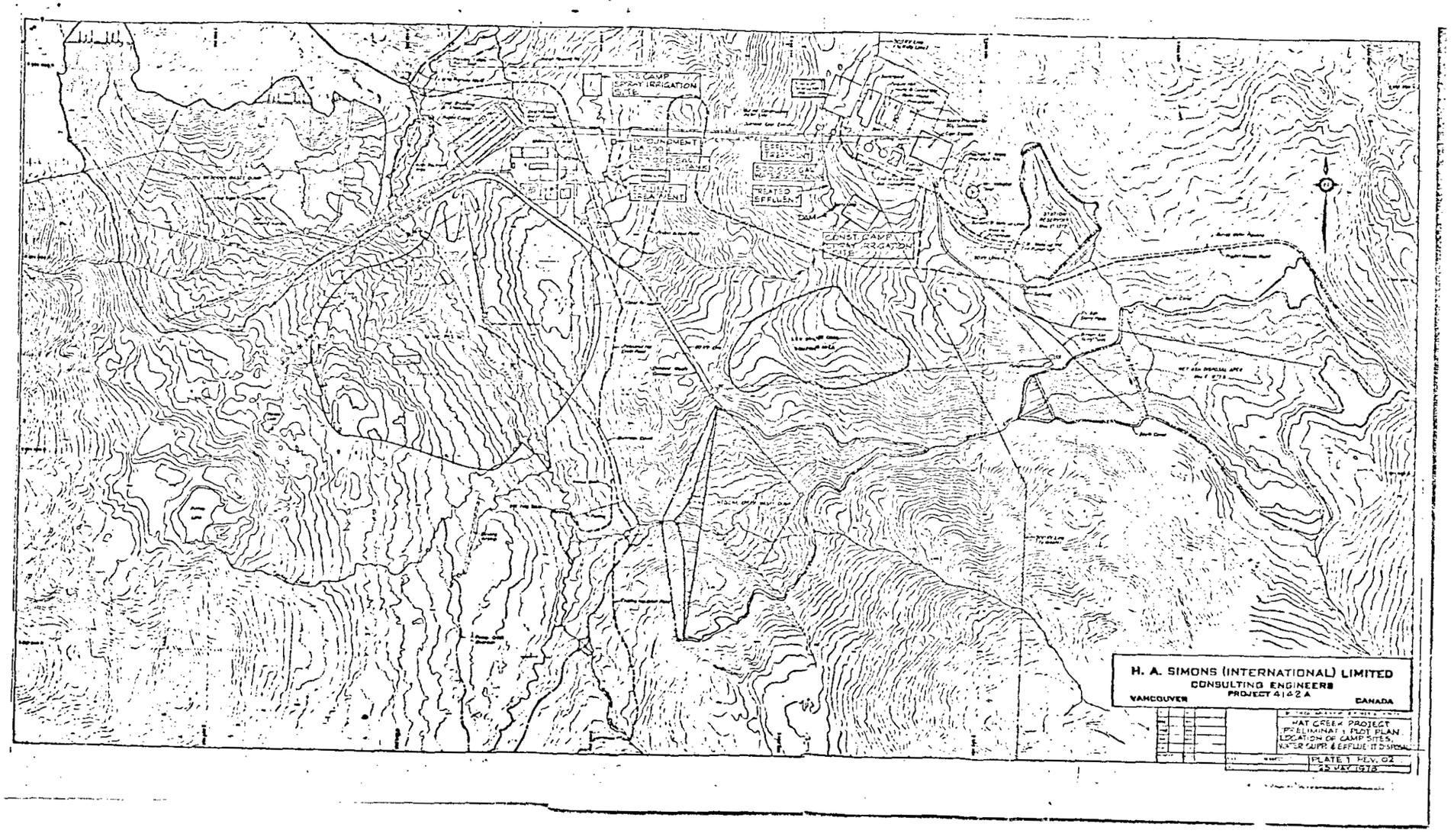
ESTIMATE OF COST

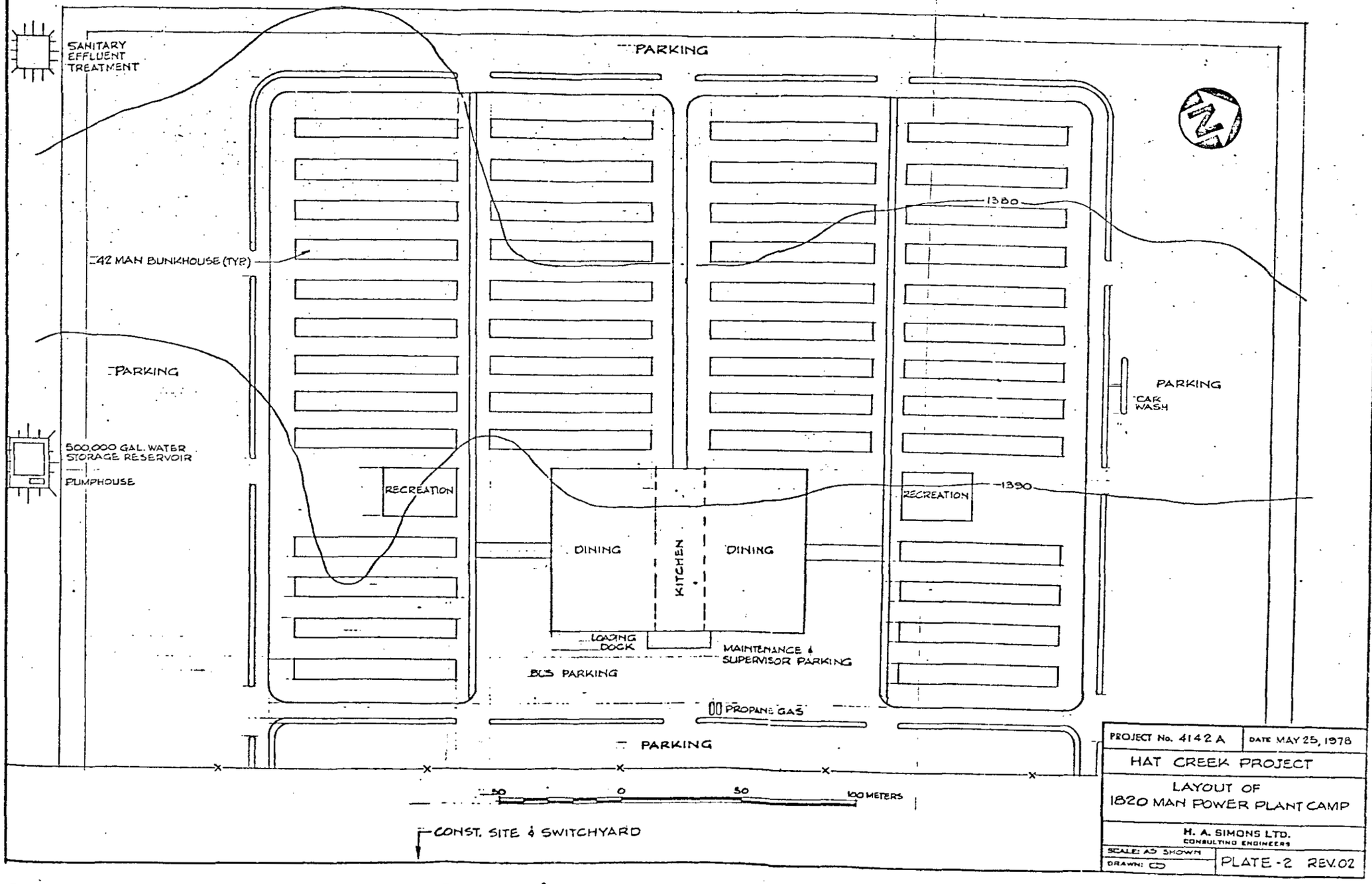
B.C. Hydro - Hat Creek Project

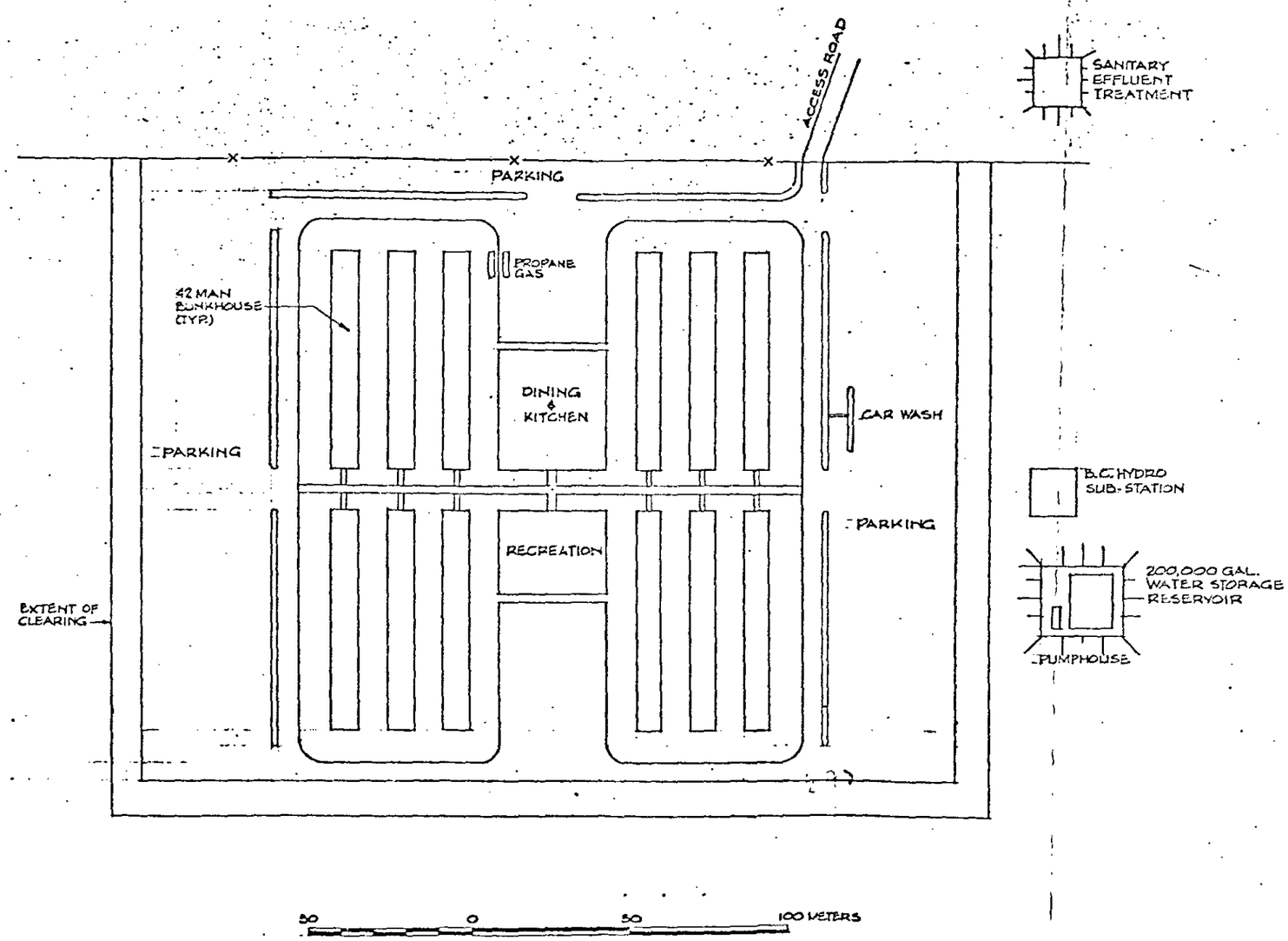
DATE: May 25, 1978

PROJECT No. 4142 A AREA DESIGN & CONSTRUCTION SERVICES

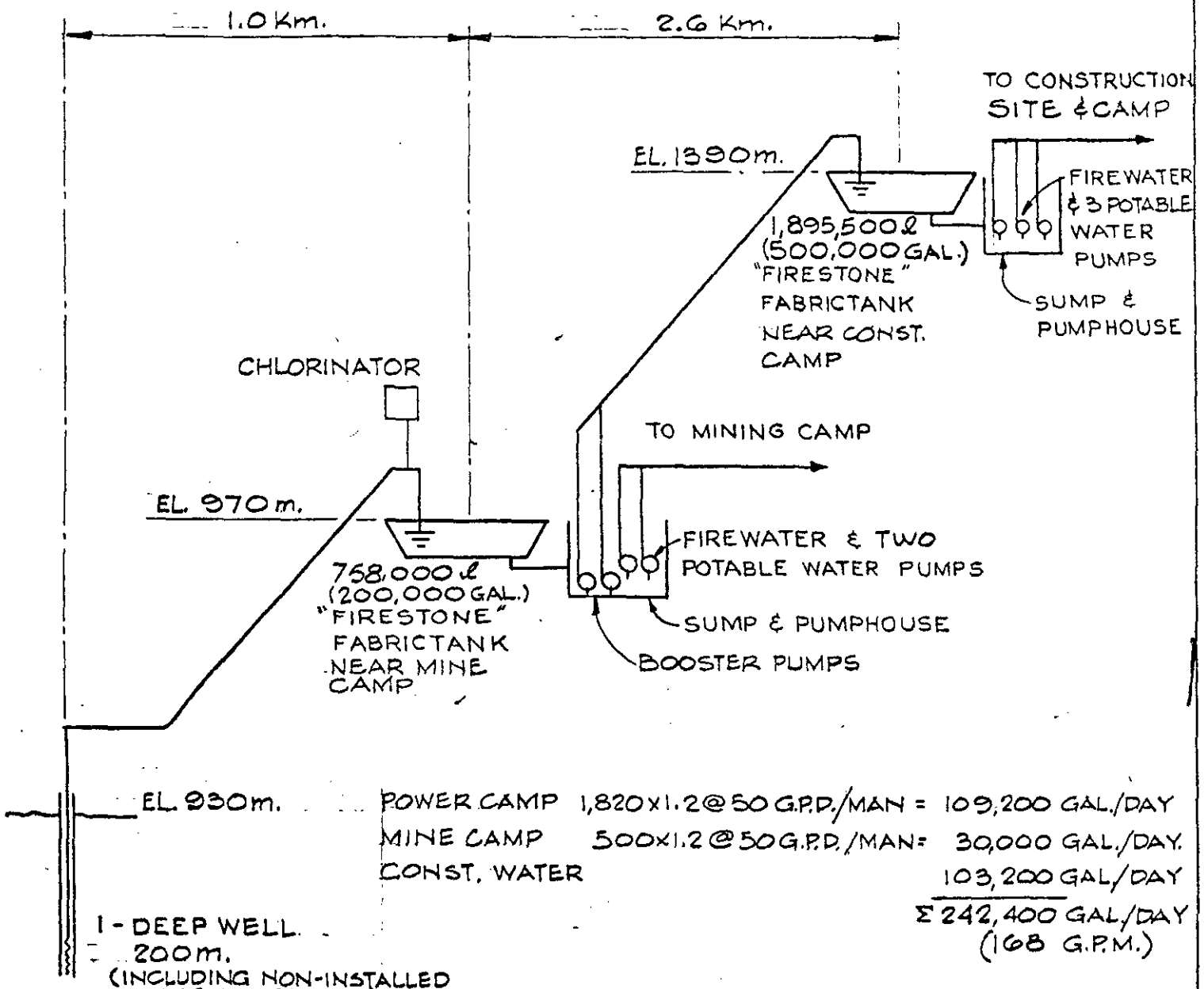
ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	Detail Engineering		140,000			140,000
	Contract Specification and					
	Purchasing Specification		20,000			20,000
	Geotechnical and Hydrology		30,000			30,000
	Topographic Surveys		12,000			12,000
	Construction Management		80,000			80,000
	ENGINEERING TOTAL		282,000			282,000


CONST. CAMP SPRAY IRRIGATION SITE
TREATMENT
TREATED EFFLUENT
CONST. CAMP SPRAY IRRIGATION SITE
H. A. SIMONS (INTERNATIONAL) LIMITED
CONSULTING ENGINEERS
PROJECT 4102 A
VANCOUVER
CANADA
HAT CREEK PROJECT
PRELIMINARY PLOT PLAN
LOCATION OF CAMP SITES,
WATER SUPPLY & EFFLUENT DISPOSAL
PLATE 1 REV. 02
25 MAY 1978


SANITARY EFFLUENT TREATMENT
PARKING
42 MAN BUNKHOUSE (TYP.)
1380
PARKING
PARKING
CAR WASH
500,000 GAL. WATER STORAGE RESERVOIR
PUMPHOUSE
RECREATION
1390
RECREATION
DINING
KITCHEN
DINING
LOADING DOCK
MAINTENANCE & SUPERVISOR PARKING
BUS PARKING
PROPANE GAS
PARKING
50
0
50
100 METERS
CONST. SITE & SWITCHYARD
PROJECT No. 4142 A
DATE MAY 25, 1978
HAT CREEK PROJECT
LAYOUT OF
1820 MAN POWER PLANT CAMP
H. A. SIMONS LTD.
CONSULTING ENGINEERS
SCALE: AS SHOWN
DRAWN: CD
PLATE - 2 REV. 02



PROJECT No. 4142 A	DATE MAY 25, 1978
HAT CREEK PROJECT	
LAYOUT OF 500 MAN MINE CAMP	
H. A. SIMONS LTD. CONSULTING ENGINEERS	
SCALE: AS SHOWN	PLATE 3 REV. 02
DRAWN: CD	



POWER CAMP 1,820 x 1.2 @ 50 G.P.D./MAN = 109,200 GAL./DAY
MINE CAMP 500 x 1.2 @ 50 G.P.D./MAN = 30,000 GAL./DAY.
CONST. WATER 103,200 GAL/DAY
Σ 242,400 GAL/DAY
(168 G.P.M.)

PROJECT No. 4142A

HAT CREEK PROJECT

SCHEMATIC OF WATER SUPPLY

H.A. SIMONS (INTERNATIONAL) LTD.
CONSULTING ENGINEERS

DATE 25 MAY 1973
DRAWN: J.W./DD

PLATE 4 REV. 02

INTRODUCTION

Acting upon direction received from British Columbia Hydro and Power Authority, in Mr. C.K. Harman's letter of award of 28 June, 1977, and the subsequent purchase order no. 759 830, H.A. Simons (International) Ltd., have prepared this report for the two single status construction camps of the proposed Hat Creek Project. The report follows the basic terms of reference provided with the letter of invitation dated 20 June, 1976.

In this report the camp servicing the Power Plant is referred to as the Power Plant Camp and the camp servicing the Mine Construction is referred to as the Mine Camp. The requirements of these camps are described herein, together with a presentation of the preliminary engineering concepts, capital cost estimates and engineering and construction scheduling for the camps.

The report is based on Preliminary Project layout drawing 604H-C14-E7, the manpower forecast of 7 July, 1977 and other information received from B.C. Hydro and listed under the section headed "References", and also on visual observation obtained through a reconnaisance survey of the Hat Creek Project site on 5 July, 1977 by H. Dombrowsky and V. Zikic of Simons. They were accompanied by R. Lindsay of B.C. Hydro.

On the basis of precedents set for other construction camps that have been installed recently in British Columbia, it is expected that the recommendations of this report will be acceptable in 1977, to the relevant regulatory agencies,

including the camp committee of the B.C. and Yukon Territory Building and Construction Trades Council. These agencies have not been contacted for approval because no commitments could be obtained due to the preliminary nature of the present layout drawings. Agreements in principal and official approvals should be obtained from these agencies as soon as the locations of the camps have been confirmed and detailed layouts are available.

Should it become necessary to have modifications in arrangement on detail layouts and slight changes in location, the capital cost estimate and the overall concept will not be affected to any significant degree.

The development concepts for both the mine camp and the power plant camp are identical, except that the power plant camp has been planned for 1000 men and the mine camp has been planned for 440 men in accordance with the terms of reference.

The capacity of services as designed will allow for a 20% expansion of the nominal peak demand. The conceptual designs for both camps provide for the progressive increase of resident populations from a small initial labour force and for their subsequent fluctuation.

During the study the alternative sites for each of the two camps were appraised and the benefits related to the alternatives were studied with special attention to:

- interference with the proposed layout of the mine, power station and facilities;
- economical access to a suitable camp water supply;
- minimization of worker travel time from the camps to the project sites;
- minimization of environmental disturbance;
- proximity of main access road.

SUMMARY OF RECOMMENDATIONS AND CONCLUSIONS

On the basis of this study it is recommended that the power plant camp should be located on the north side of the power plant. However, if the location of transmission lines should interfere with this location, the alternative site should be to the west side of the power plant. The mine camp should be located at North 87,000* East 25,000* which offers the optimum combination of economy of water supply, convenience of access and residential suitability.

The water supply should be drawn from wells to be constructed near the Hat Creek, upstream of the initial mine pit. The water should be pumped to both camps utilizing an intermediate pump station.

The proposed layouts of the camps and their essential services are shown on the enclosed drawings. The estimates of the capital costs of the facilities are as shown below. The details of these estimates are contained in this report.

- Power Plant Camp	$ 7,246,000
- Mining Camp	$ 3,834,000
- Water Supply	$ 767,000

A construction schedule has been prepared for the two camps and indicates that completion of initial "core" facilities for both camps may be achieved within 8½ months after start of engineering.

* Map coordinates taken from B.C. Hydro's contour maps, see reference.

LOCATION OF CAMPS

POWER PLANT CAMP

Two factors of major importance in considering the location of this camp are the workers' travel distance from the camp-site to the power plant project site, and the availability of a camp area of suitable size and grade to facilitate camp construction. Construction work is essentially a single shift operation and should not cause consistent loud noise during the night.

In considering camp location, it must be recognized that in accordance with current union agreements, the paid work day for most men on heavy construction sites starts when they are ready to leave the camp at 8:00 AM. If men are requested to leave before 8:00 AM, payments at premium time rates are required. Similar rules apply at lunch and at the end of the shifts. If the work site is 0.8 kilometer (½ mile) or less from the camp, most men are expected to walk. If the distance is more than 0.8 kilometer (½ mile), bus transport will have to be provided. Workmen residing in a construction camp expect hot lunches in the camp's cafeteria. This custom is now part of most union agreements, and therefore most workmen, if not all, would make four trips between camp and work site every day.

The average straight time charge-out rate on heavy construction sites approaches $30.00 per hour. The estimated manpower schedule (see reference) indicates that the power plant construction requires approximately 800,000 man days during the eight years the camp is expected to be in use.

Bus haul of several hundred men four times each day between camp and project site will be expensive, even if the travelled distance is short. If a sufficient number of buses would be available to transport all workmen simultaneously and if the drivers spent only two hours every day driving these buses and are productively engaged for the balance of the work day, these unproductive two hours would cost a total of approximately $1 million over the construction period. The cost of buses, possible premium time payments to drivers and the cost of idle time caused by delays in transporting workmen on schedule would further add to the cost of the project.

For these reasons, when it is possible on major projects, owners and contractors attempt to locate camps within walking distance of the construction site.

The construction camp for the power plant requires an area of approximately 300m (1000 ft) x 370m (1200 ft.). Areas suitable for a camp site are available north, west and south west of the power plant.

The most desirable location for this camp would be on the gentle slope on the north side of the plant, in the park-like deciduous forest in that area. This forest can provide a buffer between camp and construction site and allows attractive settings for the camp units.

However, we understand that B.C. Hydro may consider locating the project's power lines north of the plant. If these power lines hinder a suitable camp layout, we suggest that the camp be located on the west side of the plant. This area is also covered with trees; however, the ground has a

steeper slope and would require more site area and grading; therefore some additional cost would be incurred. The distance to the main construction activity is slightly longer. It is difficult to evaluate the cost to the project of a slightly longer walking time. However, the theoretical cost of this unproductive time over the eight years of the project would be approximately $1 million per minute of walking distance.

Due to the large extra cost of moving men when the camp is located remote from the construction area and because suitable sites are available within walking distance, we did not evaluate any remote site in detail. WE DO RECOMMEND LOCATION OF THE POWER PLANT CAMP ON ONE OF THE SITES CLOSE TO THE POWER PLANT.

MINE CAMP

The choice of location for the Mine Camp is governed by the worker's travel distance from the mine to the camp, and the availability of an area of suitable size that will facilitate construction. It is probable that most of the heavy equipment employed for developing the mine will be in use for 24 hours a day and the operators will be working in two or three shifts. Therefore in order that the camp conditions may be conducive to adequate rest for the off shift workers, it is desirable that the camp should be located remote from areas where noisy equipment is operating.

It is assumed that workers will begin and end their work at a change room with showers and lockers, as is normal practice in the mining industry. Also it is assumed that the change room will be located near the mine entrance, together with the mine office and maintenance facilities. Since a large waste disposal area, the coal preparation area and the public highway will be near the mine entrance, this area is likely to be active and noisy day and night. Under these circumstances it is not advisable to locate a camp within walking distance of these change rooms. Consequently the distance required from the mine entrance to the mine camp necessitates the bus haul of workers' and the normal criteria for location of camps, i.e. less than 0.8 (½ mile), cannot apply in this case.

We have considered three locations for the Mine Camp. They are labelled one (1), two (2), and three (3). The recommended location is number one (1) site.

At location number 3 the mine camp would be in a scenic area on a bench above the Hat Creek and remote from any mine activity. The residential quality of this site would be satisfactory, however, the water supply would require extra length of piping and it would be difficult to dispose of sanitary effluent unless it were drained into Hat Creek. The distance from the mine camp to the mine entrance is approximately six (6) kilometers (3.6 miles). By virtue of these factors site number 3 would be more costly to service than numbers 1 and 2, and would require the greatest travel time from the mine camp to the mine entrance. It is therefore not the desirable choice for locating the mine camp.

At location number 2 the mine camp would be on the route of a water line to the construction camp and at an elevation which would break the total rise of 600 m (1900 ft) between wells and power plant site into two equal 300 m (950 ft) lifts. It would simplify the water supply system, if water storage and repumping facilities were located at that elevation. The camp would be in an exposed location on the high ledge and noise from the pit and the Medicine Creek waste pile may be disturbing. The distance from the mine entrance is about 5 kilometers (3 miles). For the latter two factors location number 2 is considerably less attractive than location number 1.

At location number 1 the mine camp would be situated in a pine forest area. This forest would screen the camp from the new project access road, and power line and conveyor right-of-way. The water supply line would be slightly longer than for location number 2, but it would run through an easily accessible area. The area has a gentle slope and

the distance to the mine entrance would be about 3 kilometers (2 miles approximately). The soil in that area appears to be well suited for installation of underground services.

We therefore recommend that the mining camp be located on site number 1 at north 87,000 east 25,000. (Ref. B.C. Hydro coordinate).

CAMP LAYOUTS AND DETAILS

LAYOUT

The typical camp layouts that are illustrated in the "Drawing" section can be modified to suit the local contours and requirements of the project, once detail locations have been selected and surveyed. Essentially, each camp will have a centrally located kitchen/cafeteria complex with a recreation hall nearby. The bunk houses will be located around this complex. Each camp will be surrounded by an access road with parking facilities. A car wash and a limited number of outlets for car heaters will be provided. The spacing between camp units will be 8 m. (25 ft.) to 10 m. (30 ft.) to provide fire breaks and privacy.

The layout concept for the camps and the estimate are based on purchasing and leasing prefabricated units that are assembled on site into bunk houses, kitchen and cafeterias and recreation halls. Recent experience indicates that this type of installation is the most economical. However, the camps for the Hat Creek project are to be used for a longer period than normal and therefore the specification for camp buildings would have to make allowance for this extra usage. The final choice of type and size of camp buildings should be made after suppliers have made their proposals in accordance with the project specifications.

The native ground cover would be disturbed as little as possible to minimize blowing dust. Most of the grading for camp units, roads and parking lots should be done by using imported pit-run gravel. Suitable material may be obtained from excavations during construction of the main site access roads. In view of the long camp usage paving of camp roads

and parking areas is advisable. The estimate includes paving as a separate item.

Camp services - water, electric power and sanitary sewers - will be designed to function with the optimum camp development or with only the core of the camps installed. Additional residential units can be added and removed as required by the manpower schedule.

Telephone services will be provided by the B.C. Telephone Company and pay telephones for the camp population will be located in the recreation hall. No allowance has been made in the cost estimate for telephone service.

All camp buildings will have fire alarms. These alarms will be connected to outside sirens for alerting the camp population in case of an emergency.

WATER SUPPLY

Three different methods of providing water for the two construction camps are:

(1) Local wells drilled near the camps;

(2) Transporting water by tank truck from wells near Hat Creek to storage facilities at the camps;

(3) Pumping water from wells near Hat Creek to storage facilities at the mining camp and from there to storage facilities at the construction camp.

Only method three is recommended.

(1) Very little pertinent data is available at present for the areas considered for the camps. The sections of the report on Subsurface Hydrology by Golder Associates as noted in the reference, covers the area of the proposed open pit only. A few drill records by Dolmage, Campbell and Associates from near the proposed mine camp site are available. These records were obtained for coal exploration and do not mention ground water. However, for hole 74-35 a loss of drilling fluid was recorded, which seems to indicate that it was a dry hole and water was exfiltrating.

The power plant campsite is underlain by rock at shallow depth and till (as indicated in the report by Thurber Consultants Ltd. on foundation conditions at the plant site). Although most holes logged in that report have water at relatively shallow depth, it is unlikely that water of potable quality and in adequate quantity can be found near the power plant camp site since the catchment area is small and the annual precipitation in the Hat Creek area is only 300 mm (12 inches).

The cost of a test well drilling program would be very high and the likelihood of favourable results is very uncertain. Therefore such a program is not recommended.

(2) Good water in adequate quantity is available from the Hat Creek and the Monenco Report (see reference) also indicates that this creek has water throughout the year. Trucking water from Hat Creek will replace only one set of pumps and approximately four miles of small diameter pipeline. The minimum cost for a single 19,000 litre (5000 gal.) truck and one driver will be $1,300,000 over the eight years of projected use. If a smaller truck is required due to road conditions or if additional drivers are needed, the cost will increase significantly. Operating a water tank truck during the winter will be difficult and may be hazardous. Transporting water by tank truck from wells near Hat Creek to storage facilities at the camp is not recommended.

(3) The recommended water supply system is shown in diagramatic form in the "Drawing" section, and consists of two 30 m (100 ft.) deep wells in the aquifer near the Hat Creek and upstream of the initial mining activities.

A suitable location seems to be near north 78,000 east 22,000. This opinion is derived from the Golder Associates Report on subsurface hydrology. Drill holes in the vicinity indicate a top layer of sand and gravel of considerable depth with water table levels near ground surface. Pump tests will be required to determine whether the aquifer can provide water of adequate quantity to supply the camps. If the permeability of the aquifer proves unsatisfactory, surface

water could be obtained from the Hat Creek by means of shallow wells. Whichever case results, the wells will be provided with standard well pumps capable of pumping approximately 4 litres per second (60 GPM) through a 100 mm (4 inch) diameter pipeline directly to the storage facilities at the mine camp.

Before the water enters the storage reservoir it will be chlorinated as required to maintain an adequate chlorine residual in the camp distribution systems.

The elevation difference between the mine camp in location number 1 and the power plant camp is approximately 460 m (1500 ft.). This lift is more than a hundred meters beyond the range for which water supply pumps are commonly available. A more detailed study is required to find the best solution. The possible alternatives are custom designed and fabricated turbine pumps; boiler feed type pumps; positive displacement pumps; or standard turbine pumps in series, one in the sump at the storage tank and a second one in the pipe line after it has gained a few hundred feet of altitude. The selected system should be able to pump three litres per second (50 GPM) and have stand-by pump equipment. A 100 mm (4 inch) diameter pipeline will be provided to discharge into the storage facilities at the power plant camp.

The estimate is based on using multistage horizontal centrifugal boiler feed pumps installed in a dry well to ensure a positive suction head. This dry well will be part of the pumphouse for the mine camp.

The reservoir and the pumps for the camps will be discussed in the "Water Distribution and Fire Protection" section.

It is customary to control water pumps with the water level in the storage facility for the maximum savings of water and power. In this particular installation it will be advantageous to operate all pumps with manual controls.

The pipelines between the wells and the camps will be a carbon steel pipe with welded joints for most of its run. In sections where the operating pressure is 14 kPa (200 psi) or less, ductile iron pipe with push-on type joints can be installed, if it proves to be more economical. The line will be buried approximately 1 m. (3 ft.) for mechanical protection. While water is being pumped through the line, it will not freeze and when all pumps stop, the lines will be drained automatically, therefore frost protection will not be required.

After the Hat Creek has been diverted, it will be necessary to replace the wells. It is suggested that a suitable water intake be constructed where the 100 mm pipeline crosses the diversion channel. This crossing will be less than 1.6 kilometers (1 mile) from the mine camp and near the same elevation, that is, if construction proceeds similar to that shown in Preliminary Project Layout.

It is assumed that the water supply will still be available from the existing aquifer at the wells for some time after the creek has been diverted, to allow time for the flow to become clear in the diversion channel.

A new set of pumps will have to replace the well pumps. To ensure water free of sediments, a pair of pressure filters will be installed near the storage reservoir. Backwash water will be taken from the mine camp's potable water system. This backwash water can either be returned to the diverted Hat Creek or be disposed of through local storm drainage channels.

The cost for installing this second water intake for the period following the Hat Creek diversion is included in the estimate.

The water supply system is sized to provide 190 litres (50 US gallons) per day per man in the camps. At a maximum combined camp population of 1440 + 20% men, the daily demand would be 328 m^3 (87,000 gal.) per day. The proposed pumping rate of 4 litres per second (60 GPM) with a single set of pumps will supply 346 m^3 (91,000 gal.) per day into the storage reservoirs. By utilizing the stand-by pumps, this supply can be increased to approximately 600 m^3 (159,000 gal.) per day.

It is recognized that there may be advantages in combining the camp water supply system with a system to supply the power plant construction requirements. However this report has considered the camp water requirements only. If a combined system is required it could easily be adopted during the final design stage.

The cost estimate is based upon a total demand of 328 m^3 per day, supplied with a single set of pumps and the stand-by system NOT in operation.

The following items should be considered during the detail design stage, when more information may be available.

The wells and the pipeline to the mine camp are located in areas that are presently scheduled for pit development near the year 2000. If later schedules indicate that mine activities may interfere with the water supply facilities during the life of the camps, these facilities should be located outside the affected areas.

If further investigations indicate that wells near the pit rim are not advisable, or that water from the Hat Creek diversion channel may not be suitable for potable water, water could be obtained from further upstream. Under the most unfavorable circumstances the pipe line may have to be extended approximately 5 km (3 miles) to upstream of the Hat Creek diversion.

Oral reports have indicated that water may be found in rock formations near the junction of Highway 12 and the Hat Creek Road. If these reports can be confirmed, it would be advisable to undertake a test drilling and pumping program to ascertain whether adequate water for the camps can be obtained from this source. If the flow rates are not sufficient for the camps, the water may be adequate to supply the mine entrance area.

The water supply and distribution systems as outlined in this report will not be significantly affected by any of these possible changes in locating the wells, except in regard to the length of pipeline and the detail design.

WATER DISTRIBUTION AND FIRE PROTECTION

Potable water distribution and fire protection will be combined into a single system at each camp. Each system will be designed and constructed in accordance with applicable fire codes. The systems for the power plant camp and the mine camp will be similar, except for the sizes of the storage reservoirs and the detailed piping layouts.

The reservoir at the mine camp will contain 757m^3 (200,000 gal.) and the one at the power plant camp 1135m^3 (300,000 gal.) of water. Of these reserves, 379m^3 (100,000 gal.) at each camp will be allocated for fire protection only. The balance is available for potable water usage and for additional fire protection. The 379m^3 minimum fire protection reserve can supply 50 litres per second (800 GPM) for two 65 mm (2½ inch) and four 40 mm (1½ inch) hose streams for a two hour period.

The reservoirs will be completely enclosed rubber coated nylon fabric tanks, supported by soil embankments. The closed top will prevent contamination by air borne pollutant and will keep evaporation losses to a minimum.

A sump and pump house near each reservoir will contain two potable water pumps and one diesel engine driven fire pump and all controls. One potable water pump will run continuously to pressurize the distribution system. Excess water will be recirculated through a pressure relief valve back into the reservoir. The second potable water pump and the fire pump will start on pressure drop. The fire pump will start also upon power failure.

Potable water pumps will supply 32 litres per second (500 GPM) each and the fire pump 64 litres per second (1000 GPM) at 7 kPa (100 psi).

Chlorination equipment will be installed adjacent to the pump house of the mining camp.

The distribution system will consist of 150mm (6 inches) mains with 150 mm (6 inches) hydrants at strategic location, 100 mm (4 inches) branch lines and 75 mm (3 inches) risers to the bunk houses. The piping system will not be looped. It will be installed below the frost line or insulated and heat traced.

A cart with hoses, nozzles and other fire fighting equipment for use with 65 mm (2½ inch) outlets on the 150 mm (6 inch) hydrants will be housed at a central spot in each camp. For immediate fire protection 30 m (100 ft.) long 40 mm (1½ inch) hoses will be available in cabinets on both ends of each bunk house. These hoses will be connected to stand pipes that are part of the internal piping of the bunk houses and are supplied through the 75 mm risers.

Fire protection of similar standards have been accepted by fire underwriters in the past for temporary construction camps. It would be advisable for B.C. Hydro to discuss these proposals with their fire underwriters before detail design commences.

Superceded

SANITARY EFFLUENT - TREATMENT AND DISPOSAL

It is proposed to install separate sanitary effluent treatment and disposal facilities at each camp. Because of the cost of a pipeline from the power plant camp to the mine camp, and the unfavourable conditions for disposing of effluent in the mine camp area, it is impractical and undesirable to install one central plant.

The proposed installation will provide full biological treatment to remove at least 80% BOD_5 during summer and winter. Each system will provide aerobic oxidation utilizing an open basin with submerged static aerators. These aerators can operate with a minimum of maintenance even during winter conditions. This type of system, if designed with sufficient retention, will not require any primary treatment other than comminution ahead of the basin, nor will it likely require sludge removal and disposal. The final effluent will be treated to satisfy the requirements of the regulatory authorities. This type of treatment facility requires the minimum of mechanical equipment and therefore permits low maintenance and a minimum of operator attention. All equipment which requires maintenance will be mounted out of the water and can be enclosed in a housing for weather protection. Any equipment within the basin will be submerged and therefore freezing will not be a problem.

The basin will be excavated with stable slopes in the native till soil. The soil appears to be of very low permeability and it is not expected that linings will be required. The size of the basins should not be greater than 15 m (50 ft) x 45 m (150 ft). Because the treatment is of an aerobic nature, these basins will not have an offensive odour.

Similar systems have been operating satisfactorily in all parts of Canada under extreme weather conditions. For example, a large construction camp in McKenzie, B.C. used a concrete lined basin with submerged static aerators. (Very porous sandy soil required the construction of a concrete liner).

We propose that the final effluent from the power plant camp be directed to an impoundment basin formed by the existing Harry Lake. The Preliminary Project Layout indicates that this lake area will later be developed into a bottom ash impoundment. This basin is expected to have a surface area large enough to evaporate the expected volume of effluent under normal conditions. Any residual effluent could be retained as part of the ash water to be used for transportation of the ash slurry from the power plant. Chlorination as necessary will be provided as part of the system.

For disposing the final effluent from the treatment plant at the mine camp further studies will be required, in order to avoid discharge into surface water courses. The available alternatives are:

- Deep well disposal
- Spray irrigation
- Impoundment
- Drainage field.

The geological conditions appear to be favourable for deep well disposal, (bore hole records indicate that a dry gravel bed underlies the camp area), however further geological studies are required to confirm this. Spray irrigation has been used successfully at locations of similar climate, however it is limited to summer operation. It will be necessary to have an additional disposal method during the

winter period. The contours of the ground in the mining camp area do not allow a natural impoundment basin, without interfering with storm water run-off. If an impoundment basin is required for the winter time, it would have to be excavated. The surface soils in the camp area appear to be till with very low permeability. If soils of adequate permeability are found during detail soils investigation, construction of a drainage field could be undertaken.

Deep well disposal together with spray irrigation could well be the best solution.

The concept of the effluent treatment and disposal design is that there will be no discharge to any surface water channels.

The effluent facilities for the power plant camp will be sized to serve the 1000 men + 20% design population, and for the mine camp they will be sized to serve 440 men + 20% design population.

POWER DISTRIBUTION

The estimate for the power distribution assumes that B.C. Hydro will provide power at 12.47 kV within a reasonable distance of the camps, complete with required switches and breakers.

The distribution throughout the camps and from the mine camp to the well pumps will be at 12.47 kV, with step-down transformers at utilization points as required. An allowance has been made to run a signal or control cable from the mining camp to the well pumps. The distribution system has been designed to heat all bunkhouses and the hot water electrically. Kitchen/cafeteria and recreation hall will be heated with propane gas. All camp buildings will have air conditioning. If electric heating of bunkhouses and hot water is eliminated and propane gas is substituted, the power distribution cost could be reduced by $90,000 for the power plant camp and by $50,000 for the mine camp. Most of these savings would have to be spent to install a gas distribution system and the actual cost reduction would be very small.

Street lighting will be provided in camp areas and flood lighting in parking areas. Outlets for electric car heaters will be installed for 500 cars at the power plant camp and for 200 cars at the mine camp.

The estimated connected loads during the winter are 9000 kW for the power plant camp and 4100 kW for the combined mine camp and water supply. A fire alarm system with sirens and locater panel will be provided for both camps. These systems will be hooked up to the internal alarm systems of the bunkhouses.

PROPANE GAS

Propane gas will be used for heating and cooking in the kitchen cafeteria and the recreation hall. The propane gas will cost approximately $0.10 per litre ($0.45 per imperial gallon), which is approximately $4.33 per MJ ($0.41 per 100,000 BTU). The vendor of the propane gas would install required tanks and vaporization equipment. The rental cost of these facilities would be included in the above price. The unit cost of propane gas will not change significantly if the consumption is increased by heating all bunkhouses with gas, instead of electricity.

CAMP HEATING, VENTILATION AND AIR CONDITIONING

Most construction camps are heated with gas or oil fired central forced air furnaces. These furnaces are often a continuous source of mechanical trouble and many installations, are noisy when operating and odors are distributed throughout a bunkhouse. Because gas and oil systems are centrally controlled it is difficult to maintain a temperature suitable for all workmen. To avoid these problems it is recommended that all bunkhouses be heated electrically. Each room should have a unit heater controlled by its own thermostat. A make-up air system will heat fresh air when required and provide positive ventilation. Air conditioning will be required in the summer.

The extra cost of providing power distribution for electric heating would be only of the order of $140,000. This extra capital cost is balanced by savings on the propane gas distribution system. The difference in operating cost has not been evaluated at this time.

The cafeteria and the recreation hall will have warm air furnaces heated with propane gas. Gas will be used also in the kitchen for cooking and baking. Warm air furnaces are well suited for heating the large open spaces in these buildings. Maintenance of these furnaces should not present problems, because very few units will be installed.

EMERGENCY POWER

A small stand by construction type generator fueled by propane gas can provide emergency electric power for lighting and furnace fans in the cafeteria and recreation hall.

CATERING AND HOUSEKEEPING SERVICES

It is assumed that B.C. Hydro will engage an industrial catering company to manage the camps and to provide catering and housekeeping services.

The caterer should be selected before the contract for the camp buildings is awarded and be given the opportunity to participate in the detailed layouts of the kitchen and dining room facilities to suit his requirements. The resulting economies in managing the camps may reflect in lower rates charged for these services. We therefore recommend calling for tenders for a catering contract at the same time as the tenders are called for the camp buildings supply and erection contract.

The caterer should be responsible for all services required to manage and maintain the camps, including fire protection, and maintenance of water supply and effluent treatment facilities. Refurbishing of buildings, and major repairs, should be arranged by B.C. Hydro as required. Snow removal and garbage disposal should be part of the general contractor's scope of work.

All camp garbage should be disposed of by burying in a suitable location such as the bottom of an ash pond. Open dumps should be avoided. They tend to attract pests and other animals.

The cost of catering and housekeeping service will vary, depending on the number of men in a camp. The daily rates per man will vary between $12.00 and $20.00 and will be payable for seven days a week.

B.C. Hydro could charge each contractor engaged on this project a fixed sum per man per day. The catering cost will then become, for each contractor, a known and fixed portion of his labour cost. B.C. Hydro will pay the catering contractor for each man per day in accordance with the rate schedule of the contract.

The estimated total costs for the catering and housekeeping services will be approximately $8 million for the mine camp and $16 million for the power plant camp, based on the man power forecast used for this report.

These total costs are not included in the estimate. They will be part of the labour costs and are stated only to indicate the magnitude of the catering contract.

COST ESTIMATE

This cost estimate is based on 1977 prices. No allowances have been made for escalation. The cost of major equipment has been verified with appropriate vendors. The cost of installation is based on current data from heavy construction sites.

The cost of site preparation may be reduced slightly if smaller local contractors could be engaged prior to the start of major construction work.

Excavation and backfill cost for underground services in the Power Plant Camp allow for substantial excavation in rock.

Contractors equipment costs are included in the column headed "Labour and Contractors' Overhead".

The cost estimate for camp buildings assumes that all buildings which are to be use for more than three years will be purchased outright. Purchased buildings can be supplemented with rental units for shorter peak requirements.

The estimate includes a 3% maintenance and refurbishing allowance for all purchased units. The accumulated allowance is $586,100 for the Power Plant Camp and $433,300 for the Mine Camp.

Some units have been shown as purchased for the Power Plant Camp and have been relocated to the Mine Camp. Whether such shifts are feasible will depend on the actual manpower build-up in each camp.

The estimated capital cost per man per day is $17.00.

Housekeeping costs will be part of the catering contract.

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 8, 1977

PROJECT No. 4142 A AREA Summary

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	1000 MAN POWER PLANT CAMP					
	Site preparation & Services		174,800	374,100	989,500	1,538,400
	Camp buildings		4,707,400	350,000	650,000	5,707,400
	Capital Cost		4,882,200	724,100	1,639,500	7,245,800
	Catering & House Keeping			8,000,000	8,000,000	16,000,000
	(Not included in total)					
	440 MAN MINE CAMP					
	Site prepartation & Services		178,300	182,300	491,300	851,900
	Camp Buildings		2,482,000	200,000	300,000	2,982,000
	Capital Cost		2,660,300	382,300	791,300	3,833,900
	Catering and House Keeping			4,000,000	4,000,000	8,000,000
	(Not included in totals)					
	Water Supply		75,200	230,200	461,700	767,100
	Contingency (Capital cost)		900,000	100,000	500,000	1,500,000
	Design & Construction Services		282,000			282,000
	TOTAL CAPITAL COST		8,799,700	1,436,600	3,392,500	13,628,800

ESTIMATED CATERING COST

POWER PLANT CAMP

Year	Men in Camp	Estimated Daily Rate	for 360 day/year	Cost per Year
1978	80	$20	$ 619,200	
1979	208	18	1,334,880	
1980	264	15	1,425,600	
1981	444	12	1,918,080	
1982	1,000	12	4,320,000	
1983	668	12	2,885,760	
1984	380	14	1,915,200	
1985	200	18	1,296,000	
			$15,714,720	
		Say	$16,000,000	

MINE CAMP

1978	74	$20	$ 532,800	
1979	101	20	727,200	
1980	103	20	741,600	
1981	116	20	835,200	
1982	172	18	1,114,560	
1983	388	12	1,676,160	
1984	417	12	1,801,440	
1985	440	12	1,900,800	
			$ 8,069,760	

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Power Plant Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	SITE PREPARATION					
1	Surveying & Investigations		Not Included			
2	Selective Clearing & Grubbing					
	30 Acres		-	-	18,000	18,000
3	Stripping of Top Soil		-	-	42,500	42,500
4	Grading - Allowance		-	-	20,000	20,000
5	Pit-run Gravel Fill Graded and					
	Compacted		-	-	120,000	120,000
6	Storm Drainage		-	5,000	20,000	25,000
7	Crushed Gravel Sub-base Roads					
	and Parking		-	30,000	10,000	40,000
8	Paving - 2"		-	40,000	40,000	80,000
				75,000	270,500	345,500

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 4, 1977

PROJECT No. 4142A AREA Power Plant Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	WATER SUPPLY & FIRE PROTECTION					
1	Storage Reservoir 300,000 gal.					
	Fibre Tank c/w Accessories		40,000	5,000	10,000	55,000
2	Pump House c/w Sump		-	10,000	12,500	22,500
3	Fence			800	1,000	1,800
4	Fire Pump c/w Diesel Drive					
	1000 GPM @ 100 psi		25,200	500	5,000	30,700
5	2 - Potable Water Pumps					
	500 GPM @ 80 psi		8,400	500	3,000	11,900
6	Starters &Controls		Under Power Distribution			
7	Valves & Piping in Pump House		2,500	5,000	4,000	11,500
8	Heater for Tank		3,000	-	1,000	4,000
9	Distribution Piping		-	26,800	26,800	53,600
10	35" Risers 3" Ø			12,000	7,000	19,000
11	6 Hydrants			5,000	4,000	9,000

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 4, 1977

PROJECT No. 4142A AREA Power Plant Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
12	Valves c/w Boxes			3,500	4,500	8,000
13	Car Wash		300	300	1,000	1,600
14	Excavation and Backfill				200,000	200,000
15	Hose Cart c/w Hose & Equipment and Shelter		10,000	-	3,000	13,000
			89,400	69,400	282,800	441,600

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Power Plant Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	SANITARY SEWER SYSTEM					
1	4" Risers, Including Cleanouts			14,000	10,000	24,000
2	4" Sewer Pipe			5,000	5,000	10,000
3	6" Sewer Pipe			10,000	8,000	18,000
4	8" Sewer Pipe			5,000	5,000	10,000
5	4 Manholes			2,000	2,800	4,800
6	Excavation & Backfill			-	156,000	156,000
7	6" Disposal Pipe			14,000	15,000	29,000
				50,000	201,800	251,800

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Power Plant Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	EFFLUENT TREATMENT					
	Lagoon Including Clay Linings			-	12,000	12,000
	Aeration Equipment					
	2-20 HP Blowers & Aerators &					
	Piping		20,000		3,000	23,000
	Blower Structure			1,500	3,000	4,500
	Chlorination			3,000	2,000	5,000
	Lagoon Piping			2,000	2,500	4,500
	Blower MCC's & Wiring		(Included in Power Supply)			
	Dam & Overflow Structure at					
	Harry Lake			1,000	4,000	5,000
			20,000	7,500	26,500	54,000

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Power Plant Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	POWER DISTRIBUTION					
1	12.47 kV Line Extension		9,500		20,000	29,500
2	Substations 12 x 300 kVA		47,400		48,000	95,400
3	Service Wiring			83,000	45,600	128,600
4	Street Lighting			3,700	5,700	9,400
5	Fire Alarm System			5,800	5,800	11,600
6	Pump House & Water Storage		6,500	3,000	12,000	21,500
7	Effluent Treatment		2,000	5,700	3,000	10,700
8	Car Heater Outlets		-	40,900	43,000	83,900
9	Car Park - Lighting			27,400	22,200	49,600
			65,400	169,500	205,300	440,200

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 8, 1977

PROJECT No. 4142 A AREA Power Plant Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	PROPANE GAS					
1	3 Risers			400	200	600
2	Piping			2,000	2,000	4,000
3	Fence			300	400	700
4	Tanks & Vaporizer		By Gas Vendor			
	TOTAL			2,700	2,600	5,300

B.C. HYDRO - HAT CREEK PROJECT — PROJECT NO. 4142 A

AREA: CAMP BUILDINGS — 1,000 MAN POWER PLANT CAMP

YEAR	MEN	NO. OF UNITS (42 MAN) ADD		TOTAL	PURCHASE OR LEASE $	MAINTENANCE REFURBISHING ALLOWANCE $ 3% year	TOTAL $
1978	80	3		3	510,000	15,300	
			Kitchen		613,000	18,400	
			Recreation		414,000	12,400	
					1,537,000	46,100	1,583,100
						46,100	
1979	208	3			510,000	15,300	
				6		61,400	571,400
						61,400	
1980	264	1			178,600	5,100	
				7		66,500	245,100
						66,500	
1981	444	5			893,000	26,800	
				12		93,300	986,300
						93,300	
1982	1,000	14			1,128,000 L		
			2nd Kitchen		494,100 L		
			2nd Recreation		196,200 L		
				26		93,300	1,911,600
						93,300	
1983	668	-10	2nd Kitchen & Rec. Hall Removed	4L	184,400 L		
				12		93,300	277,700
1984	380	-3			To Mining Camp		
		-4	Removed (L)				
				9		76,300	76,300
1985	200	-4			To Mining Camp		
				5		55,900	55,900
					5,121,300	586,100	$5,707,400

NOTE: It is assumed that salvage cost will cover removal of camp building at the end of the project.

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Mine Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	SITE PREPARATION					
1	Surveying & Investigations		Not Included			
2	Selective Cleaning & Grubbing					
	15 Acres			-	9,000	9,000
3	Stripping of Top Soil			-	10,000	10,000
4	Grading			-	10,000	10,000
5	Pit Run Gravel Fill				30,000	30,000
6	Storm Drainage			2,000	3,000	5,000
7	Crushed Gravel Sub base,					
	Roads and Parking			15,000	5,000	20,000
8	Paving - 2"			20,000	20,000	40,000
				37,000	87,000	124,000

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Mine Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	WATER SUPPLY & FIRE PROTECTION					
1	Storage Reservoir					
	200,000 gal.Fabric Tank					
	c/w Accessories		32,000	5,000	8,000	45,000
2	Pumphouse			10,000	12,500	22,500
3	Fence			800	1,000	1,800
4	Fire Pump c/w Diesel Drive					
	1000 GPM @ 100 psi		25,200	500	5,000	30,700
5	2 - Potable Water Pumps					
	500 GPM @ 80 psi		8,400	500	3,000	11,900
6	Starters & Controls		Under	Power Distribution		
7	Valves & Piping in Pumphouse		2,500	5,000	4,000	11,500
8	Heater for Tank		3,000	-	1,000	4,000
9	Distribution Piping			17,500	17,500	35,000
10	16 Risers, 3" ø			5,600	3,200	8,800

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Mine Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
11	4 Hydrants			4,000	3,000	7,000
12	6/6" Valves c/w Boxes			2,100	3,700	5,800
13	Car Wash		300	300	1,000	1,600
14	Excavation & Backfill				88,000	88,000
15	Hose Cart c/w Hose & Equipment					
	and Shelter		10,000	-	3,000	13,000
			81,400	51,300	153,900	286,600

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Mine Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	SANITARY SEWER SYSTEM					
1	4" Risers, including cleanouts			5,200	5,000	10,200
2	4" Sewer Pipe			3,000	2,000	5,000
3	6" Sewer Pipe			5,000	7,000	12,000
4	4" Disposal Pipe			2,000	2,000	4,000
5	Grease Trap			2,000	3,000	5,000
6	2 Manholes			1,400	1,000	2,400
7	Excavation & Backfill			-	72,000	72,000
				18,600	92,000	110,600

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Mine Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	EFFLUENT TREATMENT					
	Lagoon Including Lining		-	-	9,000	9,000
	Aeration Equipment		15,000		2,000	17,000
	MCC's & Wiring		(Included in Power Supply)			
	Lagoon Piping			2,000	2,000	4,000
	Chlorination			3,000	2,000	5,000
	Blower Housing			1,500	3,000	4,500
	Allowance for Deep Wells					
	Drainage Field, Irrigation, etc.			20,000	25,000	45,000
			15,000	26,500	43,000	84,500

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Mine Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	POWER DISTRIBUTION					
1	12.47 kV Line Extension		7,200	-	15,000	22,200
2	Substation (6 x 300 kVA)		23,200		24,000	47,200
3	Service Wiring		43,000		22,500	65,500
4	Street Lighting			2,600	3,000	5,600
5	Fire Alarm System			4,900	5,000	9,900
6	Pump House & Water Storage		6,500	3,000	12,000	21,500
7	Effluent Treatment		2,000	5,700	3,000	10,700
8	Car Heater Outlets		-	16,300	17,200	33,500
9	Car Park - Lighting			13,700	11,100	24,800
			81,900	46,200	112,800	240,900

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Mine Camp

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	PROPANE GAS					
1	3 Risers			400	200	600
2	Piping			2,000	2,000	4,000
3	Fence			300	400	700
4	Tanks & Vaporizer		By Gas Vendor			
	TOTALS			2,700	2,600	5,300

B.C. HYDRO - HAT CREEK PROJECT — PROJECT NO. 4142 A

AREA: CAMP BUILDINGS — 440 MAN MINE CAMP

YEAR	MEN	NO. OF UNITS (42 MAN) ADD		TOTAL	PURCHASE OR LEASE $	MAINTENANCE & REFURBISHING ALLOWANCE $ 3% year	TOTAL $
1978	74	2			357,200	10,700	
			Kitchen		613,000	18,400	
			Recreation		414,000	12,400	
				2		41,500	1,425,700
						41,500	
1979	101	1			178,600	5,300	
				3		46,800	225,400
						46,800	
1980	103	0					
				3		46,800	46,800
						46,800	
1981	116	0					
				3		46,800	46,800
						46,800	
1982	172	1			178,600	5,300	
				4		52,100	230,700
						52,100	
1983	388	6L.			484,000		
				10		52,100	536,100
						52,100	
1984	417	0					
				3L	138,300		
				3 used	75,000	15,900	
				4		68,000	281,300
						68,000	
1985	440	1 (used)			25,000	5,300	
				3 used	75,000	15,900	
				7			
						89,200	189,200
					$2,538,700	$ 443,300	$2,982,000

NOTE: It is assumed that salvage costs will cover removal of camp buildings at the end of project.

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Water Supply

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	TO MINE CAMP					
1	4" Carbon Steel Pipe			20,000	20,000	40,000
2	4" Ductile Iron			41,000	40,000	81,000
3	Excavation and Backfill			-	30,000	30,000
4	Allowance for Rock			3,000	7,000	10,000
5	Anchors			5,000	5,000	10,000
6	Chlorination Equipment		2,000	-	3,000	5,000
	TO POWER PLANT CAMP					
7	4" Carbon Steel Pipe			68,000	100,000	168,000
8	Excavation and Backfill		-	-	80,000	80,000
9	Allowance for Rock		-	-	40,000	40,000
10	Anchors			10,000	10,000	20,000
	SUB-TOTAL		2,000	147,000	335,000	484,000

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142A AREA Water Supply

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	POWER SUPPLY					
11	12.47 kV Supply Line		27,200		27,000	54,200
12	Motor Control, including					
	Signal Wire to Mine Camp			12,700	8,800	21,500
13	Power Supply & Control for					
	Pumps at Mine Camp			7,200	5,700	12,900
	SUB TOTAL		27,200	19,900	41,500	88,600
	WELL PUMPS					
14	Two Wells @ 150'			5,000	20,000	25,000
	Fixed cost included					
15	Deep Well Pumps		19,000		6,000	25,000
	60 gpm x 600' TDH					
	c/w 25 HP Motors					
16	M.C.C.'s and Wiring		(included in Power Supply)			
17	Pump Housing			1,000	2,000	3,000

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ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142 A AREA Water Supply

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
18	Valves and piping			3,000	2,500	5,500
19	Heating and Lighting			1,000	500	1,500
20	Instrumentation			2,500	1,000	3,500
	SUB TOTAL		19,000	12,500	32,000	63,500
	BOOSTER PUMPS AT MINE CAMP					
21	Pump Station Structure			4,000	4,000	8,000
22	Horizonal Booster Pumps					
	50 gpm x 1750' T.D.H.					
	c/w 50 H.P. Motors		15,000		3,000	18,000
23	M.C.C's and Wiring		(included in Power Supply)			
24	Valves and Piping			4,000	3,500	7,500
25	Heating and Lighting			1,000	500	1,500
26	Instrumentation			2,500	1,000	3,500
	SUB-TOTAL		15,000	11,500	12,000	38,500

simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 5, 1977

PROJECT No. 4142 A AREA Water Supply

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	REPLACEMENT FOR WELLS AT HAT-CREEK					
27	Pump Station Structure			5,000	8,000	13,000
28	Pumps (5 HP?)		4,000		1,000	5,000
29	M.C.C.'s		(included in Power Supply)			
30	Valves Piping			500	1,000	1,500
31	Heat and Light			800	700	1,500
32	Instrumentation			1,500	500	2,000
33	Press Filt. Structure			2,500	2,000	4,500
34	Two Filters 60 gpm/ea		8,000		1,500	9,500
35	Valves and Piping			1,500	500	2,000
36	Heat and Light			1,000	500	1,500
37	Instrumentation			1,500	500	2,000
38	Backwash Disposal allowance			25,000	25,000	50,000
	SUB-TOTAL		12,000	39,300	41,200	92,500
	TOTAL		75,200	230,200	461,700	767,100

simons CONSULTING ENGINEERS

ESTIMATE OF COST

B.C. Hydro - Hat Creek Project

DATE: August 8, 1977

PROJECT No. 4142 A AREA Design & Construction Services

ITEM NO.	DESCRIPTION OF EQUIPT. OR SERVICE	F	DIRECT PURCHASE	CONTRACTOR PURCHASE	LABOR & CONT. O'HEAD	TOTAL
	Detail Engineering		140,000			140,000
	Contract Specification and					
	Purchasing Specification		20,000			20,000
	Geotechnical and Hydrology		30,000			30,000
	Topographic Surveys		12,000			12,000
	Construction Management		80,000			80,000
	TOTAL		282,000			282,000

SCHEDULE FOR DESIGN, PROCUREMENT AND CONSTRUCTION

Two construction schedules are enclosed. The first schedule assumes that sufficient lead time is available to complete the engineering and major equipment purchases before obtaining lump sum contracts for the installation work, based on certified drawings. The schedule will require 12 months from start of engineering until the camps are ready for occupancy.

The second schedule shortens the total time to 8½ months. Several camps have been installed by Simons within this time. It required cooperation between all parties and good contract administration and field supervision. Engineering costs for this accelerated schedule will be slightly higher. It is based on using preliminary drawings and typical details to obtain unit price tenders. Firm price contracts with appropriate adjustment clauses may be arranged just before contractors start the work.

It is estimated that about 80 men will be engaged by various contractors for the installation of camps and water supply system during a 3½ month period. Only about 50 men will be required, if 5 months are available. This estimate is based on spending $1.2 million on direct on-site labour costs at $30.00 per man hour before the cores of both camps are ready for occupancy.

SIMONS — H. A. SIMONS (INTERNATIONAL) LTD. — VANCOUVER, B.C., CANADA

CLIENT - BRITISH COLUMBIA HYDRO AND POWER AUTHORITY PROJECT - HAT CREEK PROJECT

ENGINEERING AND CONSTRUCTION SCHEDULE

TITLE - MASTER SCHEDULE - 1A

SHEET - 1 OF 1 PROJECT No 4142A.

PREPARED BY SCHEDULING DEPT - G. PICKARD DATE - 8·8·77

ITEM No	DESCRIPTION
1	ENGINEERING
2	TENDERS FOR: CAMP BUILDING
3	· CATERING SERVICES
4	· DEEP WELLS (INCL. TESTS)
5	· WATER SUPPLY LINES
6	· MAJOR EQUIPMENT
7	*ACCESS ROAD TO POWER PLANT
8	CLEARING & GRUBBING:
9	· MINE CAMP
10	· POWER PLANT CAMP
11	GRADING
12	· MINE CAMP
13	· POWER PLANT CAMP
14	CONSTRUCTION OF:
15	· WATER RESERVORS
16	· PUMP HOUSES & WELL PUMP
17	· EFFLUENT TREATMENT
18	· UNDERGROUND SERVICES
19	· POWER DISTRIBUTION
20	
21	*B.C. HYDRO POWER SUPPLY
22	ERECTION OF CAMP BUILDINGS

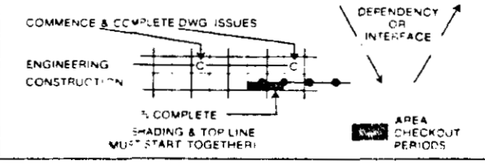
MONTH 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 — % COMPLETE 20 40 60 80 100

C — AS REQ'D — CONSTRUCTION PERIOD (TYP.) — TO BE IN PASSAGE SORTOW — CERTIFIED DWGS. — CLIENT DECISION — CAMPS READY — AWARD — SEE ITEM No 2 — THIS SCHEDULE BASED ON LUMP SUM CONTRACT (SW CERTIFIED DWGS.)

SCHED	ACTUAL	ACTIVITY
▽	▼	P.I. OR TENDER ISSUED
E	E	BID EVALUATION
◇	◆	CLIENTS DECISION OR APPROVAL
□	■	P.O. OR CONTRACT AWARDED
II	II	INITIAL VENDOR INFORMATION
X	⧗	CERTIFIED VENDOR INFORMATION
↓	↓	EQUIPMENT SHIPPED
○	●	EQUIPMENT DELIVERED ON SITE

ACTIVITY
ENGINEERING PRELIM & TAIL OFF
ENGINEERING – MAIN PHASE
PREPARE BID INFORMATION
BID PERIOD & CLOSING DATE
CONSTRUCT FOUNDATIONS
ERECT MAIN STRUCTURAL FRAME
ESSENTIAL COMPLETION OF BUILDING
INSTALLATIONS – MECHANICAL & ALLIED

SCHED	ACTUAL	ACTIVITY
MO	MO	MILL ORDER – STRUCTURAL STEEL
M	M	MECHANICAL DEPT. INPUT
PC	PC	ISSUE P&C DIAGRAMS
P	P	INFORMATION FOR PROCUREMENT
C	C	ISSUE CERTIFIED DRAWINGS
A	A	DRAWING APPROVALS
•	•	HIGHLIGHT
⟵	⟶	START OR COMPLETION DEADLINE



ISSUE	DATE	REMARKS
#1	8 8 77	PROPOSAL ISSUE

SIMONS — H. A. SIMONS (INTERNATIONAL) LTD. — VANCOUVER, B.C., CANADA

CLIENT - BRITISH COLUMBIA HYDRO AND POWER AUTHORITY PROJECT - HAT CREEK PROJECT

ENGINEERING AND CONSTRUCTION SCHEDULE

TITLE - MASTER SCHEDULE - 1B

SHEET - 1 OF 1 . PROJECT No 4424

PREPARED BY SCHEDULING DEPT. - J. PICKARD DATE - 8·8·77

ITEM No.	DESCRIPTION
1	ENGINEERING
2	TENDERS FOR: CAMP BUILDING
3	· CATERING SERVICES
4	· DEEP WELLS (INCL. TESTS)
5	· WATER SUPPLY LINES
6	· MAJOR EQUIPMENT
7	*ACCESS ROAD TO POWER PLANT
8	CLEARING & GRUBBING:
9	· MINE CAMP
10	· POWER PLANT CAMP
11	GRADING:
12	· MINE CAMP
13	· POWER PLANT CAMP
14	CONSTRUCTION OF:
15	· WATER RESERVOIRS
16	· PUMP HOUSES & WELL PUMP
17	· EFFLUENT TREATMENT
18	· UNDERGROUND SERVICES
19	· POWER DISTRIBUTION
20	
21	*B.C. HYDRO POWER SUPPLY
22	ERECTION OF CAMP BUILDINGS

MONTH 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 — % COMPLETE 20 40 60 80 100

CERT'D & ISS'D FOR TENDER

THIS SCHEDULE BASED ON UNIT PRICE CONTRACT USING CERTIFIED & PRELIM. DWG'S AS NOTED.)

ROADS TO BE IN PASSABLE CONDITION

CERTIFIED DWG'S

EASY TO READY

PRELIMINARY DWG'S

INCL TYPE (DETAILS)

AS REQ'D

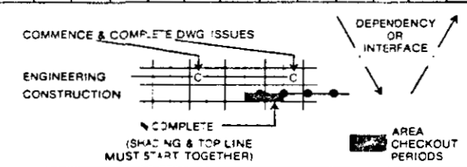
AWARD

SEE ITEM No. 7

SCHED	ACTUAL	ACTIVITY
▽	▼	P.I. OR TENDER ISSUED
E	Ⓔ	BID EVALUATION
◇	◆	CLIENTS DECISION OR APPROVAL
□	■	P.O. OR CONTRACT AWARDED
‖	▮	INITIAL VENDOR INFORMATION
X	⧗	CERTIFIED VENDOR INFORMATION
↓	↓	EQUIPMENT SHIPPED
○	●	EQUIPMENT DELIVERED ON SITE

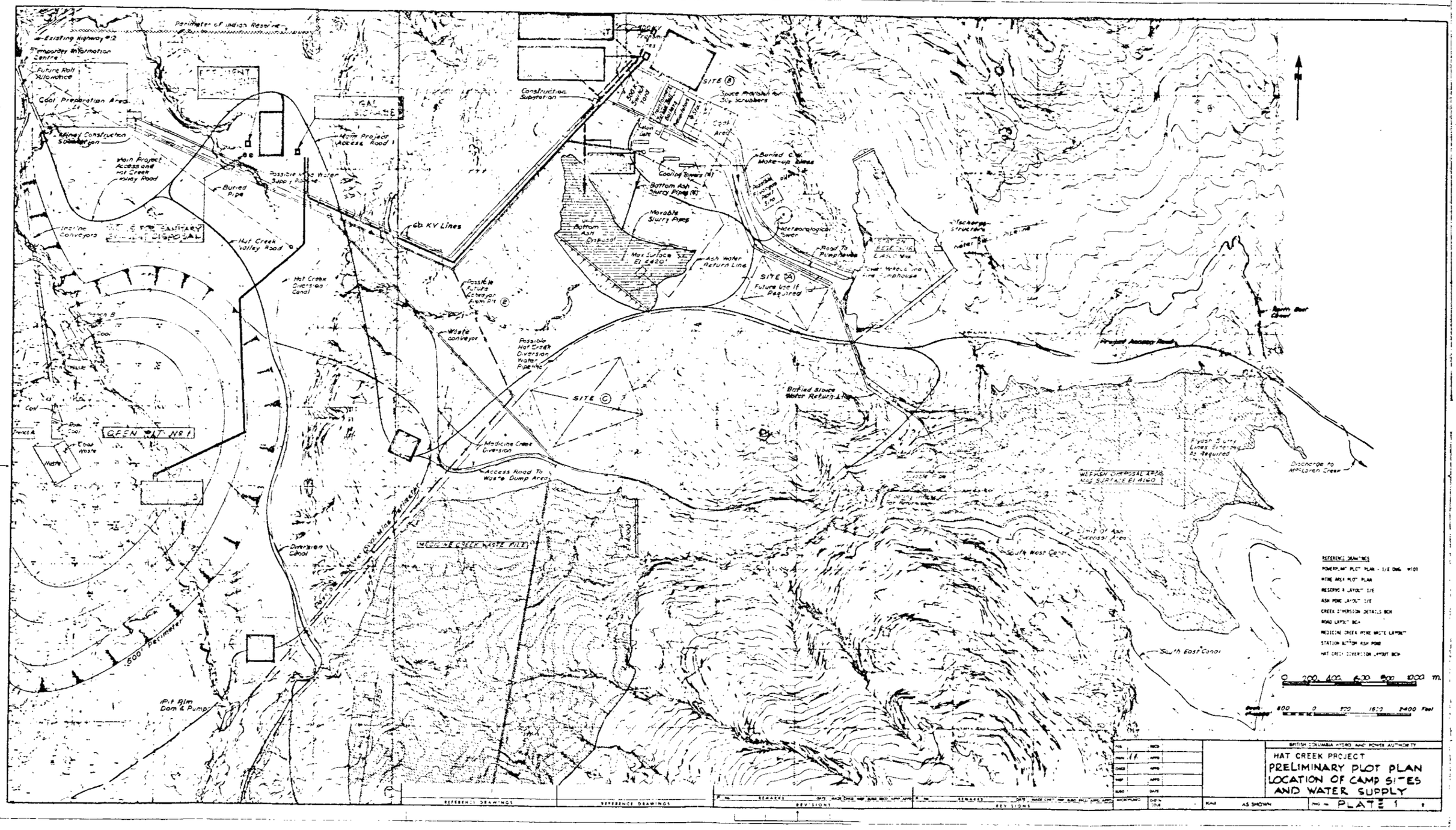
	ACTIVITY
- - - - -	ENGINEERING-PRELIM. & TAIL OFF
———	ENGINEERING — MAIN PHASE
\\\\\\\\	PREPARE BID INFORMATION
—/—/—→|	BID PERIOD & CLOSING DATE
////////	CONSTRUCT FOUNDATIONS
•——•——•	ERECT MAIN STRUCTURAL FRAME
XXXX	ESSENTIAL COMPLETION OF BUILDING
++++++	INSTALLATIONS — MECHANICAL & ALLIED

SCHED	ACTUAL	ACTIVITY
MO	Ⓜ	MILL ORDER — STRUCTURAL STEEL
M	Ⓜ	MECHANICAL DEPT. INPUT
PC	Ⓟ	ISSUE P&C DIAGRAMS
P	Ⓟ	INFORMATION FOR PROCUREMENT
C	Ⓒ	ISSUE CERTIFIED DRAWINGS
A	Ⓐ	DRAWING APPROVALS
*	*	HIGHLIGHT
K——→|		START OR COMPLETION DEADLINE



ISSUE	DATE	REMARKS
01	8·8·77	PROPOSAL ISSUE

BCIL 6263 H A S 1



BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

PRELIMINARY PLOT PLAN LOCATION OF CAMP SITES AND WATER SUPPLY

SCALE AS SHOWN

DWG. No. PLATE 1

REFERENCE DRAWINGS

REVISIONS

No.	REMARKS	DATE	MADE CHKD	APPD

SANITARY EFFLUENT TREATMENT

300 000 GAL WATER STORAGE RESERVOIR

PUMP HOUSE

BC HYDRO SUBSTATION

CAR WASH

TO SITE ACCESS ROAD

PARKING

PARKING

PARKING

10 MEN BUNK HOUSE (TYP.)

RECREATION

CAFETERIA

KITCHEN

42 MEN BUNK HOUSE (TYP.)

PROPANE GAS

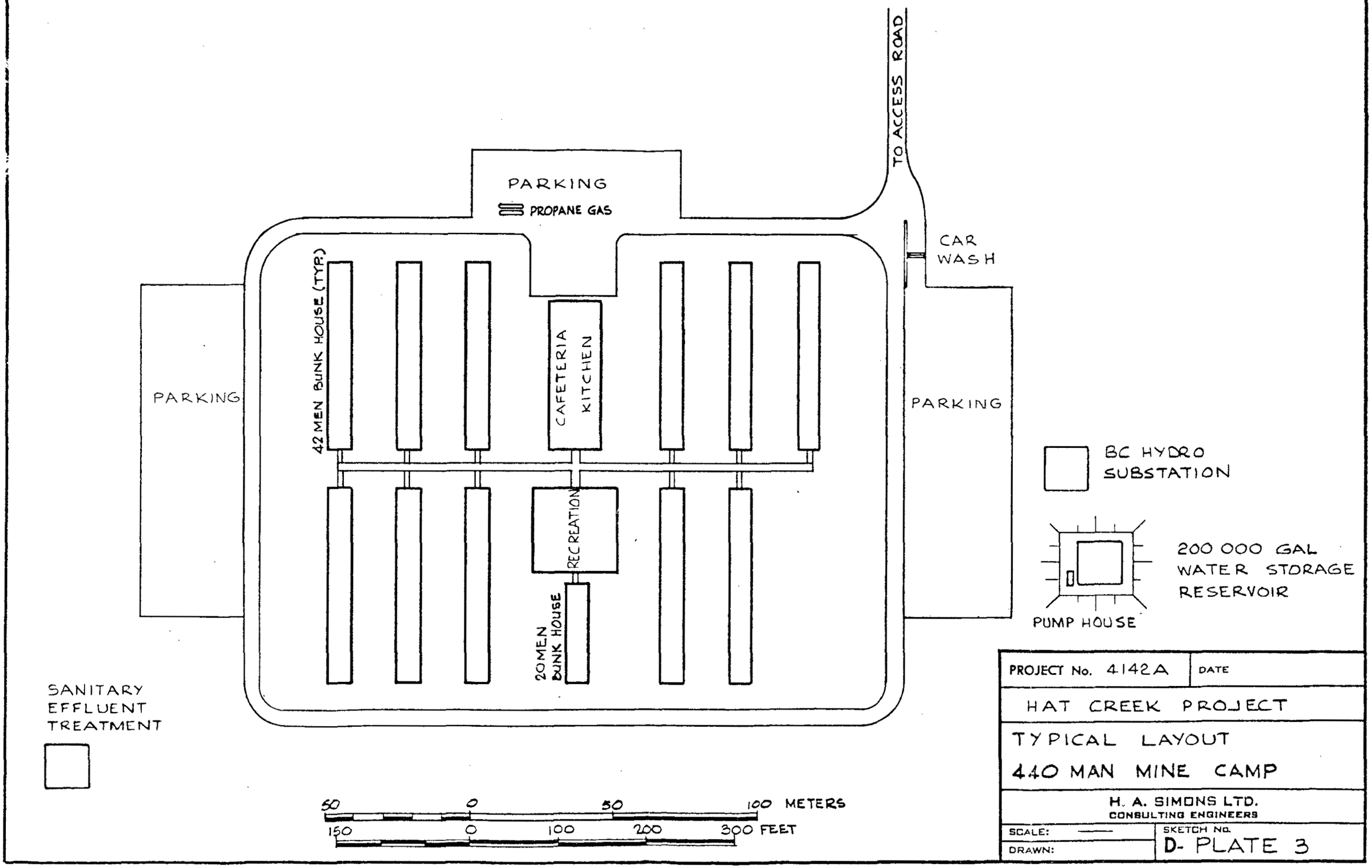
PARKING

TO CONSTRUCTION SITE

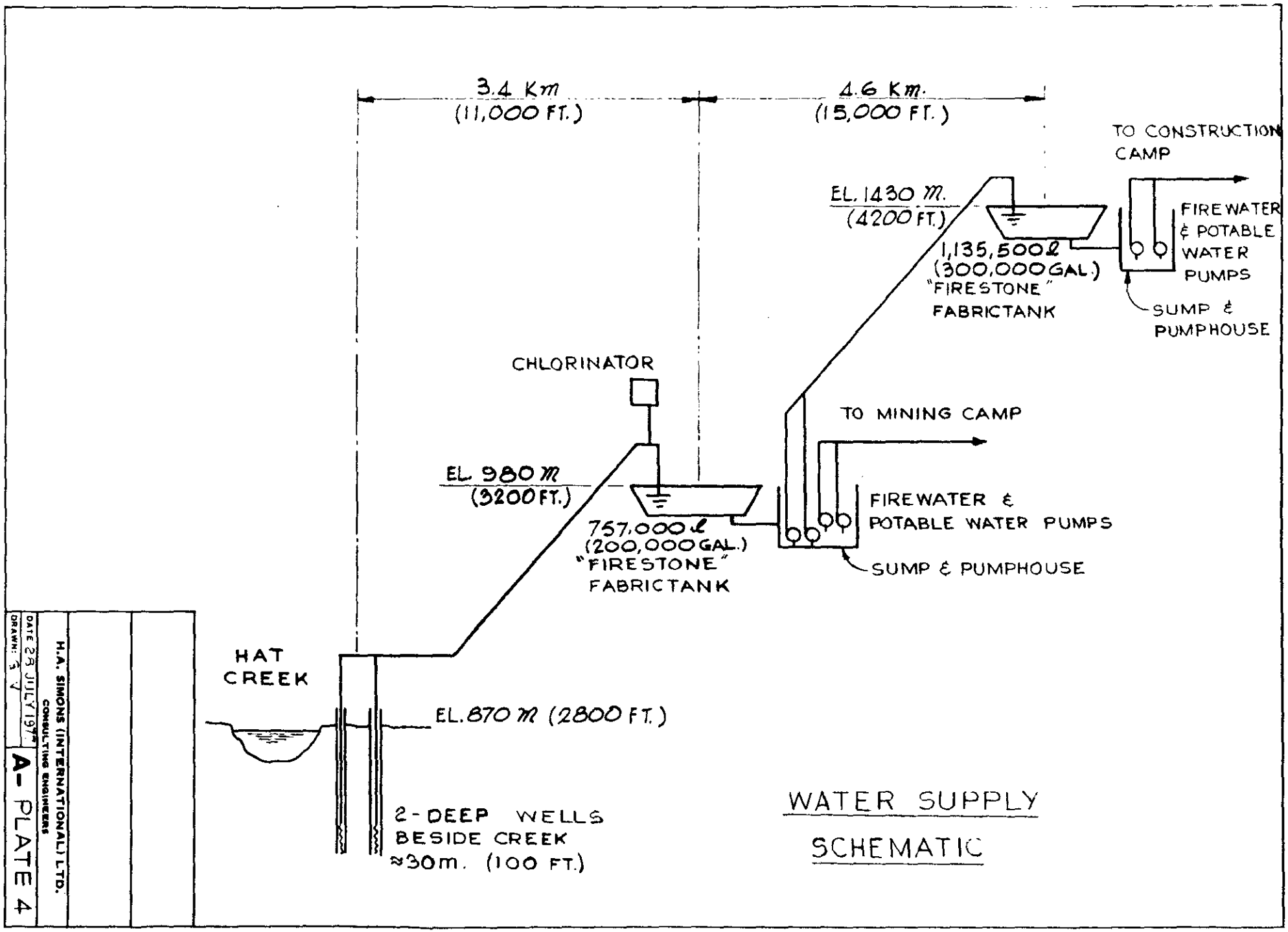
50 0 50 100 METERS

150 0 100 200 300 FEET

PROJECT No. 4142 A	DATE
HAT CREEK PROJECT	
TYPICAL LAYOUT 1000 MAN POWER PLANT CAMP	
H. A. SIMONS LTD. CONSULTING ENGINEERS	
SCALE:	D- PLATE 2
DRAWN:	



PROJECT No. 4142A	DATE
HAT CREEK PROJECT	
TYPICAL LAYOUT 440 MAN MINE CAMP	
H. A. SIMONS LTD. CONSULTING ENGINEERS	
SCALE: —— DRAWN:	SKETCH No. D- PLATE 3



WATER SUPPLY SCHEMATIC

H.A. SIMONS (INTERNATIONAL) LTD.
CONSULTING ENGINEERS
DATE 28 JULY 1971
DRAWN: S.V.
A- PLATE 4

REFERENCES

The following references were received from B.C. Hydro for the preparation of this report:

Dwg. No. 604H-C14-E7, Preliminary Project Layout, (dated 28 June, 1977).

Contour maps, 1" = 400' scale.

"The Engineering Climatic Summary" (dated February 1977).

Hydrological Data from the Monenco Report, pages 3-2 to 3-5, Appendix B and C.

Drill Records by Dolmage, Campbell & Associates, for holes 74-28, 74-35 & 76-170.

Section 4 (Sub-surface Hydrology) and Appendix 5 Geo-hydrologic Data, from Golder Associates Report (returned to B.C. Hydro).

Estimated Manpower Schedule, dated 7 July, 1977.

Plot plan M101 and Preliminary Foundation Investigation, prepared by Thurber Consultants Ltd.

Hat Creek No. 1 Deposit - Surface intercepts of stages of Pit Development to 1,500' elevation.