Cominco

cominco-monenco joint venture

monenco

MHF
DRW

no attachment
rec'd

File #320

19 October 1977

FILE 1301.4-2
THERMAL DIV.
OCT 20 1977

ROUTE		INIT
	DIV. MGR.	
1	PROJ. CONTROL	✓
2	POWER PLANT	
	MINING	
	CONSTRUCTION	
3	PRW	
ACTION:	JJF	w/2 encl
	PCCD/AC	w/1 encl.

COPIES

British Columbia Hydro
and Power Authority,
744 W. Hastings Street.
Vancouver, B.C.,
V6C 1A5

Attention: Mr. J.J. Fitzpatrick,
Manager, Mining Department

Reference: Modular Coal Washery

Dear Jerry:

Please find enclosed three (3) copies of Simon-Carves "Summary Report on Preliminary Design and Costing of a Modular Coal Washery".

As agreed, you will see that Joe Matoney receives a copy.

Yours very truly,

O.I. Johnson,
Project Manager.

OIJ/smg
Encl. (3)

1199 West Pender Street, Vancouver, British Columbia V6E 2R5 Telephone: (604) 684-7411 Telex: 04-53347

SIMON-CARVES

Simon-Carves of Canada Ltd.
2025 Sheppard Avenue East
Willowdale, Ontario, M2J 1W2

Telex: 06 966800
Cable: SIMCAR-TOR
Telephone: (416) 491-1650

October 14, 1977
F1304.C12/SGB/kc

Cominco-Monenco Joint Venture
Suite 330
1199 W. Pender Street
Vancouver, B.C.

Attention: Mr. O.I. Johnson
Project Manager

Gentlemen:

Modular Coal Washery

We have pleasure in enclosing six (6) copies of our "Summary Report on Preliminary Design and Costing of a Modular Coal Washery", for the B.C. Hydro Hat Creek Project. Please note that we have not sent copies to anyone direct, and thus we trust that you will distribute to, for example, B.C. Hydro personnel who will be involved in our Review of October 27th - November 4th.

You should note that this report is concerned only with the Coal Washery, and does not include tailings dewatering and/or disposal facilities which will be the subject of a separate report.

This report is therefore solely concerned with the design and costing of the Modular Coal Washery comprising Coarse Coal Washing by Dense Medium Baths and Fine Coal Washing by Two Stage Water Only Washing Cyclones. This is a selected scheme in order to provide an input to the First Washplant Decision. If it's "first decision" - it should be the last !!

We shall be reporting separately on the review of Alternative Coal Beneficiation Methods available and their Practical Application to Hat Creek Coals. The variations between the 1976 Washability Data, and that now becoming available from the 1977 testwork, demands completion of this year's testwork prior to making a substantive process review.

Very truly yours,
SIMON-CARVES OF CANADA LTD.

S.G. Butcher, P. Eng.,
Senior Process Engineer
Coal Preparation Division

Encl. (6)

This year's test work is not going to be of a radical nature. It's more or less confirming the tests done earlier. We could at least expect some preliminary thoughts at this stage !! BGS 21/X/77

JJF (2)
J Mackay
CMJV (3)

F1304 C-MJV for B.C. Hydro - Hat Creek

SUMMARY REPORT
ON
PRELIMINARY DESIGN AND COSTING
OF A
MODULAR COAL WASHERY

October 1977

F1304 C-MJV for B.C. Hydro
Hat Creek - Modular Coal Washery

October 1977

SUMMARY REPORT

ON

PRELIMINARY DESIGN AND COSTING

OF A

MODULAR COAL WASHERY

SECTION

1. Summary
2. Introduction
3. Conclusions
4. (Alternative Coal Beneficiation Processes?) RAW COAL DESIGN?
5. Basis of Design
6. Description of Proposed Plant
7. Outline Engineering Specifications
   - 7.1 Equipment Schedule
   - 7.2 Mechanical Engineering
   - 7.3 Electrical Engineering
   - 7.4 Instrumentation and Plant Control
   - 7.5 Structural & Civil Engineering
   - 7.6 Services (H & V, etc.)
8. Capital Cost Summary
9. Operational Requirements
10. Drawings

SECTION 1

SUMMARY

This Report is a Summary of work undertaken by Simon-Carves of Canada Ltd., between June and September 1977, to develop a Preliminary Design and Costing for a Coal Washing Plant to form part of the Hat Creek Mine and Thermal Generating Plant Complex.

Previous studies had appreciated the need for Coal Preparation and provided Washability and Test Wash Data on three coals. In this Report the data is examined to establish the ability of alternative Coal Preparation Schemes to meet the Draft Boiler Fuels Specification.

From this examination a Basis of Design for a Modular Coal Washery has been prepared in such a manner that any proportions of the coarser or finer raw coals may be treated within the total context of the Mining and Product Blending Schemes. This design has been detailed sufficient to permit site planning and to give Order of Magnitude Costs for Coal Preparation. Thus the product yields and coal washing costs associated with alternative raw coal or product specifications may be calculated.

SECTION 2

INTRODUCTION

Previous mining studies, culminating in the PD-NCB Report No. 9, had appreciated the need for Coal Preparation due to the extreme variability and general low grade of the Hat Creek deposit. No costs data had, however, been provided in these studies, and thus the C-MJV Team realized that Preliminary Order of Magnitude Costs would be needed at an early stage in the Phase I Study.

Simon-Carves of Canada thus suggested the preparation of a Modular Design of Coal Washery such that basic decisions on possible alternative mine plans and boiler fuel specifications could be quantified. These decisions were co-ordinated in the study schedule with the intention of making the "First Washplant Decision" at the beginning of November 1977. This decision is essentially whether the mine complex needs coal beneficiation to upgrade raw coal to the Draft Boiler Fuels Specification.

Previous work on coal preparation was essentially limited to a report on Washability Analyses and Test Washes of three samples by Coal Science and Minerals Testing of Calgary. No attempt was made to interpret these results into a conceptual plant design or to show the relationship between product quality and yield.

SCAN have examined, with the aid of Computer Predictions:-

2.1 The capability of alternative coal preparation methods

- 2.1.1 Dense Medium Bath
- 2.1.2 Dense Medium Cyclones
- 2.1.3 Water Only Cyclones
- 2.1.4 Baum Jigs
- 2.1.5 Dry Cleaning
- 2.1.6 Fines Extraction and/or Blending.

From these individual methods practical combinations have been examined.

2.2 The practical quality/yield relationship, using a selected scheme of Dense Medium Bath and Water Only Cyclones and Fines Blending, such that the Mine Planning Engineers could relate R.O.M. Coal Qualities to Product Yields.

SECTION 2

INTRODUCTION

2.3 The costs of a Modular Coal Washery in accordance with the selected scheme as above.

Detailed examination has been limited to the three 1976 data sets. However, in preparing the Basis of Design, full account was taken of site and laboratory observations on current testwork, and observations contained in relevant sections of reports by J. Howard Griffiths and Integ-Ebasco.

In preparing this Modular Coal Washery design and Order of Magnitude costing SCAN have made maximum use, within the process requirements, of "in-house" information. The inclusion, for example, of DSM equipment should be seen, therefore as a matter of expediency, and does not represent a recommendation of this equipment.

SECTION 3

CONCLUSIONS

Conclusions will be made following the analysis of the washability data from the 1977 raw coal samples.

SECTION 4

RAW COAL DESIGN

RAW COAL DATA

This section contains the washability data that was used in predicting the performance of various washing schemes. The 1976 Birtley Engineering report was the source of the float-sink analyses for raw coals of varying quality: type "A" represents the worst quality, type "B" the average, and type "C" the best quality.

Although this washability data was based on a raw coal sample crushed to minus 2", when, in fact, no crushing is to occur prior to washing, it was felt that variations in the size consist of the run of mine coal as well as mechanical degradation could give the raw coal feed to an actual washplant a similar size consist. Another reason for using the data based on the crushed sample was the fact that float-sink tests were performed on 8 individual size fractions giving a much more comprehensive analysis than that done on 4" x 0 samples, the data for which is also given in the Birtley Report.

why not 4.

SECTION 4

RAW COAL DESIGN

Birtley Engineering Raw Coal

Size Analysis - Type "A"

Size	% Weight (Dry Basis)	% Ash
2" x 1"	10.8	42.9
1" x 1/2"	15.5	45.1
1/2" x 1/4"	10.2	44.3
1/4" x 1/8"	13.2	47.9
1/8" x 28M	35.9	54.2
28M x 48M	6.9	64.9
48M x 100M	4.6	62.2
100M x 0	2.9	65.8

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 503
DATA SET NAME: HAT CREEK A 2x1

GIVEN WASHABILITY DATA

DRY?

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	18.10	18.10	7.90	7.90
1.300 - 1.350	8.90	27.00	20.30	11.99
1.350 - 1.400	16.30	43.30	26.60	17.49
1.400 - 1.450	12.40	55.70	40.00	22.50
1.450 - 1.500	5.30	61.00	45.50	24.50
1.500 - 1.600	8.40	69.40	51.80	27.80
1.600 - 1.700	6.80	76.20	65.90	31.20
1.700 - 1.800	10.10	86.30	72.20	36.00
1.800 - 1.900	4.20	90.50	81.20	38.10
1.900 - 2.800	9.50	100.00	93.90	43.40

HEAD ASH OF WASHABILITY DATA = 43.40
(HEAD ASH OF BULK SAMPLE = 42.90) ?

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 505
DATA SET NAME: HAT CREEK A 1x1/2

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	14.60	14.60	7.40	7.40
1.300 - 1.350	10.30	24.90	19.00	12.20
1.350 - 1.400	11.90	36.80	25.50	16.50
1.400 - 1.450	10.80	47.60	37.20	21.20
1.450 - 1.500	14.40	62.00	47.50	27.31
1.500 - 1.600	7.50	69.50	58.80	30.70
1.600 - 1.700	9.30	78.80	63.70	34.60
1.700 - 1.800	9.90	88.70	78.50	39.50
1.800 - 1.900	6.80	95.50	92.90	43.30
1.900 - 2.800	4.50	100.00	96.60	45.70

HEAD ASH OF WASHABILITY DATA = 45.70
(HEAD ASH OF BULK SAMPLE = 45.10)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 507
DATA SET NAME: HAT CRK A 1/2x1/4

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	17.10	17.10	8.20	8.20
1.300 - 1.350	7.10	24.20	17.10	10.81
1.350 - 1.400	13.20	37.40	27.50	16.70
1.400 - 1.450	7.60	45.00	35.00	19.79
1.450 - 1.500	1.20	46.20	39.40	20.30
1.500 - 1.600	16.90	63.10	46.80	27.40
1.600 - 1.700	7.40	70.50	61.70	31.00
1.700 - 1.800	8.60	79.10	62.30	34.40
1.800 - 1.900	10.30	89.40	74.30	39.00
1.900 - 2.800	10.60	100.00	92.80	44.70

HEAD ASH OF WASHABILITY DATA = 44.70
(HEAD ASH OF BULK SAMPLE = 44.30)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 509
DATA SET NAME: HAT CRK A 1/4x1/8

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	11.60	11.60	7.50	7.50
1.300 - 1.350	10.40	22.00	17.00	11.99
1.350 - 1.400	8.40	30.40	24.30	15.39
1.400 - 1.450	7.00	37.40	29.90	18.11
1.450 - 1.500	5.20	42.60	42.60	21.10
1.500 - 1.600	12.40	55.00	43.70	26.19
1.600 - 1.700	12.00	67.00	59.70	32.19
1.700 - 1.800	10.40	77.40	68.00	37.01
1.800 - 1.900	12.40	89.80	80.40	43.00
1.900 - 2.800	10.20	100.00	92.00	48.00

HEAD ASH OF WASHABILITY DATA = 48.00
(HEAD ASH OF BULK SAMPLE = 47.90)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 511
DATA SET NAME: HAT CRK A 1/8x28M

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	4.40	4.40	7.40	7.40
1.300 - 1.350	6.10	10.50	15.30	11.99
1.350 - 1.400	6.00	16.50	20.50	15.08
1.400 - 1.450	4.20	20.70	27.50	17.60
1.450 - 1.500	7.10	27.80	31.70	21.20
1.500 - 1.600	10.70	38.50	41.70	26.90
1.600 - 1.700	11.90	50.40	52.70	32.99
1.700 - 1.800	23.70	74.10	65.80	43.49
1.800 - 1.900	7.70	81.80	80.80	47.00
1.900 - 2.800	18.20	100.00	81.10	53.20

HEAD ASH OF WASHABILITY DATA = 53.20
(HEAD ASH OF BULK SAMPLE = 54.20)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 513
DATA SET NAME: HAT CRK A 28x100M

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.400	2.60	2.60	11.50	11.50
1.400 - 1.450	3.40	6.00	15.90	13.99
1.450 - 1.500	4.70	10.70	25.40	19.00
1.500 - 1.600	9.80	20.50	35.50	26.89
1.600 - 1.700	8.50	29.00	46.00	32.49
1.700 - 1.800	12.00	41.00	56.10	39.40
1.800 - 1.900	19.10	60.10	75.60	50.91
1.900 - 2.800	39.90	100.00	95.00	68.50

HEAD ASH OF WASHABILITY DATA = 68.50
(HEAD ASH OF BULK SAMPLE = 63.80)

SECTION 4

RAW COAL DESIGN

Birtley Engineering Raw Coal

Size Analysis - Type "B"

Size	% Weight (Dry Basis)	% Ash
2" x 1"	10.0	25.8
1" x 1/2"	14.6	30.0
1/2" x 1/4"	11.9	31.6
1/4" x 1/8"	18.5	32.9
1/8" x 28M	33.8	40.2
28M x 48M	5.2	50.2
48M x 100M	3.5	53.6
100M x 0	2.5	58.3

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 515
DATA SET NAME: HAT CREEK B 2x1

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	23.80	23.80	9.80	9.80
1.300 - 1.350	20.30	44.10	16.50	12.88
1.350 - 1.400	27.00	71.10	22.40	16.50
1.400 - 1.450	7.50	78.60	28.00	17.60
1.450 - 1.500	7.50	86.10	42.90	19.80
1.500 - 1.600	2.10	88.20	49.20	20.50
1.600 - 1.700	3.40	91.60	55.50	21.80
1.700 - 1.800	1.30	92.90	61.40	22.35
1.800 - 1.900	2.60	95.50	65.00	23.51
1.900 - 2.800	4.50	100.00	69.60	25.59

HEAD ASH OF WASHABILITY DATA = 25.59
(HEAD ASH OF BULK SAMPLE = 25.80)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 517
DATA SET NAME: HAT CREEK B 1x1/2

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	18.10	18.10	7.50	7.50
1.300 - 1.350	22.70	40.80	14.90	11.62
1.350 - 1.400	20.20	61.00	28.20	17.11
1.400 - 1.450	10.40	71.40	37.00	20.01
1.450 - 1.500	9.20	80.60	41.90	22.50
1.500 - 1.600	6.60	87.20	51.40	24.69
1.600 - 1.700	4.30	91.50	58.60	26.29
1.700 - 1.800	2.20	93.70	66.60	27.23
1.800 - 1.900	1.60	95.30	69.30	27.94
1.900 - 2.800	4.70	100.00	72.30	30.02

HEAD ASH OF WASHABILITY DATA = 30.02
(HEAD ASH OF BULK SAMPLE = 30.00)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 519
DATA SET NAME: HAT CRK B 1/2x1/4

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	16.40	16.40	7.50	7.50
1.300 - 1.350	23.10	39.50	15.70	12.30
1.350 - 1.400	18.50	58.00	24.00	16.03
1.400 - 1.450	8.40	66.40	33.00	18.18
1.450 - 1.500	6.80	73.20	40.60	20.26
1.500 - 1.600	7.60	80.80	50.50	23.10
1.600 - 1.700	4.40	85.20	56.90	24.85
1.700 - 1.800	6.10	91.30	63.50	27.43
1.800 - 1.900	4.30	95.60	70.00	29.35
1.900 - 2.800	4.40	100.00	74.30	31.32

HEAD ASH OF WASHABILITY DATA = 31.32
(HEAD ASH OF BULK SAMPLE = 31.60)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 521
DATA SET NAME: HAT CRK B 1/4x1/8

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	9.00	9.00	8.40	8.40
1.300 - 1.350	19.70	28.70	12.60	11.28
1.350 - 1.400	20.50	49.20	21.10	15.37
1.400 - 1.450	6.50	55.70	30.00	17.08
1.450 - 1.500	6.10	61.80	39.50	19.29
1.500 - 1.600	14.40	76.20	46.50	24.43
1.600 - 1.700	8.70	84.90	52.70	27.33
1.700 - 1.800	5.10	90.00	57.70	29.05
1.800 - 1.900	2.90	92.90	68.60	30.29
1.900 - 2.800	7.10	100.00	75.20	33.48

HEAD ASH OF WASHABILITY DATA = 33.48
(HEAD ASH OF BULK SAMPLE = 32.90)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 523
DATA SET NAME: HAT CRK B 1/8x28M

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	2.30	2.30	6.50	6.50
1.300 - 1.350	10.40	12.70	11.50	10.59
1.350 - 1.400	9.70	22.40	18.50	14.02
1.400 - 1.450	9.00	31.40	22.00	16.31
1.450 - 1.500	15.80	47.20	29.10	20.59
1.500 - 1.600	10.60	57.80	44.00	24.88
1.600 - 1.700	14.00	71.80	50.10	29.80
1.700 - 1.800	8.10	79.90	54.30	32.28
1.800 - 1.900	5.50	85.40	64.90	34.38
1.900 - 2.800	14.60	100.00	75.10	40.33

HEAD ASH OF WASHABILITY DATA = 40.33
(HEAD ASH OF BULK SAMPLE = 40.20)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 525
DATA SET NAME: HAT CRK B 28x100M

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.400	3.60	3.60	10.10	10.10
1.400 - 1.450	4.70	8.30	14.30	12.48
1.450 - 1.500	6.10	14.40	22.40	16.68
1.500 - 1.600	14.60	29.00	27.60	22.18
1.600 - 1.700	9.90	38.90	42.20	27.27
1.700 - 1.800	11.80	50.70	50.10	32.59
1.800 - 1.900	19.20	69.90	59.50	39.98
1.900 - 2.800	30.10	100.00	75.60	50.70

HEAD ASH OF WASHABILITY DATA = 50.70
(HEAD ASH OF BULK SAMPLE = 51.60)

SECTION 4

RAW COAL DESIGN

Birtley Engineering Raw Coal

Size Analysis - Type "C"

Size	% Weight (Dry Basis)	% Ash
2" x 1"	6.1	24.5
1" x 1/2"	10.2	22.3
1/2" x 1/4"	16.0	24.4
1/4" x 1/8"	14.0	26.0
1/8" x 28M	33.4	30.2
28M x 48M	8.7	37.5
48M x 100M	7.6	37.9
100M x 0	4.0	39.0

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 527
DATA SET NAME: HAT CREEK C 2x1

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	40.90	40.90	9.80	9.80
1.300 - 1.350	23.90	64.80	17.10	12.49
1.350 - 1.400	14.00	78.80	26.60	15.00
1.400 - 1.450	5.90	84.70	35.10	16.40
1.450 - 1.500	2.00	86.70	42.40	17.00
1.500 - 1.600	2.30	89.00	51.80	17.90
1.600 - 1.700	1.80	90.80	58.30	18.70
1.700 - 1.800	.80	91.60	64.50	19.10
1.800 - 1.900	1.00	92.60	74.70	19.70
1.900 - 2.800	7.40	100.00	78.30	24.04

HEAD ASH OF WASHABILITY DATA = 24.04
(HEAD ASH OF BULK SAMPLE = 24.50)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 537
DATA SET NAME: HAT CRK C 28x100M

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.350	11.70	11.70	8.60	8.60
1.350 - 1.400	15.00	26.70	14.10	11.69
1.400 - 1.450	16.20	42.90	22.60	15.81
1.450 - 1.500	12.60	55.50	32.10	19.51
1.500 - 1.600	13.40	68.90	42.60	24.00
1.600 - 1.700	8.90	77.80	52.00	27.20
1.700 - 1.800	7.30	85.10	63.30	30.30
1.800 - 1.900	7.80	92.90	68.40	33.50
1.900 - 2.800	7.10	100.00	78.30	36.68

HEAD ASH OF WASHABILITY DATA = 36.68
(HEAD ASH OF BULK SAMPLE = 37.70)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 535
DATA SET NAME: HAT CRK C 1/8x28M

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	21.70	21.70	6.10	6.10
1.300 - 1.350	20.80	42.50	13.70	9.82
1.350 - 1.400	14.10	56.60	18.20	11.91
1.400 - 1.450	3.60	60.20	28.60	12.91
1.450 - 1.500	10.80	71.00	37.90	16.71
1.500 - 1.600	4.20	75.20	48.90	18.51
1.600 - 1.700	4.20	79.40	58.20	20.61
1.700 - 1.800	7.60	87.00	64.30	24.42
1.800 - 1.900	4.00	91.00	69.90	26.42
1.900 - 2.800	9.00	100.00	76.70	30.95

HEAD ASH OF WASHABILITY DATA = 30.95
(HEAD ASH OF BULK SAMPLE = 30.20)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 533
DATA SET NAME: HAT CRK C 1/4x1/8

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	35.90	35.90	6.90	6.90
1.300 - 1.350	20.30	56.20	16.60	10.40
1.350 - 1.400	9.90	66.10	20.40	11.90
1.400 - 1.450	5.40	71.50	26.50	13.00
1.450 - 1.500	6.70	78.20	35.20	14.91
1.500 - 1.600	5.40	83.60	49.00	17.11
1.600 - 1.700	1.40	85.00	59.60	17.81
1.700 - 1.800	3.90	88.90	65.70	19.91
1.800 - 1.900	3.60	92.50	71.30	21.91
1.900 - 2.800	7.50	100.00	78.20	26.13

HEAD ASH OF WASHABILITY DATA = 26.13
(HEAD ASH OF BULK SAMPLE = 26.00)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 531
DATA SET NAME: HAT CRK C 1/2x1/4

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	41.70	41.70	7.90	7.90
1.300 - 1.350	21.70	63.40	16.40	10.81
1.350 - 1.400	7.80	71.20	26.30	12.51
1.400 - 1.450	8.40	79.60	34.30	14.81
1.450 - 1.500	4.00	83.60	42.00	16.11
1.500 - 1.600	2.10	85.70	48.70	16.91
1.600 - 1.700	2.20	87.90	56.90	17.91
1.700 - 1.800	2.80	90.70	63.30	19.31
1.800 - 1.900	2.80	93.50	72.70	20.91
1.900 - 2.800	6.50	100.00	78.20	24.63

HEAD ASH OF WASHABILITY DATA = 24.63
(HEAD ASH OF BULK SAMPLE = 24.40)

** S I M O N - C A R V E S O F C A N A D A **

DATA SET NUMBER: 529
DATA SET NAME: HAT CREEK C 1x1/2

GIVEN WASHABILITY DATA

S.G. FRACTION	FLOATS	CUM. FLOATS	ASH	CUM. ASH
0.000 - 1.300	47.70	47.70	8.70	8.70
1.300 - 1.350	16.30	64.00	13.80	10.00
1.350 - 1.400	11.10	75.10	26.90	12.50
1.400 - 1.450	9.10	84.20	34.70	14.90
1.450 - 1.500	2.00	86.20	40.80	15.50
1.500 - 1.600	2.80	89.00	50.50	16.60
1.600 - 1.700	1.90	90.90	54.90	17.40
1.700 - 1.800	3.10	94.00	59.90	18.80
1.800 - 1.900	.80	94.80	66.20	19.20
1.900 - 2.800	5.20	100.00	75.00	22.10

HEAD ASH OF WASHABILITY DATA = 22.10
(HEAD ASH OF BULK SAMPLE = 22.30)

SECTION 5

BASIS OF DESIGN & OPERATING PHILOSOPHY

5.1 NOMINAL PLANT CAPACITY

The Mine Complex (including the Coal Washery) has been sized in accordance with the Parameters set out in Mr. O.L. DeLa Cuesta's memo File 1301.4-2 of July 11, 1977. This sets, for the maximum capacity factor period 1989-1998, product production requirements of:

(a) 10,894,000 MTPY at 5,500 BTU/lb
or (b) 10,119,000 MTPY at 5,900 BTU/lb
or (c) 9,272,000 MTPY at 6,300 BTU/lb.

(These values all assume a coal moisture content of 20%.)

For an initial estimate of Coal Washery Capacity we assumed that the worst raw coal quality over "a period" to be catered for would be 45% ash (dry basis). This would give yields, as summarized in our graph "Beneficiation Yields for Hat Creek Coals" - Revision (2) August 19, 1977 of the above qualities:-

		Equivalent Raw Coal Tonnage
(a)	82.6%	13,188,862 MTPY
(b)	72.3%	13,995,850 MTPY
(c)	64.2%	14,442,368 MTPY

Taking therefore case (c) and the operating hours as set out in the above document, we obtained the following requirement:

$$\frac{14,442,368}{350 \times 24} = 1719 \text{ MTPH}$$

A nominal capacity of 2000 MTPH was therefore selected which demands an availability of 86.0%.

SECTION 5

BASIS OF DESIGN & OPERATING PHILOSOPHY

5.2 MODULAR CONCEPT

The Modular Concept which we propose for large Coal Washeries envisages a number of similar design self-contained washing circuits with a minimum of common facilities. Usually these common facilities would be restricted to high availability items such as product conveyors, feed hoppers and the like, and items which would not cause the plant to be immediately shutdown. Stagewise development to any capacity is thus possible by placing modules side by side over a set of common lengthwise conveyors.

The modular design of Coal Preparation Plant embodies two concepts. From a design and construction viewpoint it is a philosophy which is equivalent to the proposed stagewise development of the Mine and Thermal Plant. As an operational philosophy it offers two advantages:-

(i) The achievement of high net availability. Since only relatively few items - principally feed and product conveyors - can put the whole facility out of operation, the typical "unit" availability of 75 to 80% can be increased to 85 to 90% overall. Moreover, this can be achieved simultaneously with a reduction in the amount of standby equipment.

(ii) The facility to treat different portions of the Run of Mine Coal at different operational settings if required, for example, to optimize yield or quality.

When the plant is to be operated on a 7-day week, 24 hours per day cycle, it is necessary to have a standby module so that production continues while maintenance is performed on a planned basis.

In developing a modular design of economic proportions, the total requirements are calculated as for one big plant - giving approximately 26 meters width of classifying screen, etc.
Larger standard sizes of items are then compared with these values to see which simple multiple will give the requirement. In this case, 9 and 10 looked useful, but only 5 of a few items appeared. We therefore selected 5 modules each comprised of a twin stream for most items.

The site layout is thus proposed for five operating and one standby module.

SECTION 5

BASIS OF DESIGN & OPERATING PHILOSOPHY

5.3 DESIGN CRITERIA

These were developed in detail from the data set out in Section 4. These factors include a very wide range of raw coal size consist: thus at the detail process design stage we would envisage the possibility of some savings, for example, a reduction in fine coal treatment capacity. However, these reductions would not substantially change the building/structural requirements.

As an illustration of the wide variations in load which are within the plant item capacities, we have included three Mass Balance Flowsheets showing a feed of 100 MTPH through a module operating in alternative "modes".

Total Washing of "A" Coal
Partial Washing (+1/4") of "B" Coal
Partial Washing (+1/2") of "C" Coal.

The design limiting criteria were in fact developed with somewhat wider variations:

5.3.1 Maximum Clean Coal Yield from any process section - a projection of raw coal data to 20% ash (dry basis), giving a yield of approximately 90%.

5.3.2 Minimum Clean Coal Yield from any process section - a projection of raw coal data to 55% ash (dry basis), giving a yield of approximately 45%. Variations could however be expected due to the higher discard content of the fine coal, and also for the coarser size fractions if partings are not segregated. A minimum yield of 40% was thus selected.

5.3.3 The very high fine clay content obtained by projection beyond the "A" coal sample was considered unrealistic. We therefore set a Maximum Tailings Yield of 5% of the Raw Coal Input.

SECTION 5

BASIS OF DESIGN & OPERATING PHILOSOPHY

5.3 DESIGN CRITERIA - cont.

It should be noted that the samples mined during recent weeks have shown a substantially increased proportion of coal in the 25 mm to 6-mm size fraction. The design has allowed for flexibility in this area, since the Water Only Washing Cyclones selected are capable of treating coal of 13 mm X 100 M size. Thus, in reviewing the screening and washing operations described in Section 6, it should be noted that the design has allowed for the stated 13 mm size to be between 13 mm and 25 mm and the 6 mm size to be between 6 mm and 13 mm in the event that a coarser raw coal is obtained.

SECTION 6

DESCRIPTION OF PROPOSED PLANT

6.1 OUTLINE OF MODULAR CONSTRUCTION AND OPERATION

The plant will consist of a number of identical Modules each rated for a nominal 400 MTPH capacity. Each Module would be fed from the Raw Coal Handling System by a separate Raw Coal Feed Conveyor; thus a Module could be set to the requirements. Each Module could comprise of:-

Raw Coal Screening Section
Coarse Coal Washing Section
Fine Coal Washing Section
Thickener

The modules would be constructed to work with a common set of product conveyors:

Coarse Clean Coal Conveyor
Fine Clean Coal Conveyor
Fine Untreated Coal Conveyor
Discard Conveyor

The three coal product conveyors have been included for two reasons; firstly to facilitate separate product stockpiling if required and secondly to give flexibility in product blending without complicating the modular plant layout.

We thus envisage 5 operating modules (= 2,000 MTPH ROM Coal capacity) and have allowed for a sixth or standby module. A number of operational modes are possible.

6.1.1 Total Washing

In this case the full capability of each module would be required, i.e. Screening + Coarse Coal + Fine Coal + Thickener, and there would be no Fine Untreated Coal product.

6.1.2 Coarse Coal Washing (+13mm)

In the situation where only the +13mm Raw Coal would require cleaning the Fine Coal facilities would not be used. If all modules were in this mode only one Thickener would be required. Products would be +13mm Coarse Clean Coal and 13mm x 0 Untreated Fine Coal.

SECTION 6

DESCRIPTION OF PROPOSED PLANT

6.1 OUTLINE OF MODULAR CONSTRUCTION AND OPERATION

6.1.3 Coarse Coal Washing (+6mm)

This is the maximum use which can be made of the Coarse Coal Washing units, and the "carry-over" of fines from the associated screening operations would probably justify operation of Fine Coal Washing Units. Products would be +6mm Coarse Clean Coal and 6mm x 0 Untreated Fine Coal together with a small quantity of 6mm x 100M Fine Clean Coal.

6.1.4 Partial Washing

Fine and Coarse Coal Sections operating together. A controlled proportion of 6mm x 0 raw coal would be passed to the Fine Coal Section, the remainder remaining untreated. All three coal products would thus be simultaneously produced.

6.1.5 Low Grade Coal Washing

The plant would be set as in 6.1.2 except that the 13mm x 0 untreated coal would be passed to the Discard Conveyor.

As designed any module could operate in any of the five modes totally independantly of the other modules. This could be achieved by computerized control from on-line analysis of raw coals and products to give the required proportions of clean and untreated coals for blending.

Should, however it be established, for example, that the maximum degree of washing required is represented by mode 6.1.3 then it would be possible to construct and operate the plant with Five (+ one standby) Coarse Coal Sections and One (+ standby) Fine Coal + Thickener Sections. Similarily if it were established that there would be say one third of the R.O.M. coal which would not require even the + 13mm coal to be cleaned, then two of the modules could be simplified to comprise only Screening and Crushing facilities.

SECTION 6

DESCRIPTION OF PROPOSED PLANT

6.1 OUTLINE OF MODULAR CONSTRUCTION AND OPERATION

6.1.5 Low Grade Coal Washing - cont.

Alternative proposals are being investigated for treatment of the 13mm x 0 raw coal. In this situation the Raw Coal Screening and Coarse Coal Washing Sections could remain unchanged and provide the feed to the alternative fine coal treatment.

The design as a series of independant modules facilitates the stagewise development of the plant, and will greatly simplify the initial commissioning and on-going operator training programme.

SECTION 6

DESCRIPTION OF PROPOSED PLANT

6.2 DESCRIPTION OF RAW COAL SCREENING AND COARSE COAL WASHING MODULE SECTIONS

Please read this Description in Conjunction with our Drawings:

F1304-0001 P Flowsheet for Coarse Coal H.M. Section (1 Module)
F1304-0002 P Flowsheet for Fine Coal Section (1 Module)
F1304-1002 P Washery Layout

The description is given for a single Module.

6.2.1 Raw Coal Screening

The Raw Coal, broken to below say 200mm in the R.O.M Coal Breaker Stations, will be delivered at a steady rate not exceeding 400 MTPH to the Module. Facilities will be provided for automatic sampling of this raw coal.

The flow would be divided by a bi-furcated chute to two parallel stream. Raw Coal Sizing Screens will classify at 13mm and 6mm. The 6mm x 0 Raw Fine Coal will pass to Surge Hoppers.

By monitoring the ash content of the untreated fines and the yield of products a computing system will determine in which "mode" the module should be operating.

i) Total Washing

all + 6mm to Coarse Coal Washing
Feeders at base of Surge Hoppers stopped: all -13mm to Untreated Fines Conveyor.

ii) Coarse Coal Washing

+ 13mm to Coarse Coal Washing. Feeders at base of Surge Hoppers stopped: all - 13mm to Untreated Fines.

iii) Coarse Coal Washing

All + 6mm to Coarse Coal Washing. Feeders at base of Surge Hoppers stopped: all - 6mm to Untreated Fines Conveyor.

SECTION 6

DESCRIPTION OF PROPOSED PLANT

6.2 DESCRIPTION OF RAW COAL SCREENING & COARSE COAL WASHING MODULE SECTIONS

6.2.3 Coarse Coal Module Liquid Circuits - cont.

Facilities have been included for a magnetite store, magnetite handling and medium preparation; a common system to service all Modules.

The Water Clarification facilities would be provided in conjunction with the Fine Coal Modules. In the event that Fine Coal Washing are not required then on Thickener and its immediate equipment would service Five operational (+ standby) Large Coal Modules.

6.2.4 Fine Coal Washing Module

The 6mm - 0 Raw Coal will be fed at the required steady rate from the Surge Hoppers to the Classifying Cyclone Feed Cone where Clarified Water will be added under automatic control. The Raw Coal Slurry will be pumped in two parallel streams to a bank of Thirty-two Classifying Cyclones designed to remove the 100M x 0 material. This will be rejected as the cyclone overflow to the Tailings Thickener for disposal. The 6mm x 100M material will be pumped in two parallel streams to a bank of Sixteen Primary Water Only Washing Cyclones and the partially cleaned overflow from this bank similarly to a bank of Sixteen Secondary Water Only Washing Cyclones.

The underflow from both sets of cyclones would be passed via a Dewatering Screen to the Discard Conveyor. (This will be a common conveyor with the Coarse Coal Section.) The screen will retain only a portion of the 28 x 100M discard, the bulk of this fraction passing as tailings to the Thickener. The Fine Clean Coal Slurry (Secondary Washing Cyclone Overflow product) will be pumped to Thickening Cyclones to remove the bulk of the washwater and facilitate dewatering by means of Sieve Bend and Slurry Screens, effecting a partial classification at 28M, followed by conventional Basket Centrifuge (as in Coarse Coal Module) for the 6mm x 28M and Screen Bowl Centrifuges for the 28M x 100M. These centrifuges will deliver product to the Fine Clean Coal Conveyor; a common conveyor running the length of the Plant.

SECTION 6

DESCRIPTION OF PROPOSED PLANT

6.2 DESCRIPTION OF RAW COAL SCREENING & COARSE COAL WASHING MODULE SECTIONS

6.2.5 Fine Coal Module Water Circuit & Thickener

The washing circuit has already been described above. This circuit is completed by passing the Classifying Cyclones overflow and Discard Dewatering Screen Underflow to the Thickener where it will be dosed with Flocculating Reagents to provide a continuous recirculation of water for re-use. Note that a common Clarified Water Head Tank will supply the Coarse and Fine Coal Washing Sections.

The three Flocculant Mixing Tanks and Pumps will be a common service to the six Module Thickeners. It is envisaged that Lime and two different Polyelectrolytes will need to be on service to suit varying operating conditions.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.1 ONE SET per Raw Coal Screening Module as required.

7.1.2 ONE SET per Coarse Coal Washing Module as required.

7.1.3 ONE SET for the whole plant complex providing Ancilliaries for the Coarse Coal Washing Modules.

7.1.4 ONE SET per Fine Coal Washing Module as required.

7.1.5 ONE SET for each Fine Coal Washing Module, or if no fine coal washing modules are installed ONE SET to serve the total Coarse Coal facilities.

7.1.6 ONE SET for the whole plant complex providing Ancilliaries to the Fine Coal and Thickener Modules.

7.1.7 ONE SET of Miscellaneous Equipment to serve the whole plant complex.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.1 Raw Coal Screening Module

One set of each of the items listed below (4001 - 4021) would be required for each module.

ITEM	ITEM NUMBER(s)	QUANTITY
Head Chute for Raw Coal Feed Conveyor	4001	1
Bifurcated Chute to Raw Coal Sizing Screens	4002	1
Raw Coal Sizing Screens 8' x 16' AC Riplflo	4003 4004	2
Skirt Pls & Supports for Raw Coal Sizing Screens	4005 4006	2
Combined Discharge Chute & Gate for Raw Coal Sizing Screens to "Leebar" Baths	4007 4008	2
1/4" x 0 Surge Hoppers Under Raw Coal Sizing Screens	4009 4010	2
Drive Support for Raw Coal Sizing Screens	4011 4012	2
1/4" x 0 Overflow & 1/2" x 1/4" Bypass Chutes & Gate	4013 4014	2
Shut Off Gate for 1/4" x 0 Surge Hopper (Hand Operated)	4015 4016	2
Combined Discharge Chute from Surge Bin to Untreated Coal Conveyor	4021	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.2 Coarse Coal Washing Module

One set of each of the items listed below (4022 - 4109) would be required for each module.

ITEM	ITEM NUMBER(s)	QUANTITY
+ 1/4" Raw Coal Wet Screens 8' x 16' AC LH	4022 4023	2
Underpans for + 1/4" Raw Coal Wet Screens	4024 4025	2
Drive Support for + 1/4" Raw Coal Wet Screens	4026 4027	2
Discharge Chutes for + 1/4" Raw Coal Wet Screens	4028 4029	2
+ 1/4" Raw Coal "Leebar" H.M. Bath. Including Discard Extractor Chain & Clean Coal Paddle Wheels	4030 4031	2
Drive for Clean Coal Paddle Wheels (Chain Drive & Gear Box)	4032 4033	2
Drive for Discard Extractor Chain (Chain Drive & Gear Box)	4034 4035	2
"Leebar" Bath Clean Coal Discharge Chutes	4036 4037	2
Clean Coal Rinsing & Sizing Screens 8' x 20' AC LH	4038 4039	2

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.2 Coarse Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Underpans for Clean Coal Rinsing & Sizing Screens	4040 4041	2
Primary "Rainmaker" Sprays for Clean Coal Screens	4042 4043	2
Secondary "Rainmaker" Sprays for Clean Coal Screens	4044 4045	2
Drive & Spray Supports for Clean Coal Screens	4046 4047	2
Combined - 1" Clean Coal Chute to Centrifuge Incl. Bypass Chutes & Gates	4048	1
Tundish for + 1/4" Coal Centrifuge	4049	1
+ 1/4" Clean Coal Centrifuge Wemco 1100	4050	1
"Tell-Tale" Box for Clean Centrifuge	4051	1
Clean Coal Centrifuge Discharge Chute	4052	1
Combined + 1" Clean Coal Chute to Crusher	4053	1
Crusher Penn. TK2-24B	4054	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.2 Coarse Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Crusher Discharge Chute	4055	1
Bedplate for Crusher Drive	4056	1
"Leebar" Bath Discard Discharge Chutes	4057 4058	2
Discard Rinsing Screens 4' x 16' AC LH	4059 4060	2
Underpans for Discard Rinsing Screens	4061 4062	2
Primary "Rainmaker" Sprays for Discard Screens	4063 4064	2
Secondary "Rainmaker" Sprays for Discard Screens	4065 4066	2
Drive & Spray Supports for Discard Screens	4067 4068	2
Discard Screen Discharge Chutes	4069 4070	2
Sieve Boxes for "Leebar" Bath Drainage	4071 4072	2
Heavy Medium Cones	4073 4074	2
Heavy Medium Pumps Warman 6 x 4 EAH	4075 4076	2

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.2 Coarse Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Bedplates for Heavy Medium Pumps	4077 4078	2
Heavy Medium Distribution Boxes & Supports	4079 4080	2
Heavy Medium Splitter Boxes & Funnels	4081 4082	2
Dilute Medium Cone	4083	1
Dilute Medium Pumps Warman 6 x 4 EAH	4084 4085	2
Bedplates for Dilute Medium Pumps	4086 4087	2
Dilute Medium Distribution Boxes & Supports	4088 4089	2
Settling Cones & Curtains 10' - 0" Dia	4090 4091	2
Primary Magnetic Separator Eriez 36" Ø x 96"	4092	1
Concentrates Launder for Primary Magnetic Separator	4093	1
Underflow Collecting Box for Primary Magnetic Separator	4094	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATION

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.2 Coarse Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Spray Water Head Boxes	4095 4096	2
Secondary Magnetic Separator Eriez 36" Ø x 48"	4097	1
Concentrates Launder for Secondary Magnetic Separator	4098	1
Underflow Collecting Box for Secondary Magnetic Separator	4099	1
Combined Underflow Launder from Raw Coal Wet Screens	4100	1
Sieve Bend for Raw Coal Wet Screen Underflow	4101	1
- 1/4" Raw Coal Dewatering Screen 4' x 12' AC LH	4102	1
Underpan for - 1/4" Raw Coal Dewatering Screen	4103	1
Drive Support for - 1/4" Raw Coal Dewatering Screen	4104	1
Discharge Chute for - 1/4" Raw Coal Dewatering Screen	4105	1
Magnetite Floor Sump Pump Warman 4" x 3" CAM	4106	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.2 Coarse Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Bedplate for Magnetite Floor Sump Pump	4107	1
Skirt Plates for Large Clean Coal Conveyor (55'-0" Lgth)	4108	1
Skirt Plates for Discard Conveyor (55'-0" Lgth)	4109	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.3 Ancilliaries for Coarse Coal Module

One set of the equipment as listed below (4144-4161) would provide common services to the Coarse Coal Washing Modules.

ITEM	ITEM NUMBER(s)	QUANTITY
Magnet for Raw Magnetite	4144	1
Electric Hoist for Magnet	4145	1
Trolley for Magnet	4146	1
Feed Hopper to Raw Magnetite Mixing Tank	4147	1
Discharge Chute for Raw Magnetite Feed Hopper	4148	1
Magnetite Mixing Tank	4149	1
Prepared Medium Cone	4150	1
Prepared Medium Pumps Warman 6 x 4 Dam.	4151 - 4153	3
Bedplates for Prepared Medium Pumps	4154 - 4156	3
Prepared Medium Splitter Box	4157	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.3 Ancilliaries for Coarse Coal Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Prepared Medium Distribution Box & Funnels	4158	1
Agitation/Instrument Compressor	4159	1
Instrument Air Dryer	4160	1
Elevator	4161	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.4 Fine Coal Washing Module

One set of all the items listed below (4201 - 4379) will comprise one Fine Coal Washing Module.

ITEM	ITEM NUMBER(s)	QUANTITY
Skirt Plates for 1/4" x 0 Raw Coal Feeders	4201 4202	2
1/4" x 0 Raw Coal Feeders 36" x 72" LG.	4203 4204	2
Support for 1/4" x 0 Raw Coal Feeders	4205 4206	2
Combined Chute & Launder from Feeders to Classifying Cyclone Feed Cone	4207	1
Classifying Cyclone Feed Cone	4208	1
Classifying Cyclone Feed Pumps Warman 8 x 6 EAM	4209 - 4212	4
Bedplates for Classifying Cyclone Feed Pumps	4213 4214	2
Classifying Cyclones DSM 14" Dia. 20°	4215 - 4246	32
Support for Classifying Cyclones	4247	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.4 Fine Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Overflow Launder for Classifying Cyclones	4248	1
Underflow Launders for Classifying Cyclones	4249	1
Primary Water Only Washing Cyclone Feed Cone	4250	1
Primary Water Only Washing Cyclone Feed Pumps Warman 8 x 6 EAM	4251 - 4254	4
Bedplates for Primary W.O. Washing Cyclone Feed Pumps	4255 4256	2
Primary W.O. Washing Cyclones D.S.M. 14" Dia. 75°	4257 - 4272	16
Support for Primary W.O. Washing Cyclones	4273	1
Overflow Launder for Primary W.O. Washing Cyclones	4274	1
Underflow Launders for Primary W.O. Washing Cyclones	4275	1
Secondary W.O. Washing Cyclone Feed Cone	4276	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.4 Fine Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Secondary W.O. Washing Cyclone Feed Pumps Warman 8 x 6 EAM	4277 - 4280	4
Bedplates for Secondary W.O. Washing Cyclone Feed Pumps	4281 4282	2
Secondary W.O. Washing Cyclone D.S.M. 14" Dia. 75°	4283 - 4298	16
Support for Secondary W.O. Washing Cyclones	4299 4300	2
Overflow Launders for Secondary W.O. Washing Cyclones	4301 4302	2
Underflow Launders for Secondary W.O. Washing Cyclones	4303 4304	2
Thickening Cyclone Feed Cone	4305	1
Thickening Cyclone Feed Pumps Warman 8 x 6 EAM	4306 - 4309	4
Bedplates for Thickening Cyclone Feed Pumps	4310 4311	2
Thickening Cyclones D.S.M. 14" Dia. 20°	4312 - 4343	32

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.4 Fine Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Supports for Thickening Cyclones	4344 4345	2
Overflow Launders for Thickening Cyclones	4346 4347	2
Underflow Launders for Thickening Cyclones	4348 4349	2
-1/4" Clean Coal Sieve Bend	4350 4351	2
-1/4" Clean Coal Dewatering Screen 6' x 12' ACLH	4352 4353	2
Underpans for -1/4" Clean Coal Dewatering Screen	4354 4355	2
Drive Support for -1/4" Clean Coal Dewatering Screen	4356 4357	2
Combined chute from -1/4" c.c. Dewatering Screen to Centrifuge Inc. Bypass Chute & Gate	4358	1
Tundish for 1/4"-28m Clean Coal Centrifuge	4359	1
1/4"-28m Clean Coal Centrifuge Wemco 1100	4360	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.4 Fine Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
"Tell-Tale" Box for 1/4"-28m Clean Coal Centrifuge	4361	1
Discharge Chute for 1/4"-28m Clean Coal Centrifuge	4362	1
-28m Buffer Tank	4363	1
-28m Screen Bowl Centrifuges Bird 36x72 Continuous	4364 4365	2
Solids Discharge Chute for -28m Screen Bowl Centrifuges	4366 4367	2
Effluent Underpan for S.B. Centrifuge	4368 4369	2
Screen Section Effluent Underpan for S.B. Centrifuges	4370 4371	2
-1/4' Discard Sieve Bend	4372	1
-1/4' Discard Dewatering Screen 8' x 16' ACLH	4373	1
Underpan for -1/4" Discard Dewatering Screen	4374	1
Drive Support for -1/4" Discard Dewatering Screen	4375	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.4 Fine Coal Washing Module - cont.

ITEM	ITEM NUMBER(s)	QUANTITY
Tailings Pump to Thickener Warman 6 x 4 DAM	4376	1
Bedplate for Tailings Pump to Thickener	4377	1
S.B. Centrifuge Effluent Cone	4378	1
S.B. Centrifuge Effluent Pump Warman 3 x 2 CAH	4379	1
Bedplate for S.B. Centrifuge Effluent Pump	4380	1
Class & Thick.Cyclone Overflow Collecting Box & Support	4381	1
Skirt Plates for Fines Clean Coal Conveyor (55'-0" Lgth)	4382	1
Skirt Plates for Untreated Raw Coal Conveyor (55'-0" Lgth)	4383	1
Roof Fan	4384	1
Plant Heater	4385	1
Clarified Water Pump Warman 8 x 6 EAM	4386	1
Bedplate for Clarified Water Pump	4387	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.5 Thickener Module

One set of all the items listed below (4111 - 4124) will be used in conjunction with each Fine Coal Washing Module.

ITEM	ITEM NUMBER(s)	QUANTITY
Tailings Thickener 100'-0" Dia	4111	1
Launder to Tailings Thickener	4112	1
Thickener Tailings Underflow Pumps Warman 4 x 3 CAM	4113 4114	2
Bedplate for Thickener Tailings Underflow Pumps	4115 4116	2
Thickener Tunnel Sump Pump Warman 3 x 3 x 11 WPSC	4117	1
Bedplate for Thickener Tunnel Sump Pump	4118	1
Clarified Water Sump	4119	1
Clarified Water Pumps Warman 8 x 6 EAM	4120 - 4123	4
Bedplates for Clarified Water Pumps	4124 4127	4
Clarified Water Head Tank	4128	1

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.1 PROPRIETARY EQUIPMENT SCHEDULE

7.1.6 Thickener Module Ancilliaries

One set of the following ancilliary items are required for the whole plant. Present capacities are based on six modules installed.

ITEM	ITEM NUMBER(s)	QUANTITY
Flocculant Mixing Tanks	4129 - 4131	3
Agitator for Flocculant Mixing Tanks	4132 - 4134	3
Flocculant Pumps - Moyno Frame 126	- 4135 4137	3
Flocculant Distribution Boxes	- 4138 4140	3
Non-Magnetic Floor Sump Pump Warman 4 x 3 CAM	4141	1
Bedplate for Non-Magnetic Floor Sump	4142	1
Thickener Tailings Underflow Collecting Sump	4143	1
Flocculant Store Roof Fan	4176	1
(Not used-see Tailings Disposal)	4177	-
Flocculant Store Heater	4178	1
(Not used-see Tailings Disposal Scheme)	4179	-

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.2 MECHANICAL ENGINEERING

7.2.1 Plate Specification

Plate and structural steel will be new and will be in accordance with CSA G4012, ASTM A7 or ASTM A36. Wear plate material will be T1 type A-360 or equal. All bolts and nuts will be in accordance with ASTM A307 or ASTM A36. Bolts will be regular semi-finished hexagon series with heavy semi-finished hexagon series nuts, both conforming to ANSI B18.2.

Arc welding design and practice will conform to the CSA Standard W59.1. The fabricator will be fully approved by the Canadian Welding Bureau in accordance with CSA Standard W47.

All dimensions given on the drawings will be in metric.

The dimensions of the tanks and launders will be within $\pm$ 3 mm.

Welds will be continuous, full strength and watertight except the stiffener bars on covers and access doors which may have intermittent welds 50 mm every 100 mm on each side of the bar.

Joints in chutes, boxes and launders flanges will use "EXPANDITE" or approved equal. Access doors will be sealed on left rubber gaskets 6 mm thick by 25 mm wide bonded to the chute or launder. The fabricator will supply the gaskets, bond them to the chutes or launders and fully assembly the access doors.

All wear plates will be plug welded into position of the platework by using intermittent 25 mm holes welded watertight. Internally intermittent welding 25 mm every 100 mm at wear plate joints and wear plate/casing joints.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.2 MECHANICAL ENGINEERING

7.2.1 Plate Specification - cont.

Generally the platework will be fully shop assembled with all bolts fitted and tightened. Exceptions will only be shipping limitations and in this case, jointing and all bolts etc., will be supplied in a container preferably fastened to the platework sections.

All exterior platework surfaces will be painted except for mating flanged faces.

All sharp edges, burrs, etc., will be ground smooth prior to painting. The faces of all flanges will be smooth and flat. All exterior surfaces will be power brushed to remove rust and mill scale and washed with mineral spirits to remove any oil and grease.

One coat of zinc chromate primer, followed when thoroughly dry by one coat of machinery enamel with a total minimum paint thickness of two mils.

All fabricated platework, either wholly assembled or in sections, will be painted in 50 mm high letters with the applicable item number, prior to shipping.

Cones

Cones will have a minimum of 8 mm thick walls on the vertical sides and 10 mm thick walls on the conical section (13 mm thick walls for H.M. cones). The cones will be stiffened externally both vertically and peripherally where necessary to withstand all the imposed loads. The cones will be free standing on the base of the conical section at a minimum dia. of 1.0 m with a baseplate 25 mm thick. The baseplate to connect to the concrete base by cast-in bolts.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.2 MECHANICAL ENGINEERING

7.2.1 Plate Specification

Cones - cont.

Where suction pipes enter the cones, a 19 mm thick plate will surround the pipe for a minimum distance of 305 mm from the outer diameter of the suction pipe. The suction pipe to extend a minimum of 38 mm into the cone past the 19 mm thick wearplate.

The overflow pipe will be 305 mm diameter for all cones.

All cones will be covered by floor grating to prevent tramp material entering the cones, at approximately the overflow level.

Heavy Medium Launders

Mixing tanks/launders will be constructed of 13 mm thick plate with no wearplates. Splash plates 5 mm thick.

All incoming and outgoing pipe inserts will be X-Strong and to extend 38 mm into the mixing tank. The flanged pipe stubs will be of sufficient length to enable bolting up to be relatively easy.

Underpans

Underpans will not be fitted with wearplates. The heavy medium section of any underpan will be fabricated from 13 mm plate. All other underpans to be fabricated from 10 mm thick plate.

All pipe inserts will be X-Strong for H.M., Schedule 80 for all others and to extend into the underpans 38 mm. The flanged pipe stubs to extend out of the underpans a sufficient length for bolting.

External bottom stiffeners will be required at approximately 1.0 m intervals.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.2 MECHANICAL ENGINEERING

7.2.1 Plate Specification

Head Boxes

All head and splitter boxes containing heavy medium will be fabricated from 13 mm thick palte.

Flocculant head box will be fabricated from 6 mm thick plate.

All other head boxes will be fabricated from 10 mm thick plate.

Box cover plates will be 6 mm thick, except where feed pipes enter directly under, where plate thickness of the box is used. All cover plates will be bolted by external flange, with the bolts suitably pitched to prevent leakage.

Stiffening flats will be required where necessary.

All slats or doors in the box weirs will be 13 mm thick, slat depths to range from 13 mm, 25 mm and 50 mm for underpans and to project into each box for 38 mm and out of the box a suitable distance for bolting. All pipe stubs will be flanged.

Launders (Excluding Thickener Launder)

All launders will be fabricated from 6 mm plate and be equipped with abrasion resistant wearplate on wearing surfaces of 6 mm thickness.

Launders will not be fitted with cover plates except at change direction points or places where splash is anticipated.

Stiffening flats welded on the inside approximately 25 mm down from the top edge for the full length will be required, and should splash occur, loose cover plates can be located on them.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.2 MECHANICAL ENGINEERING

7.2.1 Plate Specification

Thickener Launder

The launder will be fabricated from 6 mm plate and requires no wearplates.

Rest of specification as LAUNDERS.

Chutes

All chutes will be fabricated from 6 mm plate and be equipped with 6 mm thick abrasion resistant wearplates on all wearing surfaces.

Where access or inspection covers will be necessary, these are to be equipped with either hinged doors or quick release locating pins.

Surge Bins

Surge bins will be constructed from 13 mm plate suitable stiffened, complete with 6 mm stiffened cover plate.

Flanges

All flanges will be as for piping specification.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.2 MECHANICAL ENGINEERING

7.2.2 Pipework Specifications

Simon-Carves of Canada Ltd. have developed standards for Coal Washery Pipework to suit the specialized requirements of handling abrasive media, coal slurries, etc. These would be fully detailed at an appropriate stage in a submission. They are developed from the ANSI B31.1 "Standards Code for Pressure Piping - Power Piping", and require installation by welders qualified in accordance with Section IX of the ASME "Boiler & Pressure Vessel Code".

The particular requirements call for features such as long radius bends and thick walls to allow for erosion, facility for dismantling due to pipe plugging, and design of lines sloped for gravity drainage allowing for the pipeline contents.

The Simon-Carves of Canada Ltd. Specifications are:

'A' Heavy Slurries, e.g. Magnetite Medium, 6 mm X 0 Fine Coal Suspensions and Tailings

'B' Light Slurries, e.g. Dilute Medium, 0.5 mm X 0 Fine Coal Suspensions, Slurry Cone Overflows and Drainage

'C' "Water", e.g. Effluent, Clarified Water, Floor Flushings, Flocculation and other reagent solutions

'D' Instrumentation Air

'E' Floor Drains

'F' Magnetic Separator Effluents

Pipework Supports standards, in addition to conforming with general standards and those mentioned for pipework above, make particular allowance for the additional loads placed by heavy slurries, and for support design to allow for the dismantling of pipework to clear plugging. Structural Attachments conform to CSA W59.1 and CSA W47.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.2 MECHANICAL ENGINEERING

7.2.3 Valves

Main pump suction valves will be cast iron, gear operated plug valves of Dezurik or equal supply.

Other shut-off, throttling and drain valves will be wrench operated, cast iron plug cocks of the Rockwell type.

Small bore valves for compressed air and fresh water will be handwheel operated, cast iron, diaphragm valves of the Saunders type, with screwed ends.

Automatic control valves will be cast steel, wafer type knife gate valves with pneumatic operators of Dezurik or equal supply. Valves on slurry applications will have ni-hard deflector cones.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.3 ELECTRICAL ENGINEERING

A complete electrical system will be provided for the preparation plant complex, including all power, control, lighting and grounding. The design will meet or exceed the requirements of CSA, CEMA and all provincial authorities having jurisdiction.

7.3.1 Incoming Supplies

Two main incoming 12.47 kV overhead feeders will be provided by others to terminal poles in the vicinity of the washery. From that point we will provide underground cables to the washery electrical rooms.

Each main incoming feeder will be capable of feeding the entire preparation plant complex.

7.3.2 Transformer Primary Protection

Primary protection of power distribution transformers at the washery will consist of fusible load-break disconnect switches arranged in suitable indoor metal-enclosed switchgear assemblies, with interlocking as necessary to prevent parallelling of incoming supplies.

7.3.3 Power Distribution Transformers

Power distribution transformers will be three phase, outdoor, oil-filled, sealed, epoxy painted, 65^{o} C rise, ONAN with provision for future addition of fans for ONAF rating. Transformers for 600 volt motor control centres will be 12,470 - 600 volts with secondary bus duct. Transformer neutrals will be grounded via integral resistors to limit ground fault current to a value less than 25 amps.

7.3.4 Motor Control Centres

Motor control centres will be 600 volts, CEMA 12 construction, CEMA 1B wiring, including full voltage starters with fusible disconnect switches. Each motor control centre will be protected by a main incoming circuit breaker with adjustable trips. Ground fault detection will be provided for each vertical section of each motor control centre.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.3. ELECTRICAL ENGINEERING

7.3.5 Essential Services

Systems which cannot be allowed to remain inoperative during a prolonged power outage will be fed from a separate "essential services" motor control centre. These systems include:

- thickener drives
- thickener tunnel sump pumps
- instrumentation
- air compressors
- washery heating units
- heating fuel pumps
- coal and discard loadout gates
- selected lighting

The "essential services" motor control centre will be fed from two sources, i.e., the normal distribution system and a 500 kw, 575 volts standby diesel-generator set located adjacent to the washery electrical rooms. The diesel-generator set will start automatically upon loss of incoming power, after a time delay, and the motor control centre will be equipped with an automatic transfer feature on the incoming curcuit-breakers.

7.3.6 Motors

Motors will be TEFC (wet process areas) and explosion-proof (dry process and below-grade areas). Voltages will be:

- fractional HP	115 volts, 1 ph
- 1 HP through 250 HP	575 volts, 3 ph
- 300 HP and up	4,000 volts, 3 ph

7.3.7 Cables

Cables will be stranded copper, multi-conductor Teck-type with a flame-retardant PVC jacket, installed in galvanized steel or aluminum cable trays.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.3 ELECTRICAL ENGINEERING

7.3.8 Lighting

Lighting fixtures generally will be vapour-tight type with mercury vapour lamps. Flourescent fixtures will be provided in enclosed rooms and explosion-proof enclosures will be provided in "dry coal" and below-grade areas.

Intensities will be:

- production areas 30 FC maintained
- offices 100 FC maintained
- electrical rooms 50 FC maintained

Battery-operated emergency lighting will be provided at stairways, doors and electrical rooms.

Outdoor lighting will be by means of mercury vapour or high pressure sodium floodlights with photo-cell controls.

7.3.9 Grounding

A complete grounding system will be provided for all metal structures and electrical equipment.

7.3.10 Process Controls

The main washery control desk will include switching, indication, instrumentation and annunciation for remote operation and control of the processing plant. Sequencing will be provided to ensure that a logical start-up and shutdown procedure is followed and to safeguard equipment and personnel against unsafe operating conditions. A mimic diagram will be provided showing the status of all major drives throughout the complex.

A programmable logic control system will be provided. This will accomplish the required control, sequencing and indication function with a minimum of long runs of multi-conductor cable.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.3 ELECTRICAL ENGINEERING

7.3.11 Communication Systems

A public address system, with facilities for semi-private conversation, will give full audible coverage throughout the preparation plant complex. Microphone handsets will be strategically located in all areas.

The communication system will also incorporate a process startup alarm which will be broadcast in the appropriate areas immediately prior to remote startup of equipment.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.4 INSTRUMENTATION & CONTROL

The three main process variables being controlled in the washery are liquid level, medium specific gravity, and coal ash. In addition thickener torque is being measured and recorded.

7.4.1 Liquid Level

Liquid levels are measured with a hydrostatic head type transmitter and controlled with either a cyclinder actuated splitter box and funnel assembly on medium services or a control valve on water service.

7.4.2 Specific Gravity

Specific gravities are measured with a nuclear type specific gravity transmitter. Control is achieved with a cylinder actuated splitter box and funnel assembly. The specific gravities are also recorded.

7.4.3 Coal Ash

Coal ash concentration of raw coal is continuously analyzed. The surge hopper feeders and coal chute gates are each controlled to maintain desired optimum ash concentrations.

Most control equipment will be pneumatic. Electronic signals from measuring instruments will be converted to pneumatic for operation of the controller and most final control elements. All recorders and controller will be of the 3 x 6 or 6 x 6 minature type and mounted on the control panel.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.5 STRUCTURAL & CIVIL DESIGN CRITERIA

7.5.1 Building Code

All design work is to be in strict accordance with the National Building Code of Canada, 1977 edition, inclusive of latest amendments thereto.

7.5.2 Foundations

All foundations are to consist of spread-footing type, set to a minimum frost-protection depth of seven feet below finished grade. For purposes of current phase I feasibility design, allowable gross bearing capacity has been designated at 6,000 lb/sq.ft.

7.5.3 Reinforced Concrete

All concrete design to comply with the following allowable stresses, using the strength design method of analysis to CSA Standard A23.3-1973.

Ultimate compressive concrete strength - 4,000 lb/sq.in.

Yield strength of steel reinforcement -60,000 lb/sq.in.

7.5.4 Structural Steel

All structural steel design to comply with CSA Standard S16-1969 using the allowable stress design method.

7.5.5 Applied Loads

Combined loadings are to be multiplied by the following factors for the appropriate condition -

Maximum load = dead load + live load	1.0
Minimum load = dead load + wind or seismic force	1.0
Maximum load + wind or seismic force	.75

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.5 STRUCTURAL & CIVIL DESIGN CRITERIA

7.5.5 Applied Loads

7.5.5 1) Vertical Load - Live

a) Snow = 35 x 0.8 - 30 lb/sq.ft.

Basic value to be increased for drifting to requirements of National Building Code Supplement No.4, Commentary H.

b) Floor, inclusive of access ways and stairs - 125 lb/sq.ft.

As a minimum condition, individual floor members only shall be designed for a single concentrated load of 2,000 lb., excluding the above uniform distribution.

c) Service Allowance - 15 lb/sq.ft.

To be applied to all structural members supporting floors and roofs.

d) Equipment and machine loadings shall be additive to those designated above. Design must conform to requirement of Article 7.10 of CSA Standard S16, i.e. special provision shall be made for effects of impact and/or vibratory loading.

7.5.5 2) Vertical Load - Dead

a) Roof system (complete with deck, insulation and roofing) - 10 lb/sq.ft.

b) Floor system (mechanical-lock deck under concrete topping) - 70 lb/sq.ft.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.5 STRUCTURAL & CIVIL DESIGN CRITERIA

7.5.5 Applied Loads

7.5.5 3) Horizontal Load - Wind

Design wind pressure 7.8 x 2 - 16 lb/sq.ft.

Basic pressure to be adjusted for height in accordance with exposure factors given in Table 4.1.8A of the National Building Code.

Windward pressure coefficient - 0.8 (pressure)

Leeward pressure coefficient - 0.5 (suction)

7.5.5 4) Horizontal Load - Seismic

All structures to be designed for seismic line zone '1' in accordance with subsection 4.1.9 of the National Building Code.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.6 PLANT HEATING AND VENTILATING UNITS

7.6.1 General

The purpose for heating and ventilation is to provide a safe, healthy and comfortable environment for employees, and to prevent damage to materials and equipment.

All industrial heating and ventilating units will be outdoor, indirect oil fired type heaters.

Electrical Rooms will be provided with outdoor electrical heating and ventilating units designed for positive pressure to prevent cold air and dust infiltration into electrical rooms.

Control rooms will be provided with electrical wall mounted type heating, ventilating/A.C. units designed for positive pressure to prevent cold air and dust infiltration as well as provide humidity control and employee comfort.

Electrical baseboard heaters will be installed in lunchroom, offices and other smaller areas not listed above.

Ventilating fans and exhaust fans will be selected to satisfy the particular job and will be located, sized and interlocked with corresponding heating and ventilating unit to provide proper winter and summer ventilation.

All units will be constructed to meet CSA and Insurance Underwriter's F.M. approvals and will be installed in accordance with CSA B149 and CEMA all to approval of local authority having jurisdiction.

The units will be designed to ensure 80% efficiency at rated output. All units will be assembled, wired and tested by the manufacturers prior to shipment. Installed performance will be guaranteed by the manufacturer.

SECTION 7

OUTLINE ENGINEERING SPECIFICATIONS

7.6 PLANT HEATING AND VENTILATING UNITS

7.6.2 Basis of Design

a) Minimum ambient temperature - 25°C (minus 14°F)

b) Interior design temperature:

24°C (75°F) offices, lunchroom

27°C (80°F) washrooms, shower areas

21°C (70°F) electrical rooms, control rooms

15°C (60°F) flocculant store, tailing pumphouse

7.6.3 Air Changes per hour

Summer	Winter	Location
8	4	Offices
15	10	Lunchroom, Washrooms Shower Areas
10	5	Control Rooms
15	3 Fresh 12 Recir.	Electrical Rooms
4	2	Flocculant Store, Tailing Pumphouse Washery

SECTION 8

CAPITAL COST ESTIMATE

8.1 The "Order of Magnitude" estimate on labour and material for the coal washery has been broken down as shown in the enclosed estimate summary on a modular basis. This has been done to facilitate the analysis of costs for alternate schemes at a later date.

The following items are not included in the pricing shown:-

Land Purchase
Site Clearing
Rough Grading
Rail Tracks
Roads
Main Power Supply
Potable and Process Water Supply
Construction Camp
General Workshops and Stores Facilities
General Offices
Plant Laboratory
Sewage/Effluent Treatment
Tailings Ponds

In addition, the following factors have not been taken into consideration:-

Contingencies
Escalation
Allowance for Winter Work
Premium Time
Inspection and Testing
Contract Indirects

SECTION 8

CAPITAL COST ESTIMATE

8.2 The total engineering, construction management and commissioning costs for any of the alternate washery modules, including common items, is estimated at 16% of the total prime cost (labour and material) at the initial design stage. On subsequent modules of identical design, this percentage will decrease to an estimted 10%.

The above estimate assumes that construction on the six modules is completed within a three year period.

These H.O. and Site costs can be refined further once the actual requirements are more clearly defined.

ESTIMATE SUMMARY

SIMON ... OF CANADA LTD
2025 Sheppard Avenue East
Willowdale Ontario M2J 1W1

CLIENT: C-MJV for B.C. HYDRO
PROJECT: HAT CREEK - MODULAR COAL WASHERY
LOCATION:

DESCRIPTION: LARGE COAL END MODULE

PROJECT NO.: F1304

SHEET 1 OF 12

EST'D DATE

CODE	ITEM	TOTAL COST EQUIPMENT	MATERIAL	FRT./DUTY	LABOUR	SUB/CONT.	TOTAL
	Civil and Structural		538,530		373,610		912,140
	Equipment and Platework	787,985	313,650	43,010	170,723		1,315,368
	Electrical	113,334	139,972		172,000		425,306
	Instrumentation	48,436	5,000	2,132	15,960		71,530
	Piping and Valves		157,850		129,150		287,000
		949,755	1,155,000	45,142	861,443		3,011,340

ESTIMATE SUMMARY

SIMON [illegible]

2025 Sheppard Avenue East

Willowdale Ontario M2J 1W7

CLIENT: C-MJV for B.C. HYDRO

PROJECT: HAT CREEK - MODULAR COAL WASHERY

LOCATION:

DESCRIPTION: LARGE COAL INTERIOR MODULE

PROJECT NO.: F1304

SHEET 2 OF 12

ESTD DATE

CODE	ITEM	TOTAL COST EQUIPMENT	MATERIAL	FRT./DUTY	LABOUR	SUB/CONT.	TOTAL
	Civil and Structural		446,010		303,120		749,130
	Equipment and Platework	787,985	313,650	43,010	170,723		1,315,368
	Electrical	113,334	139,972		172,000		425,306
	Instrumentation	48,436	5,000	2,132	15,960		71,530
	Piping and Valves		157,850		129,150		287,000
		949,755	1,062,482	45,142	790,953		2,848,334

ESTIMATE SUMMARY

Simon [illegible]

2025 Sampson [illegible]

Willowdale Ontario M2J 5L5

CLIENT: C-MJV for B.C. HYDRO

PROJECT: HAT CREEK - MODULAR COAL WASHERY

LOCATION:

DESCRIPTION: THICKENER

PROJECT NO.: F1304

SHEET 3 OF 12

ESTD. DATE

CODE	ITEM	EQUIPMENT	MATERIAL	TOTAL COST PRT./DUTY	LABOUR	SUB/CONT.	TOTAL
	Civil and Structural		262,720		290,060		552,780
	Equipment	125,545	10,960	4,165	16,760		157,430
	Instrumentation	1,638		65	-		1,703
		127,183	273,680	4,230	306,820		711,913

ESTIMATE SUMMARY

SIMON

CLIENT: C-MJV for B.C. HYDRO

PROJECT: HAT CREEK - MODULAR COAL WASHERY

LOCATION:

DESCRIPTION: COMBINED LARGE AND FINES END MODULE

PROJECT NO.: F1304

SHEET 4 OF 12

EST'D

DATE

CODE	ITEM	TOTAL COST EQUIPMENT	MATERIAL	FRT./DUTY	LABOUR	SUB/CONT.	TOTAL
	Civil and Structural		713,535		477,920		1,191,455
	Equipment and Platework	1,511,415	513,320	76,640	304,168		2,405,543
	Electrical	190,910	186,209		256,190		633,306
	Instrumentation	59,244	5,000	2,557	19,920		86,723
	Piping and Valves		253,230		207,190		460,420
		1,761,569	1,671,294	79,197	1,265,388		4,777,447

ESTIMATE SUMMARY

SIMON

CLIENT: C-MJV for B.C. HYDRO

HAT CREEK - MODULAR COAL WASHERY

DESCRIPTION: COMBINED LARGE AND FINES INTERIOR MODULE

PROJECT NO.: F1304

SHEET 5 OF 12

DATE

CODE	ITEM	TOTAL COST EQUIPMENT	MATERIAL	PST/DUTY	LABOUR	SUB/CONT.	TOTAL
	Civil and Structural		569,490		375,230		944,720
	Equipment and Platework	1,511,415	513,320	76,640	304,168		2,405,543
	Electrical	190,910	186,209		256,190		633,306
	Instrumentation	59,244	5,000	2,557	19,920		86,723
	Piping and Valves		253,230		207,190		460,420
		1,761,569	1,527,249	79,197	1,162,698		4,530,712

ESTIMATE SUMMARY

SIMON [illegible]

2025 [illegible]

[illegible]

CLIENT: C-MJV for B.C. HYDRO

PROJECT: HAT CREEK - MODULAR COAL WASHERY

LOCATION:

DESCRIPTION: SUMMARY OF COMMON ITEMS

PROJECT NO.: F1304

SHEET 6 OF 12

EST'D

DATE

CODE	ITEM	TOTAL COST					
		EQUIPMENT	MATERIAL	FRT./DUTY	LABOUR	SUB/CONT.	TOTAL
	Flocculant Mix House	18,360	44,370	1,220	30,295		94,245
	Pumphouse	24,056	31,815	750	45,035		101,656
	Elevator Bay		14,895		24,040	60,000	98,935
	Underground Ductwork		6,080		20,270		26,350
	Service Bay		43,735		65,615		109,350
	Common Services	201,195	121,754		227,035		549,984
		243,611	262,649	1,970	412,290	60,000	980,520

ESTIMATE SUMMARY

SIMON

CLIENT: C-MJV for B.C. HYDRO

HAT CREEK - MODULAR COAL WASHERY

DESCRIPTION: FLOCCULANT MIXER HOUSE COMMON

PROJECT NO.: F1304

DATE

CODE	ITEM	EQUIPMENT	MATERIAL	TOTAL COST PRE-DUTY	LABOUR	SUB-CONT.	TOTAL
	Civil and Structural		32,250		29,120		61,370
	Equipment	18,360	12,120	1,220	1,175		32,875
		18,360	44,370	1,220	30,295		94,245

ESTIMATE SUMMARY

SIMON [illegible]

2025 [illegible]

[illegible]

CLIENT: C-MJV for B.C. HYDRO

PROJECT: HAT CREEK - MODULAR COAL WASHERY

LOCATION:

DESCRIPTION: ELEVATOR BAY
COMMON

PROJECT NO.: F1304

SHEET 8 OF 12

CODE	ITEM	STD EQUIPMENT	DATE TOTAL COST MATERIAL	FRT./DUTY	LABOUR	SUB/CONT.	TOTAL
	Civil and Structural		14,895		24,040		38,935
	Equipment					60,000	60,000
			14,895		24,040	60,000	98,935

ESTIMATE SUMMARY

SIMON

CLIENT: C-MJV for B.C. HYDRO

PROJECT: HAT CREEK - MODULAR COAL WASHERY

DESCRIPTION: PUMPHOUSE COMMON

PROJECT NO.: F1304

SHEET 9 OF 12

ESTD DATE

CODE	ITEM	TOTAL COST EQUIPMENT	MATERIAL	FRT./DUTY	LABOUR	SUB/CONT.	TOTAL
	Civil and Structural		31,215		41,215		72,430
	Equipment	24,056	600	750	3,820		29,226
		24,056	31,815	750	45,035		101,656

ESTIMATE SUMMARY

SIMON

CLIENT: C-MJV for B.C. HYDRO

PROJECT: HAT CREEK - MODULAR COAL WASHERY

DESCRIPTION: UNDERGROUND DUCTWORK COMMON

PROJECT NO.: F1304

CODE		EQUIPMENT	MATERIAL	FRT. DUTY	LABOUR	SUB/CONT	TOTAL
	Civil		6,080		20,270		26,350
			6,080		20,270		26,350

ESTIMATE SUMMARY

Simon [illegible] OF CANADA [illegible]
2025 Sheppard Ave. E. East
Willowdale, Ontario M2J 1W2

CLIENT: C-MJV for B.C. HYDRO
PROJECT: HAT CREEK - MODULAR COAL WASHERY
LOCATION:

DESCRIPTION: SERVICE BAY COMMON

PROJECT NO.: F1304

SHEET 11 OF 12

EST'D

DATE

TOTAL COST

CODE	ITEM	EQUIPMENT	MATERIAL	FRT./DUTY	LABOUR	SUB/CONT.	TOTAL
	Civil and Structural		43,735		65,615		109,350
			43,735		65,615		109,350

ESTIMATE SUMMARY

SIMON

CLIENT	DESCRIPTION	PROJECT NO.
C-MJV for B.C. HYDRO	COMMON SERVICES	F1304
PROJECT: HAT CREEK - MODULAR COAL WASHERY		SHEET 12 OF 12
LOCATION	DATE	

CODE	ITEM	EQUIPMENT	MATERIAL	FRT./DUTY	LABOUR	SUB.CONT.	TOTAL
	Piping and Valves		53,900		44,100		98,000
	Electrical	201,195	67,854		182,935		451,984
		201,195	121,754		227,035		549,984

OPERATING COST ESTIMATE (5 Operating Module + 1 Standby)

1. Consumables

a) Electric Power

	Installed HP	Running HP			
Coarse Coal Section	6750	4500	Max. Demand @ $3.95/kVA month	= $	991,845
Fine Coal Section	13500	9000	Max. Usage @ $0.42/kWHr	=	473,740
Auxilliary Equipment	4500	3000			
Feed Conveyor	900	600			
Lighting & Miscellaneous	900	900			
Emergency Power	1000				

b)	Raw Magnetite	2050 MTPA	@ $77.00/Tonne	= $	157,850
C)	Plant Heating Peak Periods	36,000,000 BTU/HR	@ $ 0.50/140,000 BTU	= $	277,714
d)	Flocculants	335,000 kg/yr	@ $ 2.64/kg	= $	848,400
			SUB-TOTAL 1)	= $	2,785,549

OPERATING COST ESTIMATE (5 Operating Module + 1 Standby)

2) Operating Manpower Requirements

	Shift Number 1	2	3	Swing	Total	MH *	Rate **	
Plant Superintendent	1	-	-	-	1	1 x	42,700	$ 42,700
Assistant Plant Superintendent	1	1	1	1	4	4 x	31,500	126,000
Shift Foreman	2	2	2	2	8	8 x	26,400	211,200
Central Control Room Operators	2	2	2	2	8	2100 x 8 x	13.37	224,616
Thickener & Fines Operators	6	6	6	6	24	2100 x 24 x	12.53	631,512
Dense Medium Operators	6	6	6	6	24	2100 x 24 x	12.07	608,328
Dewatering Operators	6	6	6	6	24	2100 x 24 x	11.84	596,736
Pumpman	2	2	2	2	8	2100 x 8 x	11.38	191,184
Samplers	4	4	4	4	16	2100 x 16 x	10.77	361,872
Maintenance Foreman (Mech)	2	-	-	-	2	2 x	26,400	52,800
Maintenance Foreman (Elect)	2	-	-	-	2	2 x	26,400	52,800
Millwrights	6	6	6	6	24	2100 x 24 x	13.37	673,848
Electricians	6	6	6	6	24	2100 x 24 x	13.37	673,848
Welders	4	4	4	4	16	2100 x 16 x	13.37	449,232
Labourers/Maintenance	3	3	3	3	12	2100 x 12 x	10.77	271,404
Magnetite Handlers	3	3	3	3	12	2100 x 12 x	10.77	271,404
Labourers/Cleanup	6	6	6	6	24	2100 x 24 x	10.77	542,808
	62	57	57	57	233		SUB-TOTAL 2) $	5,982,292

3) Spares Allowance 1% of Equipment Cost — SUB-TOTAL 3) $ 850,000

* Manhours equivalent to $\frac{350 \times 24}{4} = 2100$

TOTAL OPERATING COSTS $ 9,617,841

AVERAGE OPERATING COSTS (10,119,000 MTPA Clean Coal)
= $0.95/MT Clean Coal

** See Over....

SECTION 9

OPERATIONAL REQUIREMENTS

**

OPERATING COST ESTIMATE

Manpower rates include allowances for:

a) Statutory & Annual Vacation

b) Tool Allowances provided under Union Agreements

c) Canada Pension, Medical & Dental Plans, Unemployment Insurance

d) Retirement Plans

e) Clothing Allowance

f) Shift Differentials, Wet Pay Allowances

g) Absenteeism, Turnover, Travelling, Schedules Overtime

Supervisory personnel salary rates include 25.6% Payroll Burden.

SECTION 10

DRAWINGS

DRAWING NO.	TITLE	SHEET NO.
F1304-0001	Flowsheet for Coarse Coal H.M. Section (1 Module)	Sheet 1 of 1
F1304-0002	Flowsheet for Fine Coal Section (1 Module)	Sheet 1 of 1
F1304-0003	Mass Balance Flowsheet	Sheet 1 of 3
F1304-0003	Mass Balance Flowsheet	Sheet 2 of 3
F1304-00-3	Mass Balance Flowsheet	Sheet 3 of 3
F1304-1002	Washery Layout	Sheet 1 of 1

DWG. NO. F1304-0001 SHEET 1 OF 1

RAW COAL FEED CONVEYOR
TO RAW COAL SIZING SCREEN
FROM CLARIFIED WATER PUMP
CLARIFIED WATER HEAD TANK
TO CLARIFIED WATER SUMP
TO FINES WO CYCLONE PLANT
TO RAW COAL WET SCREEN
HEAVY MEDIUM DISTRIBUTION BOX
SPRAY WATER HEAD BOX
DILUTE MEDIUM DISTRIBUTION BOX
SETTLING CONE
HEAVY MEDIUM SPLITTER BOX
+6mm DISCARD RINSING SCREEN
TO DISCARD CONVEYOR
PRIMARY MAGNETIC SEPARATOR
SECONDARY MAGNETIC SEPARATOR
TO PRE-WET SCREEN
CLARIFIED WATER
RAW COAL SIZING SCREEN
13mm
6mm
GATE
RAW COAL WET SCREEN
6mm-0 RAW COAL SURGE HOPPER
'LEEBAR' BATH
+6mm CLEAN COAL RINSING & SIZING SCREEN
25mm
+25mm CLEAN COAL
CRUSHER
SIEVE BOX
TO FINE COAL WASHING SECTION
UNTREATED FINE COAL CONVEYOR
DISCARD CONVEYOR
FEED FROM RAW COAL CONVEYOR
EFFLUENT FROM SECONDARY MAGNETIC SEPARATOR
TO FINE COAL WASHING SECTION
TO DISCARD CONVEYOR
TO UNTREATED FINE COAL CONVEYOR
25mm-6mm CLEAN COAL
+6mm CLEAN COAL CENTRIFUGE
COARSE CLEAN COAL CONVEYOR
NON-MAGNETITE FLOOR SUMP
HEAVY MEDIUM CONE
800 IGPM.
DILUTE MEDIUM CONE
350 IGPM.
RAW MAGNETITE
MEDIUM PREPARATION
PREPARED MEDIUM TO HEAVY MEDIUM CONE
+6mm RAW COAL DEWATERING SCREEN
TO UNTREATED COAL CONVR.
TO THICKENER
LIGHT EFFLUENT FROM CLEAN COAL CENTRIFUGES.
TO DISCARD SCREEN
MAGNETITE FLOOR SUMP

REV	DESCRIPTION	BY	DATE	CHK
1	ISSUED WITH INTERIM REPORT		OCT 1977	—
P	PRELIMINARY	K.S	SEP 1977	

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT, BRITISH COLUMBIA, CANADA
2400 M.T.P.H. COAL WASHERY & OUTSIDE HANDLING

SIMON-CARVES

PHOTOGRAPHIC SCALE — MILLIMETRES 8 & 10 DIV/INCH

DESIGNED | DRAWN K.S SEP 1977 | CHECKED

SCALE N.T.S.

PROJ. MGR | PROJ. DES | D.O. MGR

AREA: CATEGORY:

DWG. TITLE: FLOWSHEET FOR COARSE COAL H.M. SECTION (1 MODULE)

CLIENT'S DRAWING NUMBER

SCAN DRAWING NUMBER F1304-0001 SHEET 1 OF 1

REV. 1

DWG. NO. F1304-0002 SHEET 1 OF 1

RAW COAL FEED CONVEYOR

CLARIFIED WATER HEAD TANK

TO LARGE COAL SECTION

CLASSIFYING & THICKENING CYCLONE OVERFLOW COLLECTING BOX

RAW COAL SIZING SCREEN

13mm

6mm

GATE

RAW COAL WET SCREEN

TO "LEEBAR" BATH

6mm-0 RAW COAL SURGE HOPPERS

6mm-0 RAW COAL FEEDER

TO 6mm RAW COAL DEWATERING SCREEN

PRIMARY WATER ONLY WASHING CYCLONES DSM 350mm ø

SECONDARY WATER ONLY WASHING CYCLONES DSM 350mm ø

THICKENING CYCLONES DSM 350mm ø

-6mm CLEAN COAL DEWATERING SCREEN

28M

CLASSIFYING CYCLONES D.S.M. 350mm ø

-28 MESH BUFFER TANK

6mm-28M CLEAN COAL CENTRIFUGE

28x100M CLEAN COAL SCREEN BOWL CENTRIFUGES

SCREEN SECTION EFFLUENT CONE

FROM COARSE COAL MODULE

UNTREATED FINE COAL CONVEYOR

TO DISCARD CONVEYOR

FLOCCULANT HEAD BOXES

FLOCCULANT MIXING TANKS

CLASSIFYING CYCLONE FEED CONE

PRIMARY WATER ONLY WASHING CYCLONE FEED CONE

SECONDARY WATER ONLY WASHING CYCLONE FEED CONE

THICKENING CYCLONE FEED CONE

3500 I.G.P.M.

3500 I.G.P.M.

3500 I.G.P.M.

3500 I.G.P.M.

3200 I.G.P.M.

3200 I.G.P.M.

3000 I.G.P.M.

800 I.G.P.M.

-6mm DISCARD DEWATERING SCREEN

THICKENER

CLARIFIED WATER SUMP

3000 I.G.P.M.

3000 I.G.P.M.

1000 I.G.P.M.

1000 I.G.P.M.

THICKENER TAILINGS UNDERFLOW COLLECTING SUMP.

NON-MAGNETITE FLOOR SUMP

TO TAILINGS DISPOSAL SYSTEM

FINE CLEAN COAL CONVEYOR

DISCARD CONVEYOR

REV	DESCRIPTION	BY	DATE	CHK
1	ISSUED WITH INTERIM REPORT		OCT 14/77	—
P	PRELIMINARY	K.S	SEP 19/77	

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT, BRITISH COLUMBIA, CANADA
2400 M.T.P.H. COAL WASHERY & OUTSIDE HANDLING

SIMON-CARVES

PHOTOGRAPHIC SCALE — MILLIMETRES 8 & 10 DIV/INCH

AREA: CATEGORY:

DWG. TITLE: FLOWSHEET FOR FINE COAL SECTION (1 MODULE)

DESIGNED			SCALE	PROJ. MGR.
DRAWN	K.S.	SEP 19/77	N.T.S.	PROJ. DES.
CHECKED				D.O. MGR.

CLIENT'S DRAWING NUMBER — SCAN DRAWING NUMBER: F1304-0002 SHEET 1 OF 1 — REV. 1

DWG. NO. F1304-0003
SHEET 1 OF 3

TOTAL WASHING
(1976 'A' WASHABILITY)

OVERALL WASHING SCHEME
1. DENSE MEDIA BATH : 8" x ¼"
2. WATER ONLY CYCLONE : ¼" x 100M

NOTE:
THE INHERENT MOISTURE CONTENT WAS ASSUMED TO BE A CONSTANT 20 %

BASED ON 100 MTPH RAW COAL FEED

LEGEND

CALORIFIC VALUE BTU/LB (DRY BASIS)	PRODUCT DESCRIPTION
% ASH CONTENT (DRY BASIS)	ASH CONTENT MTPH
% TOTAL MOISTURE CONTENT	MOISTURE CONTENT MTPH
(% SURFACE MOISTURE)	DRY SOLIDS MTPH

5.52 M^3/H MAKE-UP WATER
(EVAPORATION NOT ACCOUNTED FOR)

5220	RAW COAL
51.2 %	38.30 MTPH
25.2 %	25.20 MTPH
(8.5 %)	74.80 MTPH

—	CLARIFIED WATER
—	—
100 %	225.13 MTPH
—	0 MTPH

4610	FINE RAW COAL
55.22 %	26.23 MTPH
25.9 %	16.58 MTPH
(7.3 %)	47.30 MTPH

6280	COARSE RAW COAL
44.23 %	12.07 MTPH
24.0 %	8.62 MTPH
(5.0 %)	27.30 MTPH

1570	COARSE REJECTS
75.20 %	6.55 MTPH
24.0 %	2.75 MTPH
(5.0 %)	8.71 MTPH

TAILINGS THICKENER

FINE COAL WASHING MODULE

RAW COAL SCREENING

COARSE COAL WASHING MODULE

—	LAGOON RETURN
—	—
100 %	34.88 MTPH
—	0 MTPH

2860	TAILINGS
66.71 %	5.08 MTPH
96.8 %	230.20 MTPH
(3.6 %)	7.61 MTPH

TAILINGS LAGOON OR DEWATERING PLANT

2860	TAILINGS SLUDGE
66.71 %	5.08 MTPH
40.0 %	5.07 MTPH
—	7.61 MTPH

2860	THICKENED TAILINGS
66.71 %	5.08 MTPH
84.0 %	29.95 MTPH
(80 %)	7.61 MTPH

2810	FINE REJECTS
67.06 %	14.21 MTPH
31.2 %	9.61 MTPH
(14 %)	21.19 MTPH

—	UNTREATED FINE COAL
—	0 MTPH
—	0 MTPH
—	0 MTPH

8430	COARSE CLEAN COAL
29.71 %	5.52 MTPH
24.0 %	5.87 MTPH
(5.0 %)	18.53 MTPH

2450	WASHERY DISCARD
69.43 %	20.76 MTPH
29.2 %	12.36 MTPH
(11.6 %)	29.9 MTPH

7380	FINE CLEAN COAL
37.10 %	6.94 MTPH
28.4 %	7.42 MTPH
(10.5 %)	18.70 MTPH

7930	BLENDED PRODUCT
33.41 %	12.46 MTPH
26.3 %	15.23 MTPH
(7.8 %)	37.23 MTPH

REV	DESCRIPTION	BY	DATE	CHK
1	ISSUED WITH INTERIM REPORT		OCT 14/77	—

B.C. HYDRO
HAT CREEK MINING PROJECT
MODULAR COAL WASHERY
SIMPLIFIED FLOW SHEET
SHOWING MASS BALANCE

PHOTOGRAPHIC SCALE — MILLIMETRES 8 & 10 DIV/INCH

DESIGNED
DRAWN K.S.
CHECKED
SCALE N.T.S.
PROJ. MGR
PROJ. DES
D.O. MGR

SIMON-CARVES

AREA: CATEGORY:
DWG TITLE: MASS BALANCE FLOWSHEET

CLIENT'S DRAWING NUMBER
SCAN DRAWING NUMBER: F1304-0003 SHEET 1 OF 3
REV. 1

DWG. NO. F1304-0003
SHEET 2 OF 3

PARTIAL WASHING
(1976 'B' WASHABILITY)

BASED ON 100 MTPH RAW COAL FEED

OVERALL WASHING SCHEME

1. DENSE MEDIA BATH : 6" x ½"
   ASSUMING 80% SCREENING EFFICIENCY
2. BLEND IN : ½" x 0 RAW COAL.
3. WATER ONLY CYCLONES :
   THE PORTION OF ½" x 100M THAT REPORTS TO THE UNDERFLOW OF THE D/M BATH PRE-WET SCREEN.

NOTE: THE INHERENT MOISTURE CONTENT WAS ASSUMED TO BE A CONSTANT 20%

LEGEND

CALORIFIC VALUE BTU/LB (DRY BASIS)	PRODUCT DESCRIPTION
% ASH CONTENT (DRY BASIS)	ASH CONTENT MTPH
% TOTAL MOISTURE CONTENT	MOISTURE CONTENT MTPH
(% SURFACE MOISTURE)	DRY SOLIDS MTPH

0.80 M³/H MAKE-UP WATER
(EVAPORATION NOT ACCOUNTED FOR)

7490	RAW COAL
38.3 %	27.15 MTPH
25.2 %	25.20 MTPH
(6.5 %)	74.80 MTPH

–	CLARIFIED WATER
–	–
100 %	27.81 MTPH
–	0 MTPH

6870	FINE RAW COAL
40.35 %	3.83 MTPH
26.0 %	3.34 MTPH
(7.5 %)	9.50 MTPH

8540	COARSE RAW COAL
29.37 %	8.02 MTPH
24.0 %	8.62 MTPH
(5.0 %)	27.30 MTPH

3110	COARSE REJECTS
65.12 %	2.63 MTPH
24.0 %	1.28 MTPH
(5.0 %)	4.04 MTPH

TAILINGS THICKENER

FINE COAL WASHING MODULE

RAW COAL SCREENING

COARSE COAL WASHING MODULE

–	LAGOON RETURN
–	–
100 %	4.31 MTPH
–	0 MTPH

4620	TAILINGS
55.13 %	0.52 MTPH
36.8 %	28.44 MTPH
(36 %)	0.84 MTPH

TAILINGS LAGOON OR DEWATERING PLANT

4620	THICKENED TAILINGS
55.13 %	0.52 MTPH
64.0 %	4.84 MTPH
(80 %)	0.84 MTPH

4970	FINE REJECTS
52.85%	1.94 MTPH
31.2 %	1.67 MTPH
(14 %)	3.68 MTPH

4620	TAILINGS SLUDGE
55.13 %	0.52 MTPH
40.0 %	0.63 MTPH
–	0.84 MTPH

8880	UNTREATED FINE COAL
40.25%	18.30 MTPH
25.84 %	13.24 MTPH
(7.3 %)	38.00 MTPH

2480	COARSE CLEAN COAL
23.16 %	5.39 MTPH
24.0 %	7.54 MTPH
(5.0 %)	23.26 MTPH

4010	WASHERY DISCARD
59.20%	4.57 MTPH
27.8 %	2.95 MTPH
(9.6 %)	7.72 MTPH

8730	FINE CLEAN COAL
28.10 %	1.37 MTPH
28.4 %	1.94 MTPH
(10.5 %)	4.88 MTPH

7930	BLENDED PRODUCT
33.35 %	22.06 MTPH
25.4 %	22.62 MTPH
(8.75 %)	66.14 MTPH

REV	DESCRIPTION	BY	DATE	CHK
1	'ISSUED WITH INTERIM REPORT'		DEC 4/77	–

B.C. HYDRO
HAT CREEK MINING PROJECT
MODULAR COAL WASHERY
SIMPLIFIED FLOWSHEET
SHOWING MASS BALANCE

SIMON-CARVES

PHOTOGRAPHIC SCALE — MILLIMETRES 8 & 10 DIV/INCH

AREA: CATEGORY:
DWG TITLE: MASS BALANCE FLOWSHEET

DESIGNED | DRAWN K.S | CHECKED | SCALE N.T.S | PROJ MGR. | PROJ DES. | D.O. MGR.

CLIENT'S DRAWING NUMBER | SCAN DRAWING NUMBER F1304-0003 SHEET 2 OF 3 | REV. 1

DWG. NO. F1304-0003
SHEET 3 OF 3

PARTIAL WASHING
(1976 'C' WASHABILITY)

BASED ON 100 MTPH RAW COAL FEED

OVERALL WASHING SCHEME

1. DENSE MEDIA BATH : 8" x ½" ASSUMING 90% SCREENING EFFICIENCY
2. BLEND IN ½" x 0 RAW COAL
3. WATER ONLY CYCLONE : THE PORTION OF ½" x 100M THAT REPORTS TO THE UNDERFLOW OF THE D/M BATH PRE-WET SCREEN

NOTE: THE INHERENT MOISTURE CONTENT WAS ASSUMED TO BE A CONSTANT 2.0%

LEGEND

CALORIFIC VALUE BTU/LB (DRY BASIS)	PRODUCT DESCRIPTION
% ASH CONTENT (DRY BASIS)	ASH CONTENT MTPH
% TOTAL MOISTURE CONTENT	MOISTURE CONTENT MTPH
(% SURFACE MOISTURE)	DRY SOLIDS MTPH

0.49 M³/H MAKE-UP WATER (EVAPORATION NOT ACCOUNTED FOR)

8560	RAW COAL
29.1 %	21.77 MTPH
25.2 %	25.20 MTPH
(6.8 %)	74.80 MTPH

–	CLARIFIED WATER
–	–
100 %	21.30 MTPH
–	0 MTPH

8190	FINE RAW COAL
31.65 %	1.60 MTPH
26.0 %	1.78 MTPH
(7.5 %)	5.08 MTPH

9470	COARSE RAW COAL
23.23 %	3.11 MTPH
24.0 %	4.23 MTPH
(5.0 %)	13.39 MTPH

2150	COARSE REJECTS
71.42 %	1.08 MTPH
27.1 %	0.56 MTPH
(8.8 %)	1.51 MTPH

TAILINGS THICKENER

FINE COAL WASHING MODULE

RAW COAL SCREENING

COARSE COAL WASHING MODULE

–	LAGOON RETURN
–	–
100 %	4.02 MTPH
–	0 MTPH

6120	TAILINGS
45.3 %	0.33 MTPH
86.8 %	21.78 MTPH
(96 %)	0.72 MTPH

TAILINGS LAGOON OR DEWATERING PLANT

6120	THICKENED TAILINGS
45.3 %	0.33 MTPH
84.0 %	3.78 MTPH
(80 %)	0.72 MTPH

6120	TAILINGS SLUDGE
45.3 %	0.33 MTPH
40.0 %	0.48 MTPH
–	0.72 MTPH

5430	FINE REJECTS
49.60 %	0.60 MTPH
31.3 %	0.55 MTPH
(14 %)	1.21 MTPH

8400	UNTREATED FINE COAL
30.27 %	17.05 MTPH
25.4 %	19.19 MTPH
(6.75 %)	56.35 MTPH

10400	COARSE CLEAN COAL
17.1 %	2.03 MTPH
23.6 %	3.67 MTPH
(4.5 %)	11.88 MTPH

3610	WASHERY DISCARD
61.80 %	1.68 MTPH
29.0 %	1.11 MTPH
(11.2 %)	2.72 MTPH

9740	FINE CLEAN COAL
21.5 %	0.67 MTPH
28.4 %	1.24 MTPH
(10.5 %)	3.13 MTPH

8780	BLENDED PRODUCT
27.69 %	19.76 MTPH
25.2 %	24.10 MTPH
(6.6 %)	71.36 MTPH

REV	DESCRIPTION	BY	DATE	CHK
1	ISSUED WITH INTERIM REPORT		OCT 14/77	–

B.C. HYDRO
HAT CREEK MINING PROJECT
MODULAR COAL WASHERY
SIMPLIFIED FLOWSHEET
SHOWING MASS BALANCE

SIMON-CARVES

PHOTOGRAPHIC SCALE — MILLIMETRES 8 & 10 DIV/INCH

AREA: CATEGORY:
DWG TITLE: MASS BALANCE FLOWSHEET

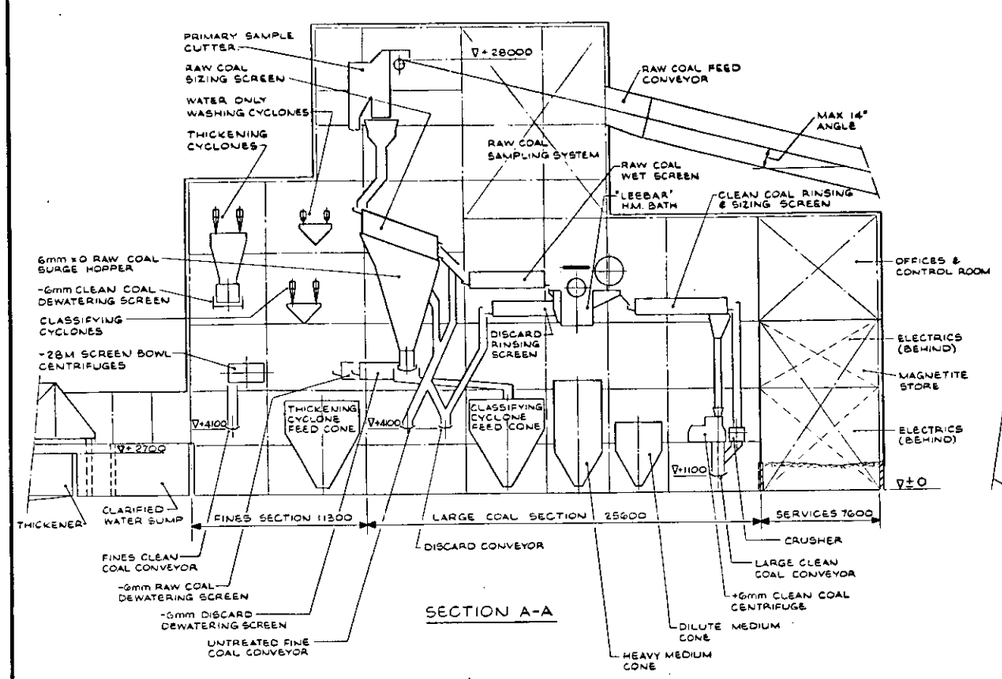
DESIGNED			SCALE	PROJ. MGR.		
DRAWN	I.E.S.		N.T.S.	PROJ. DES.		
CHECKED				D.O. MGR.		

CLIENT'S DRAWING NUMBER

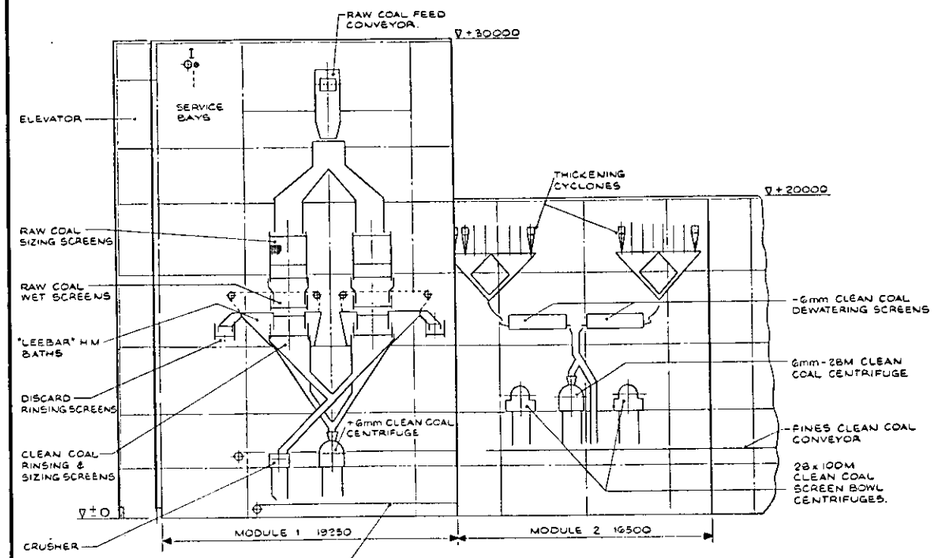
SCAN DRAWING NUMBER: F1304-0003 SHEET 3 OF 3

REV. 1

DWG. NO. F1304-1002 S-SECT 1 OF 1

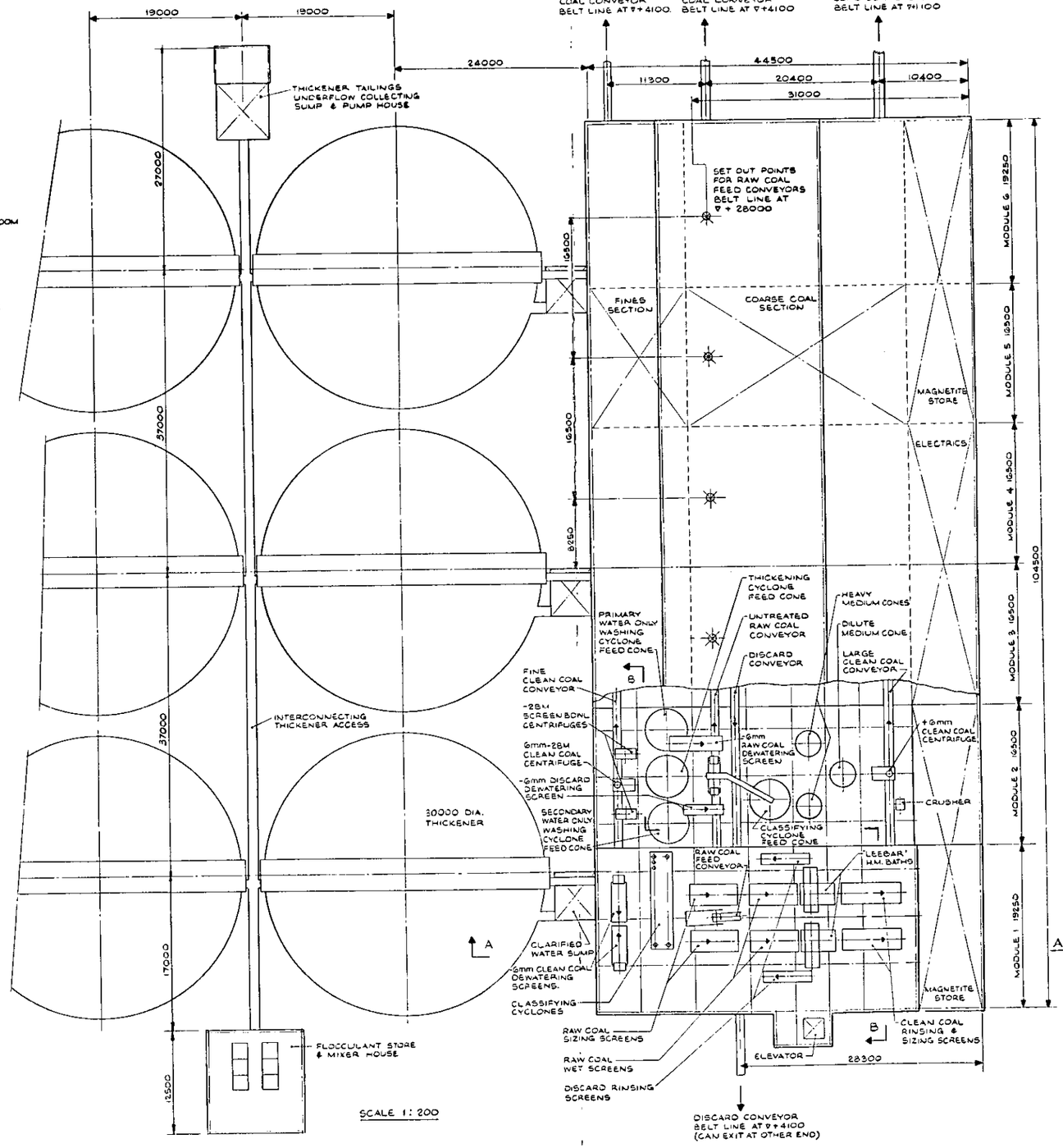


SECTION A-A



SECTION B-B

SCALE 1:125



SCALE 1:200

REV	DESCRIPTION	BY	DATE	CHK
1	'ISSUED WITH INTERIM REPORT'		OCT 14/77	—
P	PRELIMINARY	K.S		

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT, BRITISH COLUMBIA, CANADA
2400 M.T.PH COAL WASHERY & OUTSIDE HANDLING

PHOTOGRAPHIC SCALE — MILLIMETRES 8 & 10 DIV./INCH

DESIGNED | DRAWN K.S | CHECKED | SCALE AS NOTED | PROJ. MGR. | PROJ. DES. | D.O. MGR.

SIMON-CARVES

AREA: | CATEGORY:
DWG. TITLE: WASHERY LAYOUT

CLIENT'S DRAWING NUMBER | SCAN DRAWING NUMBER F1304-1002 SHEET 1 OF 1 | REV. 1