PR-QUINTETTE 80(1)A

QUINTETTE COAL LIMITED

1980 GEOLOGICAL ASSESSMENT REPORT

JANUARY 1981

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QUINTETTE COAL LIMITED

1980 EXPLORATION ASSESSMENT REPORT - JANUARY 1981

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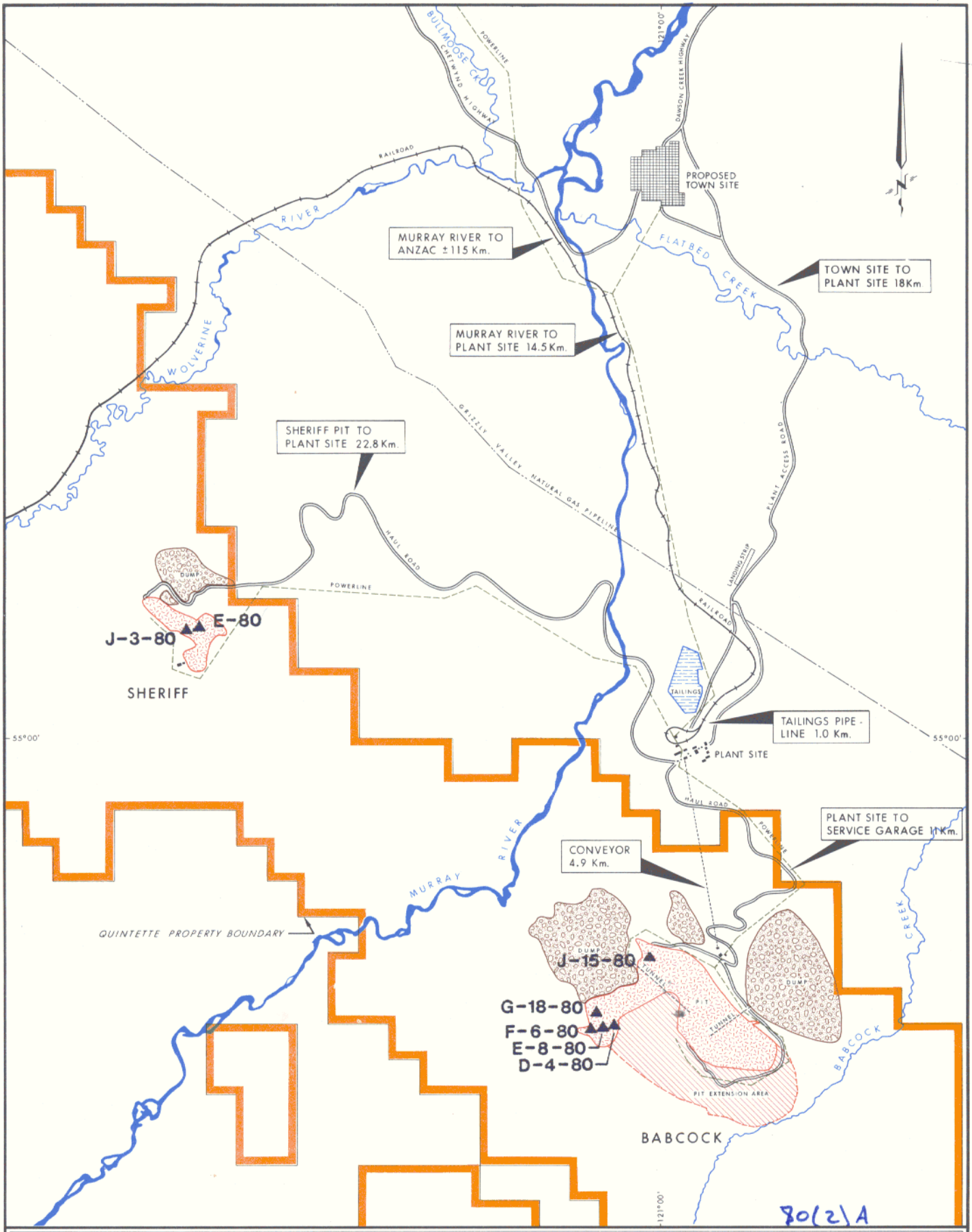
YUKON
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
PACIFIC OCEAN
UNITED STATES OF AMERICA
FORT NELSON
FORT ST. JOHN
CHETWYND
DAWSON CREEK
GRANDE PRAIRIE
FORT McMURRAY
PRINCE RUPERT
ANZAC
±130
QUINTETTE
HANSARD
PRINCE GEORGE
WHITECOURT
EDMONTON
LLOYDMINSTER
BRÛLÉ
RED PASS
JASPER
RED DEER
GOLDEN
BANFF
CALGARY
REVELSTOKE
KAMLOOPS
MEDICINE HAT
LETHBRIDGE
FORT MACLEOD
FERNIE
BRITANNIA BEACH
HOPE
VANCOUVER
VICTORIA
LEGEND
PROVINCIAL BOUNDARY
INTERNATIONAL BOUNDARY
GEOGRAPHICAL LOCATIONS
CAPITAL CITIES
RAILWAY LINES
MILES / KILOMETRES } BETWEEN POINTS
kilometers
50 0 50 100 150 200 250
miles
50 0 50 100 150
DENISON MINES LIMITED
PR-QUINTETTE 80(2*)A*(1)
Location Map
QUINTETTE
COAL LIMITED



BABCOCK - SHERIFF GENERAL LAYOUT PLAN

▲ E-80.....1980 ADIT

SCALE 0 1 2 3 4 5 6 KILOMETRES

FIGURE NO. 1

1.0 INTRODUCTION

The 1980 Quintette exploration program was carried out to obtain bulk samples of metallurgical and thermal coal from all major seams in the planned open pit mine areas of the Babcock and Sheriff coal deposits (Figure 1).

The primary objectives were:

1) To provide clean coal samples of metallurgical coal to prospective customers, and

2) To obtain washability and quality data of thermal coal.

To accomplish these objectives seven adits were sampled; five adits which were constructed in previous programs were resampled and two new adits were constructed and sampled.

In addition, a limited amount of geological mapping and one rotary drill hole was completed in the Johnson area. (See geology maps, Appendix 1)

The field program commenced in the beginning of June and was completed by the end of August.

2.0 ADIT CONSTRUCTION AND SAMPLING

During the 1980 Quintette exploration program, adit construction and sampling were carried out by Pyramid Mining & Tunneling Limited in the Babcock area and by Target Tunneling Limited in the Sheriff area. The adits were advanced for a minimum distance necessary in order to ensure that coal was not oxidized. Geological sampling was carried out every 2.5 metres or less and the free swelling index (F.S.I.) of coal sample determined as a test for oxidization. Once consistent high F.S.I. values were obtained over a 10 to 15 metre interval, the seam was cross-cut from floor to roof. The cross-cut was geologically logged in detail, sampled intervals were marked off and subsequently, samples were taken. In order to obtain thermal coal samples, a detailed F.S.I. profile from the portal to the non-oxidized zone was established and the area with F.S.I. values between 2 - 4 was selected for sampling. (In some instances, due to mining difficulties, thermal coal samples were taken at the adit portal, i.e. adit J-3-80.) The thermal coal samples were taken following the same procedures as for the metallurgical coal samples. The sampled adits, their location and driveage in 1980 are presented in the following table.

3.0 ADIT SAMPLE ANALYSIS

Bulk and incremental channel samples of both metallurgical and thermal coal were taken from each of the adits. The bulk samples were shipped to Birtley Coal and Minerals Testing in Calgary for analyses and bulk washability tests. Channel samples were taken from the same location as the bulk samples and shipped to General Testing Laboratories in Vancouver for detailed laboratory float-sink analyses.

3.1 BULK SAMPLE TESTS

3.1.1 Metallurgical Coal

Approximately 10 tonnes of metallurgical raw coal was taken from each of the adits and washed at Birtley's pilot plant. Details of the pilot plant analytical flowsheet are schematically presented in Figure 2. Each sample was washed to a clean coal product of 7.5 per cent ash level (air dry basis). Individual samples of the clean coal product were sent to Canada Centre for Mineral and Energy Technology Laboratories (CANMET) in Edmonton for carbonization tests and a petrographic study. In addition, samples of product clean coal have been sent abroad to the prospective customers.

3.1.2 Thermal (Oxidized) Coal

Similar to metallurgical coal, thermal coal samples were taken from each of the adits and sent to Birtley Coal and Mineral Testing. The amount of sample taken from a given seam was in proportion to the thermal coal reseres of the seam. The quantity of sample varied from 6 to 16 drums (approximately 200 kg. each drum). Both individual and blend samples were processed in the same manner as the metallurgical coal samples following Figure No. 2. The clean coal from the blend sample was sent to the E.M.R.'s Canadian Combustion Research Laboratories in Ottawa for a burn test.

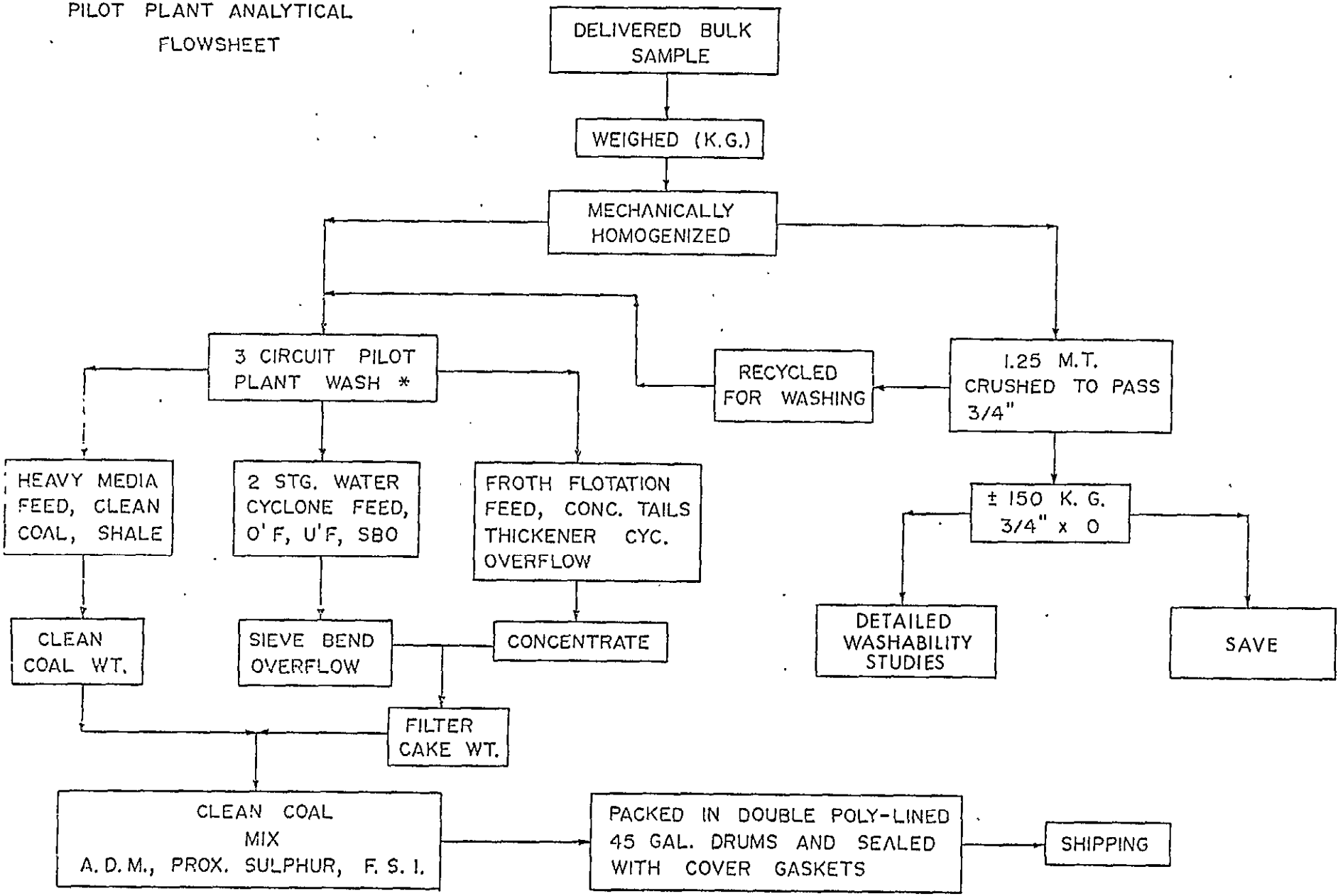
3.2 CHANNEL SAMPLE TESTS

Channel samples are generally used to verify quality of various bulk lots. Incremental samples (metallurgical and thermal coal) were taken from each adit after the section was logged and subsequently sent to General Testing Laboratories. Each incremental sample was floated at 1.5 specific gravity to determine the yield and then composited in the given ratio to represent the mining section for subsequent analytical tests according to the Flowsheet in Figure No. 3. The increments of the individual channel samples taken from each adit are presented on adit drawings in Appendix 2.

Coal Seam & Adit Number	Deposit	Status	Driveage (m) 1980	Total Driveage(m)
D-4-80	Babcock	Resampled	15.0	46.0
E-8-80	Babcock	Resampled	10.5	36.5
F-6-80	Babcock	Resampled	4.0	20.0
G-18-80	Babcock	New	42.0	42.0
J-15-80	Babcock	Resampled	5.5	60.0
E-80	Sheriff	Resampled	8.0	52.0
J-3-80	Sheriff	New	69.0	69.0

At the completion of the sampling of an adit, the adit was surveyed and sealed as stipulated by the Coal Regulation of the Province of British Columbia. The adit locations are illustrated on Figure 1 and shown in detail on geology maps of Babcock and Sheriff included in Appendix 1. Further details of each adit, including seam section, lithology, F.S.I. values and sampled intervals for new and resampled adits, are presented as drawings in Appendix 2 at the end of the text.

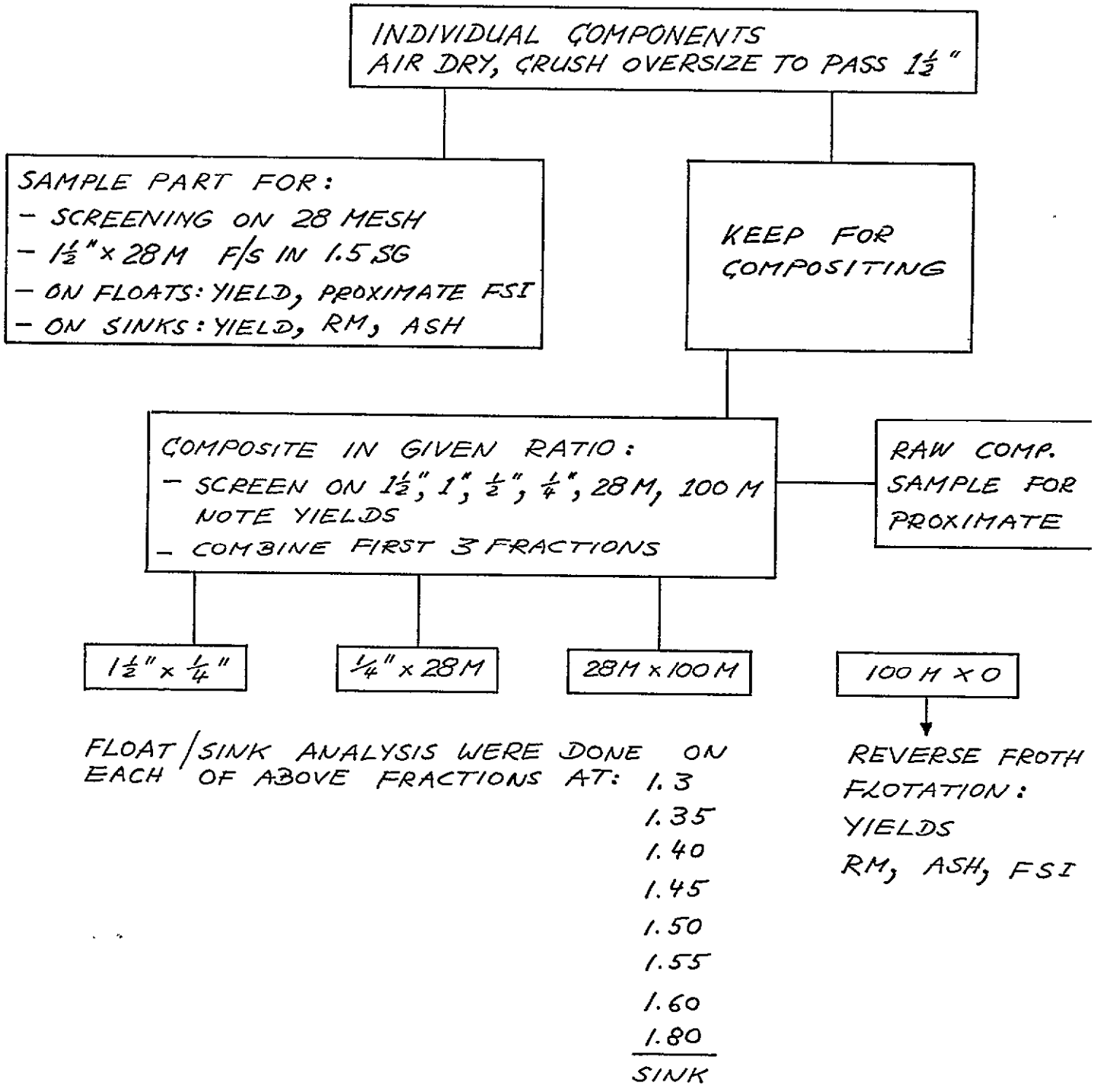
PILOT PLANT ANALYTICAL FLOWSHEET



* ALL PLANT SAMPLES ANALYSED FOR ASH AND F. S. I.

FIGURE NO. 2

QUINTETTE CHANNEL SAMPLE ANALYSIS FLOW DIAGRAM



RECORD YIELDS ANALYSIS:
- RM, ASH, FSI (cum) ON FLOATS
  RM, ASH ON SINKS

FIGURE Nº3

4.0 GEOLOGICAL MAPPING AND DRILLING PROGRAM

The Johnson area is located in the central part of the Quintette trend, southeast of the Sheriff Mountain. All the natural bedrock exposures of the area were mapped prior to this year's program. In 1980, mapping was restricted to newly constructed road cuts in which hitherto undetected coal seams were exposed.

In addition, one rotary drill hole was accomplished in the Johnson area. A new oil well site (Well D-83-J-93-1-14) and a road, built in 1980 by B.P. Exploration Canada Ltd., were mapped by a two-man team. Based on new geological information, drilling was undertaken and carried out by Bertram Drilling Company from Carbon, Alberta. The hole was drilled to a depth of 123 metres, using a Mayhew 1000 Nodwell mounted rig. For structural and stratigraphic information, 1.5 metres of core (H.Q. size) was obtained at depths of 39, 87 and 123 metres. The hole was geophysically logged by Roke Oil Enterprises Ltd. and the following response tests were run: Gamma Ray, Sidewall Density, Focused Beam Resistivity, Caliper and Directional Survey. These logs were run at a scale of 1:200 and supplemented by a Sidewall Density Log, run at a detailed scale of 1:20 over the coal bearing intervals. A complete set of logs is enclosed in Appendix 3.

5.0 GEOLOGY AND COAL DEVELOPMENT OF THE JOHNSON AREA

The structure of the area was found to be a synclinal basin with an erosional reminent of the coal bearing Middle Gates member of Commotion Formation in the core. The newly mapped sequence of conglomerate and conglomeratic sandstone, overlying a 1.8 metres thick coal seam, was considered an equivalent to the uppermost part of the Middle Gates in the Sheriff area. One rotary hole was drilled in the center of the structure to establish coal seam development and stratigraphy in the area. This drill hole confirmed that three economical coal seams were present, with an aggregate mining thickness of 9.8 metres, all within 35 metres from the surface. The seams have been designated as: D, E_1, and E_2 from younger to older. The following table summarizes the seam thickness and calculated in-place reserves.

Seam	Seam Thickness (m)	Reserves ($\times 10^6$ tonnes)
D	1.8	0.7
E_1	6.5	4.5
E_2	1.5	1.2
TOTAL	9.8	6.4

It is suspected that coal within the structure may be extensively oxidized, however, more definitive programs in the future will be required to confirm coal quality. The geology of coal seam development in Johnson area is presented in detailed geology map 1:5000, and accompanying cross sections (drawings included in Appendix 4).

6.0 FIELD CAMPS AND ROADS

Previously established camp facilities at the Babcock and Mast camps and existing roads were utilized for the 1980 field programme. Only 100 metres of road access was built near Adit J-3-80 in the Sheriff area.

Babcock camp was utilized from June 1 until July 16 and Mast camp from July 17 until August 27. Both camps were winterized and left on site.

7.0 RECLAMATION

The areas of environmental disturbance associated with the 1980 exploration programme have been reclaimed in accordance with guidelines set forth by the Ministry of Energy, Mines and Petroleum Resources. This reclamation has been inspected by the appropriate authorities. The recontouring and establishing of water barriers was found to be satisfactory. However, during the inspection, it was found that some seeding may be required next year because germination of the seed has occurred, which raises the possibility of winter kill (see letter in Appendix 5). Therefore, reclamation for the 1980 exploration program should be considered pending.

8.0 PROJECT MANAGEMENT AND CONTRACTORS

During the 1980 exploration programme for Quintette Coal Limited, technical supervision and data analyses were carried out by the staff of Denison Mines Limited. The professional members of the Denison staff involved and major contractors are listed below:

Denison Mines LImited

G. Gormley	Manager of Exploration
R. Sagi	Chief Geologist
I. Delas	Project Geologist
L. Samoil	Geological Assistant

Contractors

1. Bertram Drilling Company Ltd.	Rotary Drilling
2. Birtley Coal & Mineral Testing	Coal Sample Analyses
3. General Testing Laboratories	Coal Sample Analyses
4. Pyramid Mining & Tunneling	Adit Construction
5. Roke Oil Entreprises Ltd.	Geophysical Logging
6. Target Tunneling	Adit Construction
7. Tompkins Contracting Ltd.	Heavy Equipment

APPENDIX 1

GEOLOGY MAPS - BABCOCK AND SHERIFF DEPOSIT

B 7716
B 7724
B 7730
B 7738
B 7748
B 7754
54 50
BL 7722
54 55
12 1700

KCm(b)
KCm(h)
KCm(g)
KCm(b)
KCm(h)
KCm(g)
KCm(h)
KCm(b)
KCm(h)
KCm(b)
KCm(g)
KCm(h)
KCm(b)
KCm(g)
KCm(b)
KCm(g)
KMb
KCm(g)
KMb
KCm(h)
KCm(g)
KCm(b)
KSh
KCm(b)

WATERFALL CREEK SYNCLINE

Babcock Camp

LEGEND

- KCm(b) Brazeau Creek member
- KCm(h) Hallerton member
- KCm(g) Gates member
- KMb Moosebar formation
- Syncline
- Anticline
- Dip & Strike
- Adit
- Reverse fault
- Normal fault
- GBD 7601 Diamond drill hole
- Rotary drill hole
- Geological contact
- Coal seam outcrop
- Cross section location

METRES 100 0 100 200 300 400

614

NO.	DESCRIPTION	BY	DATE
	REVISED GEOLOGY IN NORTH EXPOSURE	AT	FEB 78
	REVISIONS		

QUINTETTE COAL LIMITED
PREPARED BY
DENISON MINES LIMITED
MITSUI MINING CO. LTD.

BABCOCK MOUNTAIN
GEOLOGY

DRAWN BY:	DATE: Dec. '76	SCALE: 1:5000	
RECD BY:	DATE: Mar '77	DRAWING NUMBER:	
APPR'D BY:	DATE: Dec '76	BRCK76-0716-R03	

KCm(b)

KCm(h)

SHERIFF FAULT

KCm(g)

KCm(g)

KCm(h)

MARMOT FAULT

(h)

KCm(g)

MESA THRUST

KCm(g)

SYNCLINE

KCm(h)

MESA THRUST

KCm(g)

KMb

QMD7602

QMD7603

QMD7604

QMD7605

QMD7606

QMD7607

QMD7608

QMD7609

QMD7610

QMD7611

QMD7612

QMD7613

QMD7614

QMD7615

QMD7616

QMD7617

QMD7618

QMD7619

QMD7620

QMD7621

QMD7622

QMD7623

QMD7624

QMD7625

S7774

MESA ANTICLINE

KCm(g)

KCm(g)

DEPUTY SYNCLINE

KCm(g)

KMb

KGt

S7771

S7772

S7773

S7775

KCm(g)

SURVEY NOTE

Ground Control Survey for the Project was surveyed by Burnett Resource Surveys Ltd. All co-ordinates on U.T.M. System, Zone 10. Elevations on Geodetic Datum.

Aerial Photography taken 1976, Map Compilation 1976, by Burnett Resource Surveys Ltd.

NO.	DESCRIPTION	BY	DATE
1	CROSS SECTION LOCATIONS & NUMBERS	ET	FEB/78

REVISIONS

QUINTETTE COAL LIMITED

PREPARED BY:
DENISON MINES LIMITED
MITSUI MINING CO. LTD.

SHERIFF PIT GEOLOGY

DRAWN BY: J.K. E.T.	DATE: Jan. 77	SCALE: 1:2500	
PREP'D BY: K.K. (1)	DATE: Dec. 76	DRAWING NUMBER:	
APPR'D BY: G.C. (1)	DATE: Jan. 77	QNTT 77-0728-R03	

QMap# 102
P.R. Quintette SC(1)A(1)

614

LITHOLOGIC LEGEND:

- CONGLOMERATE
- SANDSTONE
- SHALE

TOPOGRAPHIC LEGEND

- ACCESS ROAD -ALL WEATHER
- -LIMITED WEATHER
- ACCESS TRAIL-LIMITED WEATHER
- AIR STRIP
- SEISMIC LINE, CUT LINE
- TRENCH
- ADIT
- DRILL HOLE -ROTARY (QMR 7595)
- -DIAMOND (QMD 7603)
- HORIZONTAL AND VERTICAL CONTROL -TARGET (T-9)
- -IRON PIN (IP 4625)
- -PHOTO CENTER (PP 68)
- RIVER
- STREAM
- LAKE
- SWAMP
- CONTOURS
- DEPRESSION CONTOUR

GEOLOGICAL LEGEND:

- OUTCROP STRIKE & DIP
- TRENCH STRIKE
- TRENCH STRIKE & DIP
- FAULT TRACE
- REVERSE (THRUST) FAULT
- NORMAL FAULT
- SEAM OUTCROP
- GEOLOGICAL CONTACT
- KMb: MOOSEBAR FM.
- KCm(g): COMMOTION FM. (Gates member)
- KCm(h): COMMOTION FM. (Hulcross member)
- KCm(b): COMMOTION FM. (Boulder Creek member)
- CROSS-SECTION LOCATION
- SYNCLINE
- ANTICLINE

SCALE 1:2,500

METRES 30 0 100 200 300 400

CONTOUR INTERVAL 2 METRES