

PR-CARBON CREEK 76(7)A

OPEN FILE

**CARBON CREEK
COAL DEVELOPMENT**

UTAH MINES LTD.

PROSPECTUS

MARCH 1976

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

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INTRODUCTION

Utah Mines Ltd. have been investigating the metallurgical coal potential of the company's Carbon Creek coal **licences** adjacent to Williston Lake in northeastern British Columbia (Peace River Regional District).

The property is located within the designated northeastern coal block 20 miles west of the W.A.C. Bennett Dam. With respect to existing communities, the property is 30 miles west of Hudson Hope, 45 miles northwest of Chetwynd and 40 miles northeast of MacKenzie. The John Hart highway, which connects Prince George and Dawson Creek **is** 25 miles to the south of the property. Geographical co-ordinates for the center of the property are **55° 59' N** and **112° 39' W**. Figures 1, 2 and 3 show the location of the property.

Since acquisition **of** the property in late 1970, **exploration** programs have been directed towards the development of sufficient coal reserves to support an economic metallurgical coal mining venture. In co-ordination with the exploration programs, environmental studies have been conducted yearly since field operations were initiated in 1971.

It must be emphasized that all the engineering studies conducted to date and referred to in this prospectus are preliminary in nature. The estimated coal reserves warrant a more detailed engineering study which will be initiated this spring.

We are presenting the following information as an introduction to the concept of the potential Carbon Creek metallurgical coal development.

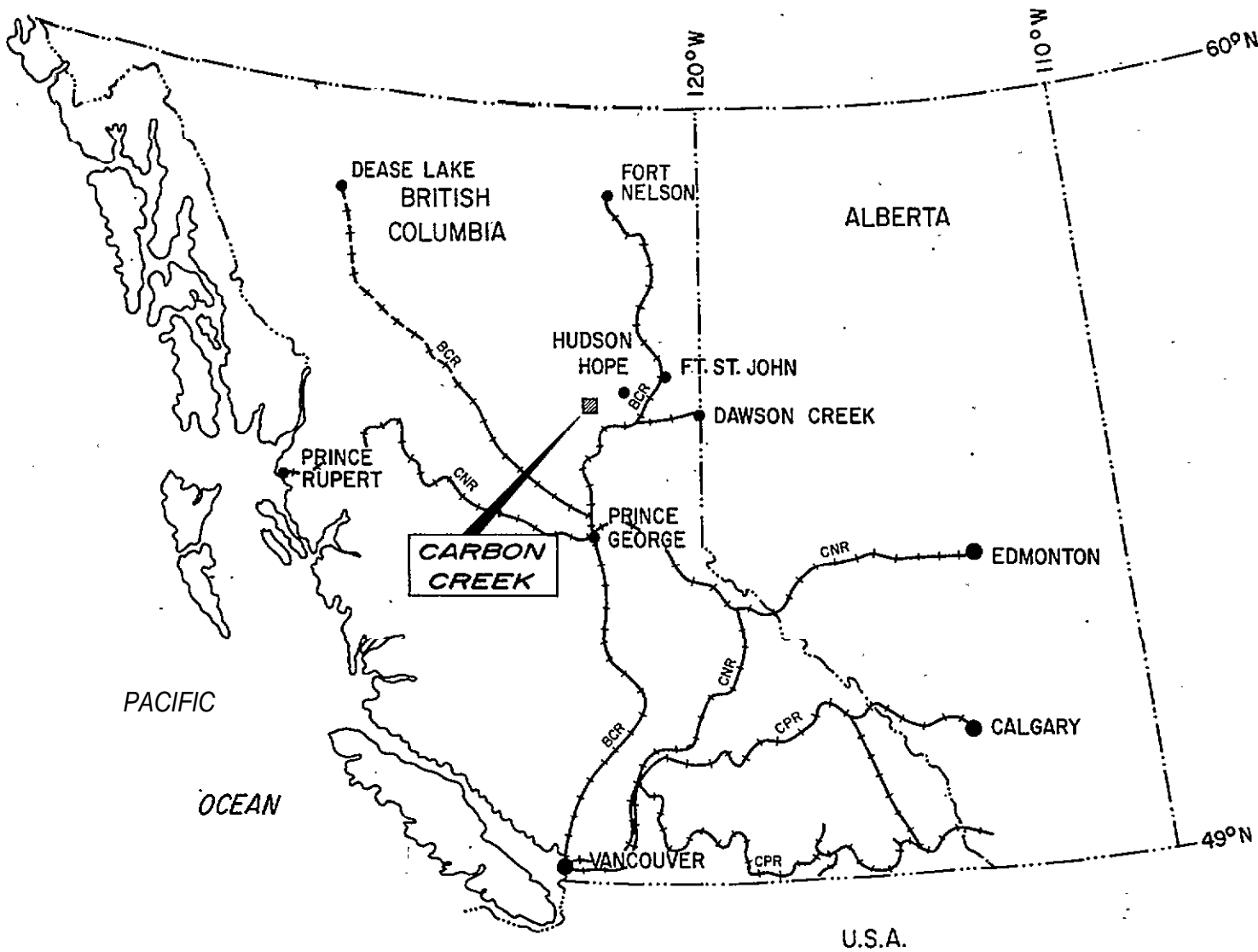
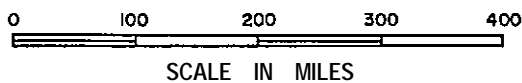


FIGURE 1
 UTAH MINES LTD.
 CARBON CREEK COAL DEVELOPMENT
 LOCATION MAP
PR-CARBON CREEK 76(2)B.



SCALE IN MILES

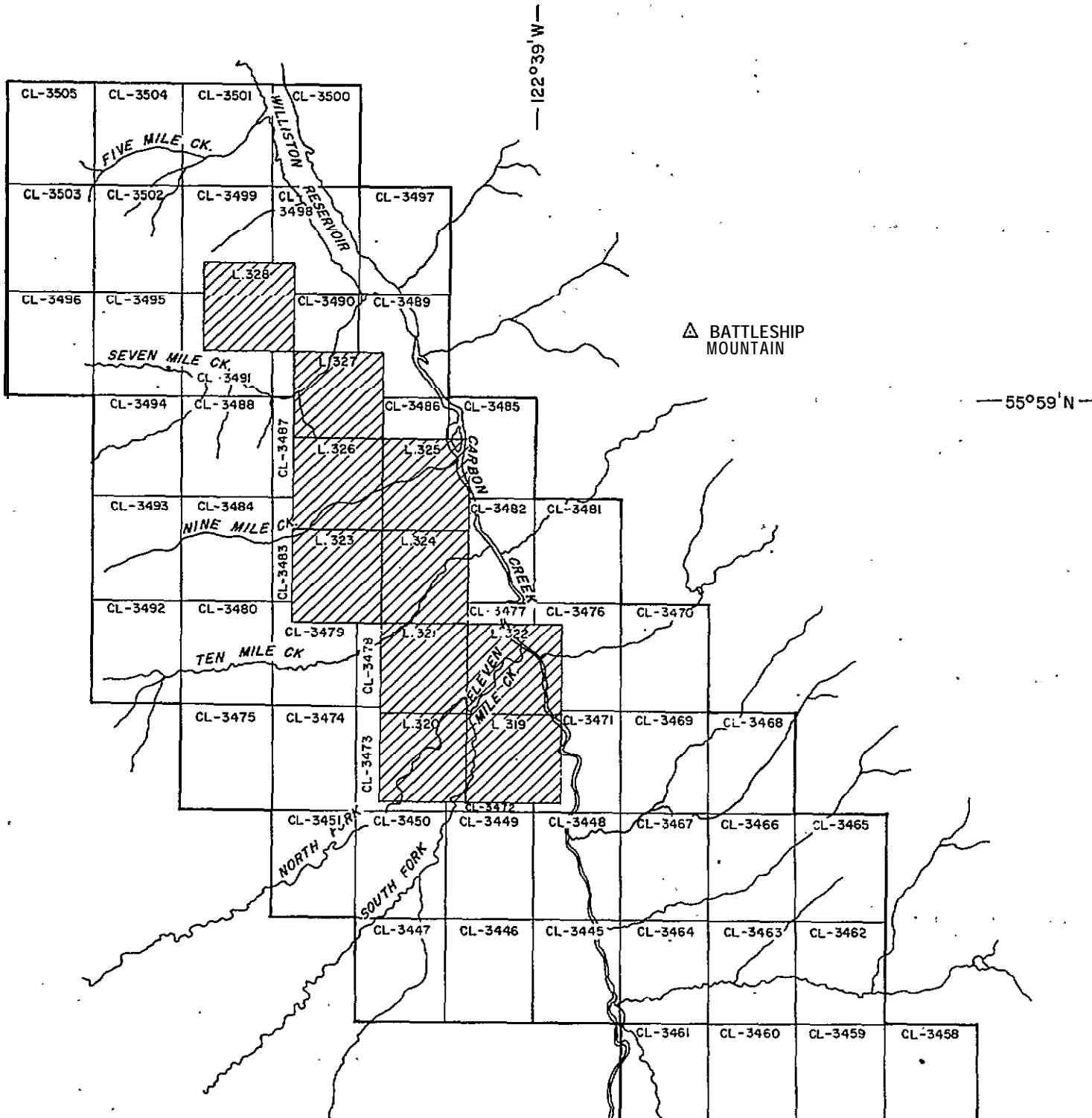


FIGURE 3

UTAH MINES LTD.
 (CARBON CREEK COAL DEVELOPMENT
 COAL LICENCE
 AND LEASE LOCATIONS
 PR-CARBON CREEK 76(2)B.

CL-3505
 COAL LICENCE
 L-328
 COAL LEASE - COAL RIGHTS ALIENATED

0 1 2
 SCALE IN MILES

DESCRIPTION OF COAL RESERVES

Sixty-one coal licences, numbers 3445 to 3505, and ten Crown Granted coal leases, numbers 319 to 328 currently comprise the Carbon Creek property. Total area is 44,447.78 acres or 69.45 square miles.

The property is located within the foothills belt of the Rocky Mountains. This belt, characterized by a series of synclines, anticlines and major west dipping thrust faults, is underlain predominantly by Mesozoic rocks. The 'high northwesterly trending ridges and steep-sided valleys are generally parallel with the strike of the underlying formations.

The formations, in ascending order, as defined by the Geological Survey of Canada, and present in the Carbon Creek vicinity are: Upper Jurassic Fernie Formation, Lower Cretaceous Monteith, Beattie Peaks, Monach, Cadomin and Gething Formations. The Gething Formation is the only unit in the Peace River Canyon area containing coal of commercial interest. This unit underlies most of the surficial area of the Carbon Creek coal licences. The other formations are exposed on the margins and adjacent to the licences.

Conglomerates, sandstones, siltstones, mudstones, shales and coal are representative rock types for the Jurassic and Cretaceous units named above. A single lithology or a combination of these lithologies may comprise the formations. All the above rock types are represented within the Gething Formation. The depositional environment for these sediments was transitional, with neritic marine, shoreline, and deltaic deposits represented.

The Carbon Creek basin is an intervening north-south trending **syncline** lying between two major anticlinal belts. The embracing eastern anticlinal belt is a faulted continuation of a southerly anticline. The **western** anticlinal belt consists of several en-echelon folds extending from the southwest corner of the property, northerly along the west edge of the licences. Within the northern part of the **licence group** the **syncline** plunges gently southeastward. In general the **coal** measures **encountered** are relatively flat lying ranging from 0 to 20°. The southern part of the basin is more complex with several subsidiary folds and flexures. In the central area of the **licence** block the basin is complicated by a high angle westward dipping north-south trending thrust fault. There are a number of less severe parallel high angle faults to the west of this thrust. Delineation of structural features within the licences is difficult due to the lack of outcrop and the thick veneer of glacial **drift**.

A preliminary coal reserve estimate **has been** calculated from sixteen coal seams located north of Ten Mile Creek and west of Carbon Creek. Location of coal reserves are illustrated in Figure 4 and summarized on Table 1.

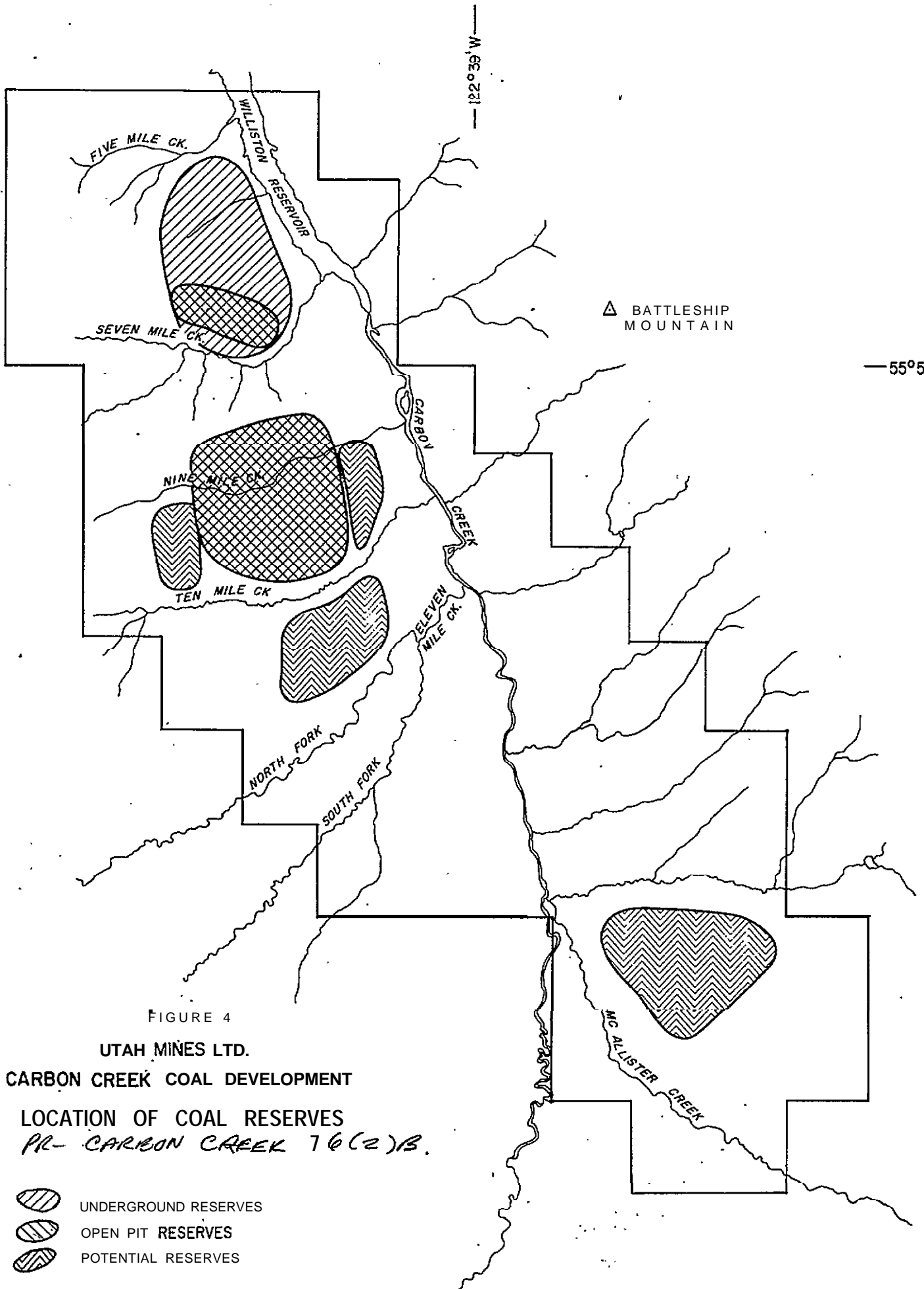





FIGURE 4

UTAH MINES LTD.

CARBON CREEK COAL DEVELOPMENT

LOCATION OF COAL RESERVES

PR- CARBON CREEK 76(2)B.

-  UNDERGROUND RESERVES
-  OPEN PIT RESERVES
-  POTENTIAL RESERVES

0 1 2
SCALE IN MILES

TABLE I
PRELIMINARY
COAL RESERVE ESTIMATE .
SHORT TONS

Coal Reserves	In Place	Recoverable
Surface Mineable	43,335,000	39,002,000
Underground Mineable	89,506,000-	34,718,000
T o t a l	132,841,000	73,720,000

Criteria for the reserve calculations are as follows:

1. Minimum coal seam thickness for underground operations would be 3.0 **feet.**,
2. Minimum coal seam thickness for open pit operations would be 2.0 feet.
3. **The** weight of the coal was taken as 1800 tons per acre-foot for the reserve calculation.
4. No reserves were calculated from areas, either for underground or open pit, where depth of cover is less than 40 feet. Coal within the surface layer is assumed to be oxidized.
- 5.-A **30:1 highwall** is assumed for stripping which approximates an overall average **15:1** ratio of overburden to coal.
6. Recovery of underground coal is dependent upon pitch of the coal seams.
7. All reserve estimates are classified as "measured". The outer limit of a block of measured reserves is one quarter mile from the last point of definite information.

Limited exploration over other areas of the property indicates potential for additional open-pit and underground reserves.

The analysis of the more important **coal** seams used for the reserve estimate is listed on Table 2. **Analytical** data from the 1975 season is **not** currently available. FOR **TABLE 2**
'COAL ANALYSIS A-r 1.40 SPECIFIC GRAVITY', REFER TO : PR-CARBON CREEK

3
76(4)

DESCRIPTION OF PROPOSED COAL MINING OPERATION

EXPLORATION PHASE

Since acquisition of the property, exploration programs have been conducted on the **licences** during **1971, 1972, 1973** -and 1975. Emphasis, through diamond drilling each year, has been directed towards development of sufficient **coal** reserves to support an economic metallurgical coal mining venture. Most areas of the property have been tested to varying degrees, but more recently, work has been concentrated over the northern half of the property, where early work indicated favourable reserve potential.

Seventy diamond drill holes, with an aggregate footage of 48,482 feet, 62 miles of roads, and surface mapping have been completed on the property to provide information for coal reserve calculations. **The** majority of the data has **been gathered from** the area west of Carbon Creek and north of Ten Mile Creek.

Since the area **is not accessible by** road, all equipment for prior programs has been transported across Williston Lake by tug and barge and moved out at the end of the summer season. The short duration of each exploration program has necessitated construction of temporary seasonal **accomodation** for **field** crews.

Expanded operations proposed for 1976 and subsequent years will **require** an all-weather camp facility and services. To meet this objective, an access road will be required this year.

Future exploration will involve close spacing of rotary and diamond drill holes on one and two thousand foot centers for detailed character delineation of coal **seams** and accurate calculation of coal reserves. **Adit** work will progress concurrently to confirm coal quality information and provide data on underground mining conditions.,

This work will consist of four to ten **adits** in four areas as illustrated in Figure 5. These **adits will** be driven to depths of up to 800 feet, preferably using mechanized mining equipment. Excess coal extracted, beyond that required for samples, will be stored in piles adjacent to the **adit** portal on a prepared **pad**. If necessary, a berm will be constructed around the circumference of the pad to control runoff and channel the water into a catchment basin. The **adits** would remain accessible for geotechnical investigations and environmental measurements. **The** pads and disturbed areas would be reclaimed as soon as practical.

Additional roads will be necessary for access throughout these areas of potential development. Government **regulations** and guidelines with respect to forest and surface disturbance during road construction are observed. Environmental factors are considered for road locations and where necessary bridges are constructed to prevent possible siltation of stream beds.

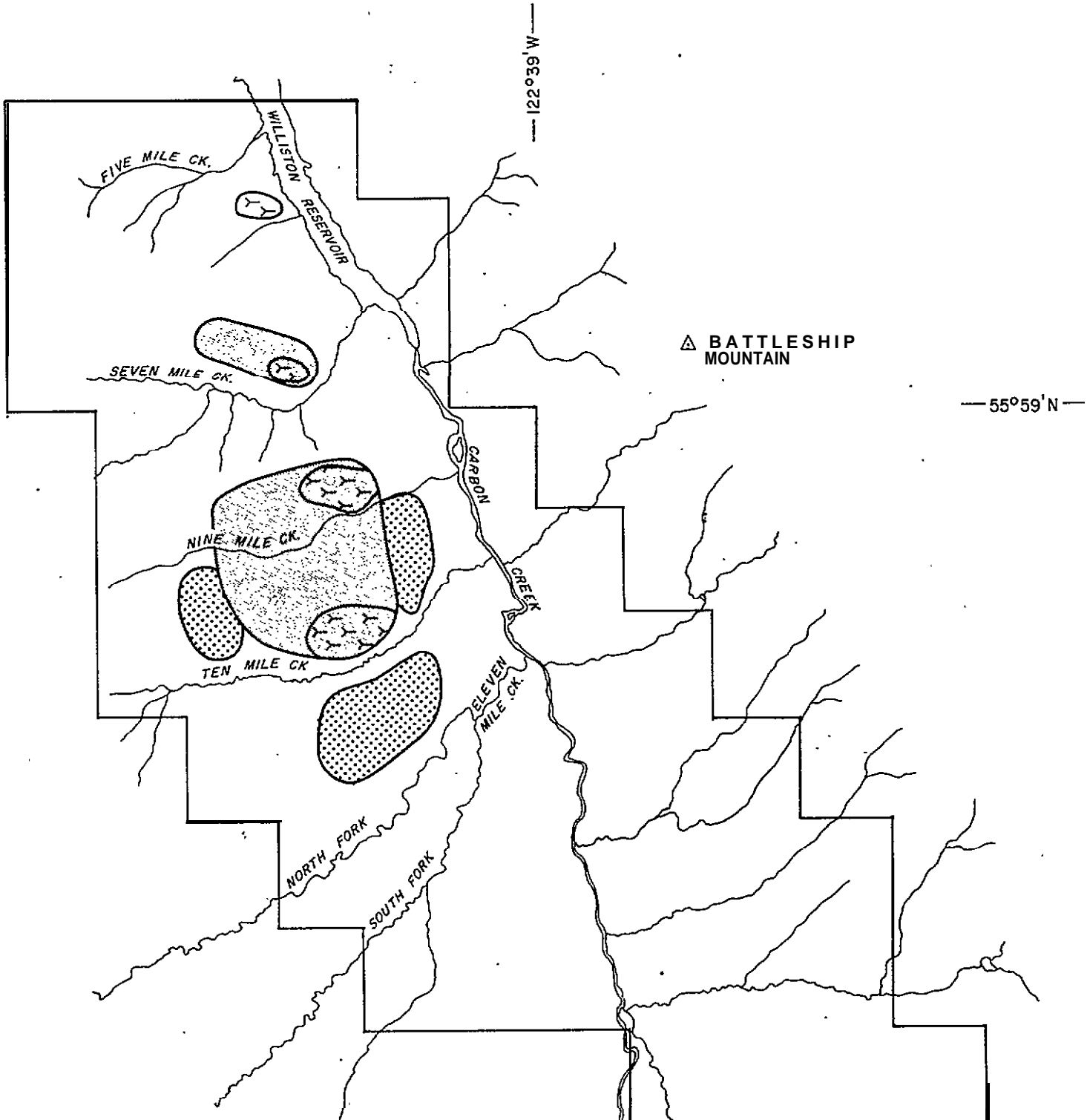



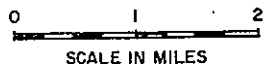


FIGURE 5

**UTAH MINES LTD.
CARBON CREEK COAL DEVELOPMENT**

**TYPE AND LOCATION OF FUTURE
EXPLORATION PHASES**

-  *PR-CARBON CREEK 76(2)B.*
EXPLORATION DRILLING FOR POTENTIAL RESERVES
-  ROTARY DRILLING PROVE-UP OF PRELIMINARY RESERVES
-  AREAS OF ADIT WORK



CONSTRUCTION PHASE,

The construction camp would likely be located in the vicinity of the mine industrial complex at the junction of Eleven Mile Creek and **Carbon Creek**. It would be designed to **accom-**odate the majority of the construction workers, with the **possibility** of later modification to **acomodate** a portion of the mine production workers. The camp facility would be equipped with a modern sewage treatment plant. Domestic solid wastes and garbage would be disposed of according to guidelines provided by the Pollution Control Branch.

The proposed mine access route, approximately 20 miles long, would extend from the W.A.C. Bennett Dam, west to Carbon Creek, as shown on Figure 7. The design of the road would be in accordance with the Class Three Access Road specifications of the B.C. Forest Service. The road will provide access and could at a later date be upgraded to serve as a route for mine employees commuting to Hudson Hope.

The mine industrial area would be constructed near the **con-**fluence of Eleven Mile Creek and Carbon Creek. It would consist of a wash plant, mine shops, warehousing and offices. An overland **conveyor system** will be built to transport raw coal from mine areas to the wash plant. See Figure 6 for general layout of on-site mining facilities.

From the wash plant the clean coal would be conveyed to a load-out facility to be constructed east of Carbon Creek. Because truck transport of the coal is not economically viable, it is currently envisioned that a rail spur for unit-

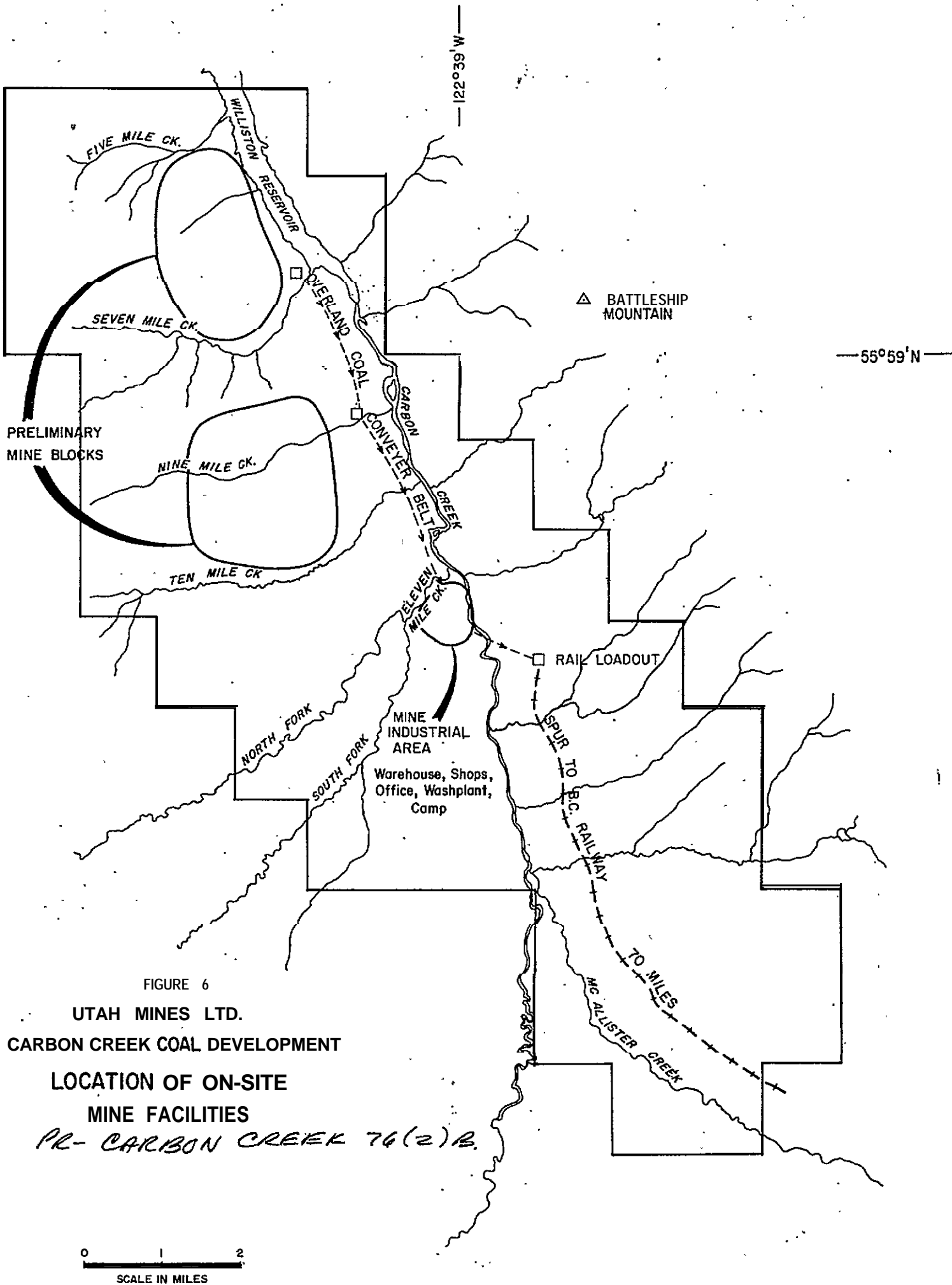


FIGURE 6

UTAH MINES LTD.
 CARBON CREEK COAL DEVELOPMENT

LOCATION OF ON-SITE
 MINE FACILITIES

PR-CARBON CREEK 76(2)B.

0 1 2
 SCALE IN MILES

trains would be constructed to the B.C. Railway mainline at Windy Station, approximately 70 miles east of the property. Additional engineering studies will be conducted to determine the most suitable route. See Figure 7 for location of the rail spur.

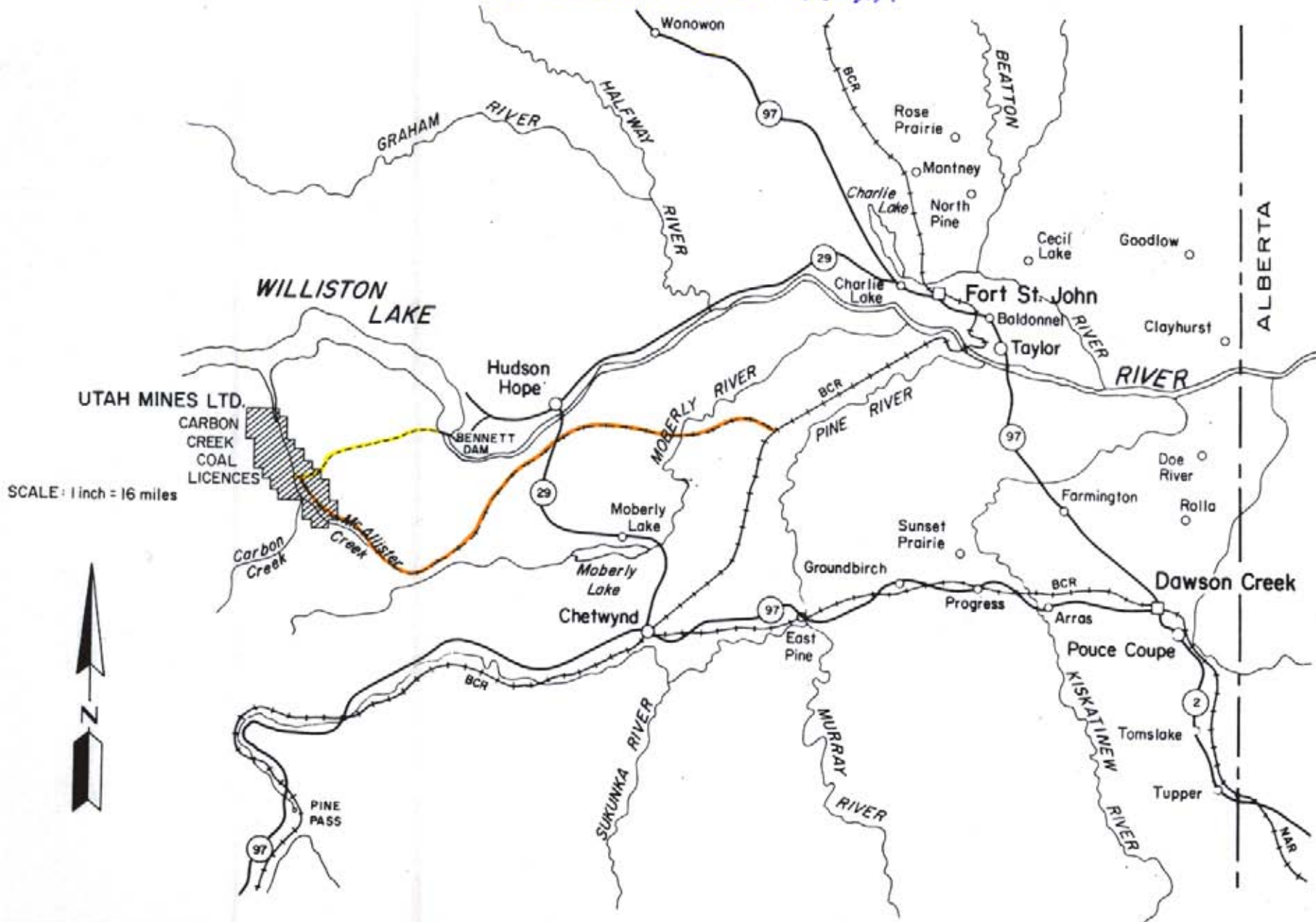
Construction of associated facilities would begin in the years as shown on Table 3 below.

TABLE 3
CONSTRUCTION SCHEDULE

YEAR	WORK CATEGORY	NUMBER OF CONSTRUCTION EMPLOYEES
1976 & 1977	Construction of access road Installation of all-weather camp Development drilling Bulk sampling of coal	85
1978 & 1979	Construction of wash plant, mine shops, warehouse and offices Construction of overland conveyer belts for surface mine Construction of housing and utilities Construction of unit train loading facilities' Pre-mine stripping of open pit	500
1980	Construction-of overland conveyer belts for underground mines	200
1981	Pre-mine development for underground mine and shops	200

FIGURE 7

UTAH MINES LTD.
CARBON CREEK COAL DEVELOPMENT
PROPOSED LOCATIONS FOR ACCESS ROAD
AND RAILSPUR TO MINESITE
PR-CARBON CREEK 76(2)A.



MINE OPERATIONS

During the four year period of mine development from 1979 through 1982, both the surface and underground operations will reach full production. See Table 4 for production schedule.

Multiple open pits would be used for surface mining operations. Overburden would be drilled using large rotary track mounted, electric drills and blasted. Power shovels would be the main stripping machines to load overburden into off highway type, end dump, diesel powered trucks. Coal would also be **drilled and** blasted and then loaded with large **front-**end loaders into off highway haulage trucks. Coal would be hauled to a centrally located breaker station, from that point the coal would be transported by overland conveyor belts to the wash plant located in the mine industrial area. The surface mining operations would employ approximately 400 people.

Underground mining will be planned on conventional room and pillar methods. Initially, entries would be driven from outcrops or highwalls left from surface mining operations. Mechanized equipment (continuous miners) would be used to mine the coal. An underground conveyer system would transport **the raw** coal to the surface. From this point the coal would be transported by belt or truck to the main overland conveyer system. Approximately 150 mining personnel would be required. An additional 200 employees would be required for wash plant operation, transportation, maintenance and administration staff.

TABLE 4
PRODUCTION SCHEDULE
SURFACE AND UNDERGROUND MINING

YEAR	OPERATION	VOLUME "	NO. OF MINE EMPLOYEES
1979	Surface stripping	4 MYPY	200
	Coal production	0	
1980	Surface stripping	20 MYPY	400
	Surface coal production	1.6 MSTRC -1.2 MSTCC	
1981	Surface stripping	33 MYPY	600
	Surface coal production	2.8 MSTRC -2.0 MSTCC	
	Underground coal production	~.3 MSTRC ~.2 MSTCC	
1982 to 2004	Surface stripping	33 MYPY	750
	Surface coal production.	2.8 MSTRC -2.0 MSTCC	
	Underground coal production	~.6 MSTRC ~.5 MSTCC	

* MYPY - millions of yards per year
MSTRC - millions of short tons of raw coal
MSTCC - millions of short tons of clean coal

-Approximately 5000 acres of ground surface would be disturbed during the life of the mine. Annual surface disturbance would average 200 acres. Most waste rock would be back-filled into completed pits.

It is anticipated that electrical power for the mine would be supplied by B.C. **Hydro** from the nearby W.A.C. Bennett hydroelectric generating station.

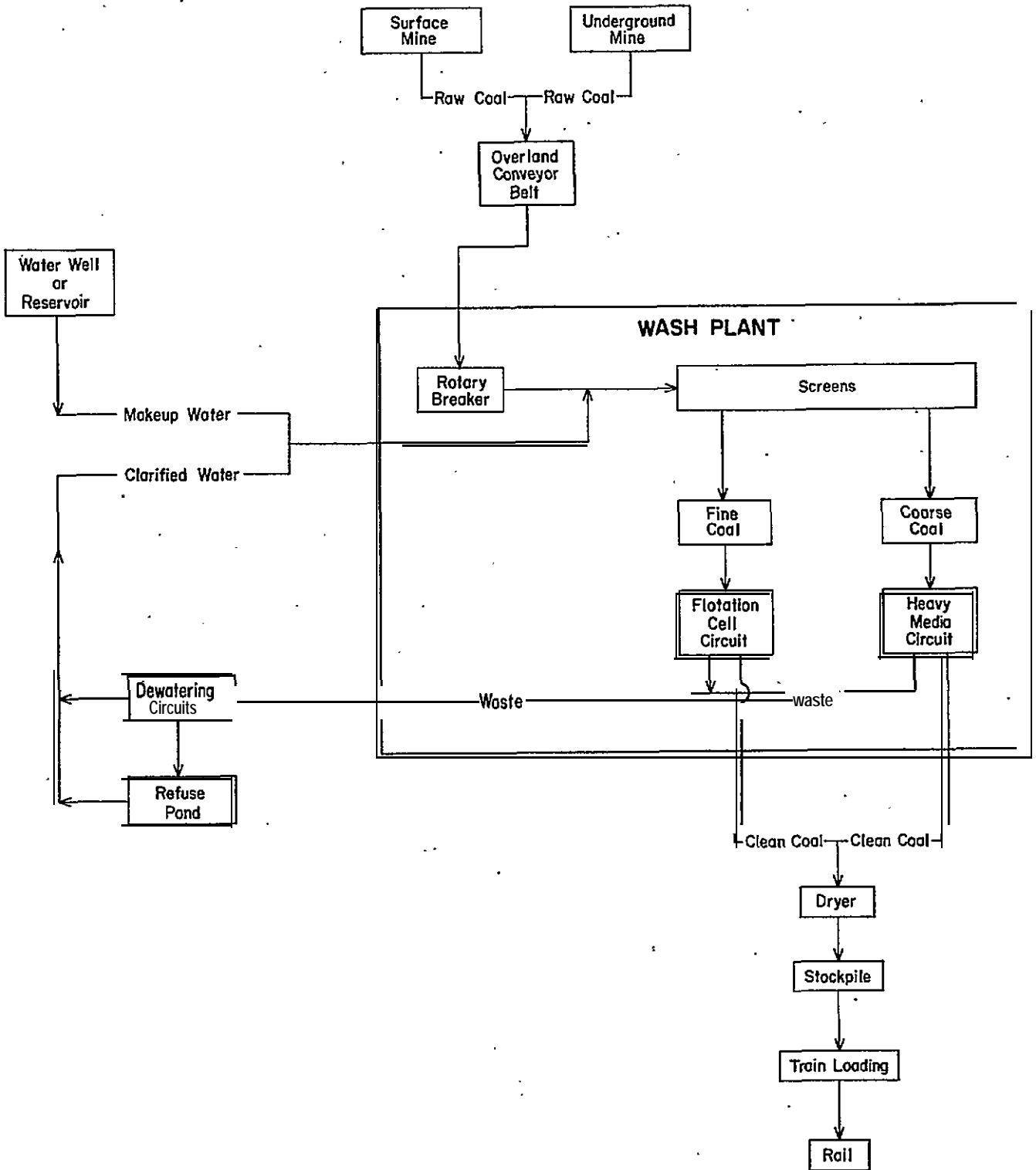
From the wash plant at the **minesite** the clean coal would be conveyed to the unit-train loading facility east of Carbon Creek. Coal shipped from the mine by unit-trains would be hauled to a port in the vicinity of Vancouver or Prince Rupert. It is expected that the **coal** would, be marketed in **Europe**, Japan or other overseas markets.

COAL PROCESSING

Raw coal from the surface and underground mining operations would be processed **in** a wash plant designed to produce 2.5 million tons per year of cleaned coal. Raw coal would be crushed to minus two inches and screened to separate coarse and fine fractions. The coarse coal would be cleaned in a heavy media circuit. Fine coal would be cleaned using conventional flotation methods. Filtering systems would dewater the fine coal prior to thermal drying. **The coal** processing is illustrated in Figure 8.

FIGURE 8

UTAH MINES LTD.
CARBON CREEK COAL DEVELOPMENT
COAL PROCESSING FLOW CHART



Refuse would be trucked to a coal refuse area, or pumped to a tailing pond. In either case, excess water will be collected and re-used in the preparation plant. Scrubbers and cyclones would be used to control particulate and sulphur dioxide emissions from the thermal dryer exhaust.

Make up water would be pumped from wells or Williston Lake. As a closed circuit is planned, waste water discharge would be minimal. This limited effluent discharge would be clarified and treated to meet pollution control standards.

A bar graph illustrating the history and proposed schedule for the Carbon Creek Coal Development is shown in **Figure 9**.

SOCIO-ECONOMIC CONSIDERATIONS

Aggregate manpower requirements for developing and operating the Carbon Creek project are summarized in Figure 10.

Requirements are relatively limited until 1978, when 500 construction workers will be engaged for a two-year period. Subsequently, the construction work force will diminish and, by 1982, construction activity will be complete.- As their jobs phase out some construction workers who qualify can be expected to seek and fill jobs in production activities.

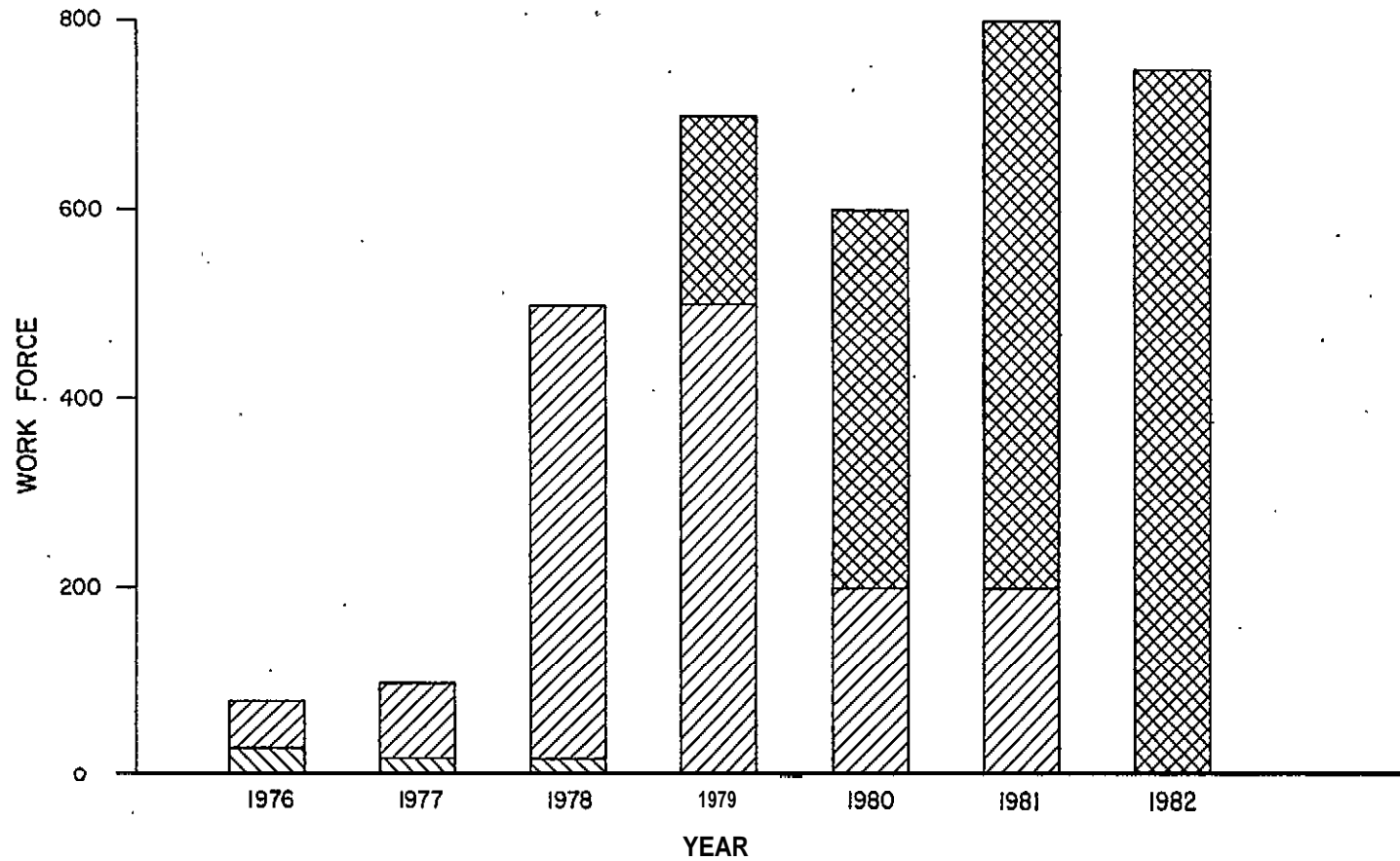
An initial production work force of 200 will be required in 1979 for pre-mining activities. This work force will grow to its maximum size of 750 in 1982 and pending expansion, will remain at this level for a projected 22 years.




Peak manpower requirements will occur in 1981, when 600 production employees and 200 construction workers will be needed.

Efforts will be made to recruit from the local resident labour force, but a significant percentage of projected jobs will have to be filled through in-migration. As a result, options for accommodating workers and their families must be studied carefully.

The mine camp will be the principal means of resolving housing problems in the short term. Assuming existing housing shortages continue in the immediate region, any construction workers not housed at the camp nor now residing in the region will probably seek trailer sites near existing

FIGURE 10
UTAH MINES LTD.
CARBON CREEK COAL DEVELOPMENT
PROJECTED WORK FORCE 1976 - 1982



 EXPLORATION
 CONSTRUCTION a DEVELOPMENT
 PRODUCTION

communities within tolerable commuting distance. Construction of access via W.A.C. Bennett Dam would make Hudson Hope the closest community, **at** a distance of approximately 35 miles. Alternate routes to Hudson Hope or Chetwynd would result in a one-way commute of about 55 miles.

Problems of housing and community services will become more pronounced as the permanent production work force begins to form in 1979. It is not known at this time how long the current shortages of **labour** and housing will continue. The magnitude of the shortages, plus the demographic and cultural characteristics of future in-migrants will influence public and private choices of means of providing for the basic needs of these newcomers.

At the present time, the following options have been identified as requiring more study:

- A. Relocate and expand the mine camp into a **townsite** with adequate housing, services and facilities to sustain the entire projected permanent population generated by the project (direct and indirect employment included) for the life of the project.

- B. Maintain the mine camp at a reduced and diminishing scale, adding facilities necessary to make it a more amenable living environment for a permanent population of predominantly single persons. Plan a staged housing development for the beneficial expansion of Hudson Hope into the major center of population and community activity.

- C. Discontinue the camp after 1981 (the end of construction) and shift all growth to Hudson Hope, subject to a comprehensive plan for the community.

- D. Discontinue the camp in 1982 or before, and develop a new **townsite** at a new location selected on the basis of a regional plan for the area and consistent with the economic viability of the Carbon Creek coal development project and other industrial development in mining or forestry.

At this time, option B or C appears to be the most practical. The use of Hudson Hope as an employee residence base could be of mutual benefit to both the existing community and to Utah employees as the possibilities for amenities increase in a larger town. As a multiple industry base, Hudson Hope should give a more stable workforce.

In any respect, each of the above options will be analyzed in greater detail in subsequent stages of the impact assessment process required by the B.C. Environment and Land Use Committee.

PR - CARBON CREEK 76(4)A

NOTE: COAL ANALYSIS DATA HAS BEEN
TAKEN FROM OPEN FILE - 76(7)

CARBON CREEK COAL DEVELOPMENT

UTAH MINES LTD.

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TABLE 2

COAL ANALYSIS AT 1.40 SPECIFIC GRAVITY

COAL SEAM NUMBER	THICKNESS in feet	RECOVERY	H ₂ O %	ASH %	SULPHUR %	VOLATILE MATTER %	FIXED CARBON %	BTU	FSI
55	5.0	85.8	2.35	3.90	0.73	30.3	65.8	14,169	3.1
54	4.9	90.8	2.32	2.35	0.73	28.0	69.6	14,402	2.0
52	4.4	67.0	1.90	4.61	1.57	30.8	64.6	14,114	5.0
51A	4.4	90.1	2.14	2.92	0.86	26.6	70.6	14,384	2.7
51	5.7	87.2	2.21	2.67	0.79.	26.2	71.0	14,412	2.6
47	4.3	76.2	2.52	3.39	0.96	27.1	69.9	14,209	2.3
46	5.1	88.1	2.05	2.96	0.86	28.9	68.6	14,441	3.6
40	4.8	80.0	1.8	3.66	1.00	29.3	67.7	14,420	6.8
31	7.3	59.7	1.5	5.62	1.02	28.4	65.2	14,280	7.9
15	8.4	89.0	1.35	3.53	0.50	22.3	74.9	14,860	4.1
14	7.7	76.1	1.15	4.9	0.56	21.3	74.1	14,710	3.7

The analysis of the more important coal seams used for the reserve estimate is listed on Table 2. Analytical data from the 1975 season is not currently available.