TELKWA COAL
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TELKWA COAL PROJECT

Application for a Project Approval Certificate

Submitted by: Manalta Coal Ltd.

Date: January 31, 1997

Project Name:	Telkwa Coal Project
Description:	Development and operation of a surface coal mine and associated infrastructure approximately six kilometres south west of the Village of Telkwa, British Columbia. The infrastructure consists of a coal washing facility, tailings disposal area, clean coal haul road and access road and rail loadout facility. Over a 25 year period, the mine is expected to produce approximately 25 million clean tonnes of coal primarily for the export market.
Proponent:	Manalta Coal Ltd. is a privately owned Canadian company based in Calgary, Alberta. It is a member of the Loram Group of Companies. An average yearly production of 26 million tonnes makes Manalta Canada's largest producer of coal. Approximately 1750 people are employed by Manalta and its subsidiaries at eight mines in British Columbia, Alberta, and Saskatchewan (Figure 1-2). Six of the mines produce lignite or sub-bituminous coal which is delivered to nearby electricity generating stations and two of the mines, including the Line Creek Mine in British Columbia, produce bituminous coal for export.
Address:	7th Floor, 700-9th Avenue S.W. Calgary, Alberta T2P 3V4
Mail Address:	P.O. Box 2880 Calgary, Alberta T2P 2M7
Contact:	Allan Flemming Project Manager
Telephone:	(403) 231-7100 Toll free 1-888-8TELKWA Facsimile (403) 269-8075 Email telkwa@manalta.com

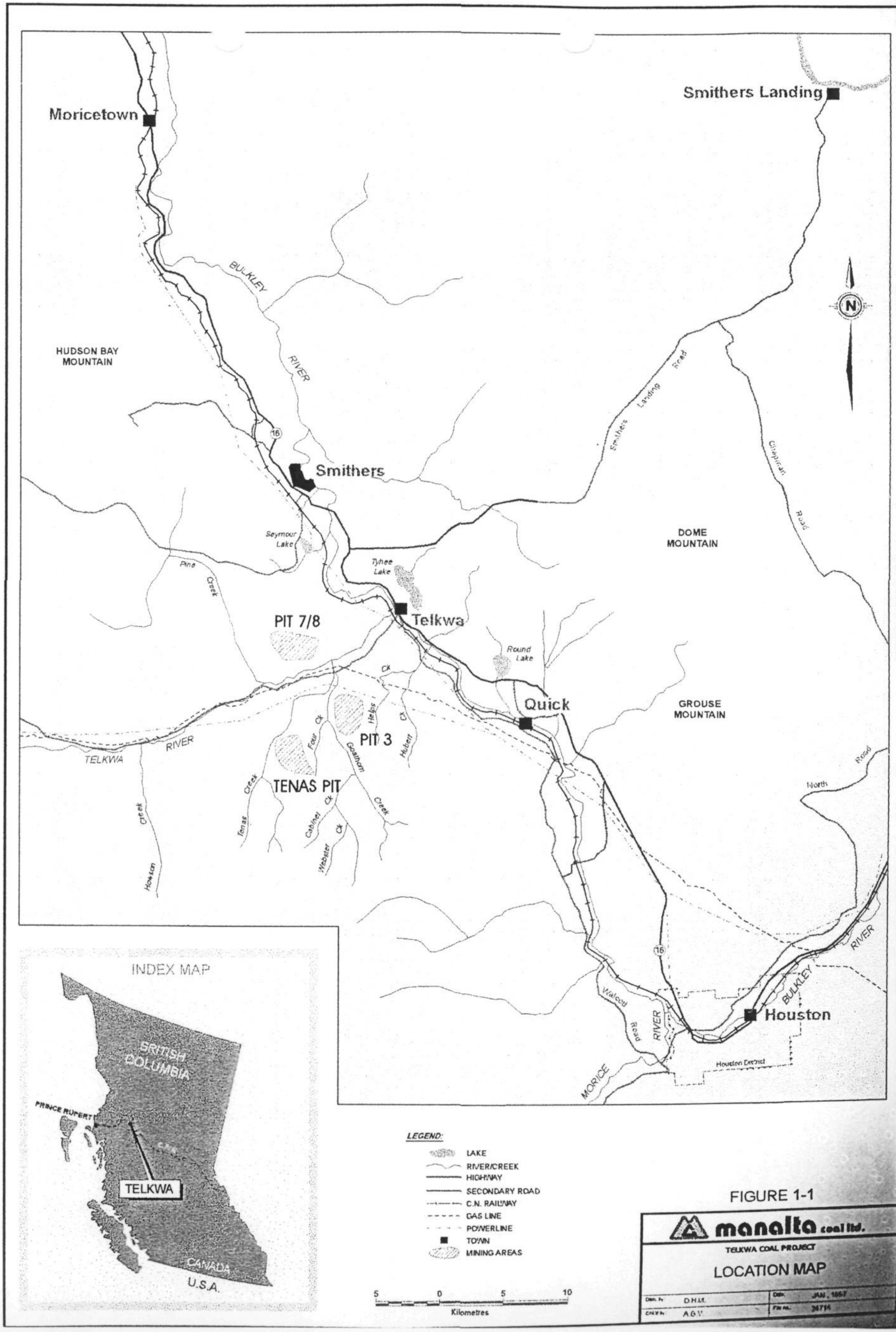

FIGURE 1-1

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TELKWA COAL PROJECT

LOCATION MAP

Dwn. by	D.H.M.	Date	JAN., 1997
Chk'd by	A.G.V.	File no.	34714

2.0 PROJECT DESCRIPTION

The proposed Telkwa Coal Mine has been planned to produce up to 1.5 million tonnes of clean coal per year depending upon export market requirements. The Project plan described in this section was based on a one million tonne per year preliminary feasibility study. Ongoing feasibility study work will evaluate production levels between 1.0 to 1.5 million tonnes per year by accelerating the development plan for each pit area. There will be no increase in the disturbance area but the Project life will be reduced. The construction of the Telkwa Bridge will be required earlier.

Coal associated with the mining property is a high quality, low ash, bituminous coal suitable for use in the steel making industry or as a fuel for thermal power generation. Coal will be mined from three major mining areas that will be mined sequentially within the Project area (Figure 2-1).

The proposed coal preparation plant, mine maintenance facilities and mine service facilities will be located near the original Bulkley Valley Collieries minesite approximately six km southwest of the Village of Telkwa. Clean coal will be hauled from the coal preparation plant on an access road to a rail loadout on the CN mainline near the confluence of Hubert Creek and the Bulkley River. Coal will then be loaded onto unit trains and transported approximately 400 km by rail to the port of Prince Rupert. The location of all major Project components is shown on Figure 2-1.

A Project Boundary has been established, shown on Figure 2-1, which delineates the lands Manalta Coal Ltd. will require control of in order to restrict public access during the mine life. For safety and security reasons, Manalta Coal Ltd will maintain a no trespassing, no hunting policy on areas specified as active and where by reason of the mine infrastructure and development, public access to these areas would be restricted.

2.1 Description of the Mine Plan

Coal will be mined exclusively from open pits using conventional truck and shovel methods. Mining is planned to start in the Tenas Pit (south of Telkwa River), followed by Pit 3 with satellite pits (south of Telkwa River). The third and final mining area will include Pit 7 & 8 (north of Telkwa River). Table 2-1 summarizes the coal reserves, approximate pit life, and development area for each of the three mining areas:

Table 2-1 Mine Area Information			
Mining Area	**Raw Coal Reserves (MT)**	**Years Mined**	**Development Area (ha)**
Tenas Pit	20	0 - 14	650
Pit 3	15	14 - 20	550
Pit 7 & 8	11	20 +	500
TOTAL	46		1 700

The primary waste moving fleet will consist of one 33.6 m^3 electric shovel loading 177-tonne haul trucks, which is a typical equipment combination for an open pit coal mine.

Pit highwalls will be developed to geotechnical design standards appropriate to the geological strata found in the Telkwa area. Engineering, geology and geotechnical assessments have been completed for all pit areas by Piteau Engineering Ltd.,which has recommended highwall configurations for each section of the pit walls. The highwall designs generally consist of 12 m double benches separated by safety berms resulting in an overall angle of 52°.

Waste rock will be blasted using a rotary blasthole drill with an ammonium nitrate/fuel oil (ANFO) explosive product.

Modern state-of-the-art mining technology (geological modelling, Global Positioning Surveying and equipment positioning) will be used to guide any selective mining of potentially acid generating rock material, so that the construction of waste rock dumps will achieve a balance of materials satisfying government Acid Rock Drainage (ARD) criteria, as discussed in Section 2.3.3.

The following is an overview description of individual pit developments.

2.1.1 Tenas Pit (Years 1 - 14)

The Tenas Pit area contains the largest coal reserves and the least complex geology in the Project area. The ultimate pit design including the potential pushback area, shown on Figure 2-2, contains 123 million m^3 of waste and 20 million raw tonnes of coal. The pit covers 300 ha and reaches a maximum depth of 120 m.

Production will be scheduled in four phases to create the maximum amount of backfill room for future waste. In-pit backfill room provides for economical waste hauls, minimization of disturbance to surrounding topography and long-term storage areas for potentially acid generating material. Approximately 45% of the total waste quantity will be backfilled into previously mined out phases as shown in Figure 2-3, the End of Mining Plan. Waste rock dumps will be developed in a series of platforms to provide a stable design and minimize the amount of uphill hauling.

Tenas Pit development will proceed through the following phases:

- Pre-Production (Year 1): This phase involves mining only overburden (also referred to as waste rock or "waste") to reduce the stripping ratio in the later years of mining. The last two months of this year will start to produce coal from the smaller Tenas West Pit.
- Tenas Phase 1-North (Years 2 - 4): Phase 1-North Pit waste rock will be dumped, or "spoiled", into the empty West Pit until full. Three external dumps, elevations 850 m, 890 m, and 938 m will be created off the northwest and northeast corners of the pit for the remainder of this phase.
- Tenas Phase 2-Middle (Years 5 - 9): The majority of waste from this phase is spoiled into the mined out Phase 1-North, dump elevation 938 m. Any excess waste is spoiled externally into the 986 m and 938 m dumps west of the pit.
- Tenas Phase 3-South (Years 10 - 14): The majority of waste from this phase is spoiled into the mined out Phase 2-Middle, dump elevations 938 m and 986 m. Any excess material is spoiled into a new external waste dump to the east, elevation 925 m.

An eight km mine haul road originating at the plant location will be constructed with pit-run waste during the pre-production year for Tenas Pit. Construction of a crossing over the Goathorn Creek is required capable of supporting the 177 tonne haul trucks. This road will be used for the raw coal haul to the preparation plant. A power line will also be installed into the Tenas area for the major equipment.

2.1.2 Pit 3 (Years 14 - 20)

When Tenas Pit is near completion, the mining operation will shift focus to the Pit 3 area including the surrounding satellite pits. The size and quantities in these satellite pits will be better defined with future exploration programs. The ultimate pit design for Pit 3, shown on Figure 2-4, contains approximately 80 million m^3 of waste and 15 million raw tonnes of coal. The pit will cover 145 ha and reach a maximum depth of 144 m.

Waste scheduling will be carried out in three phases similar to the Tenas Pit scheduling, with approximately 30% of the total waste quantity backfilled into the previously mined out phases. The end of mining plan for Pit 3 is shown in Figure 2-5. As the satellite pits are further defined, they may be mined earlier in the Pit 3 sequence to allow for more backfill room or alternate sites for storing preparation plant tailings.

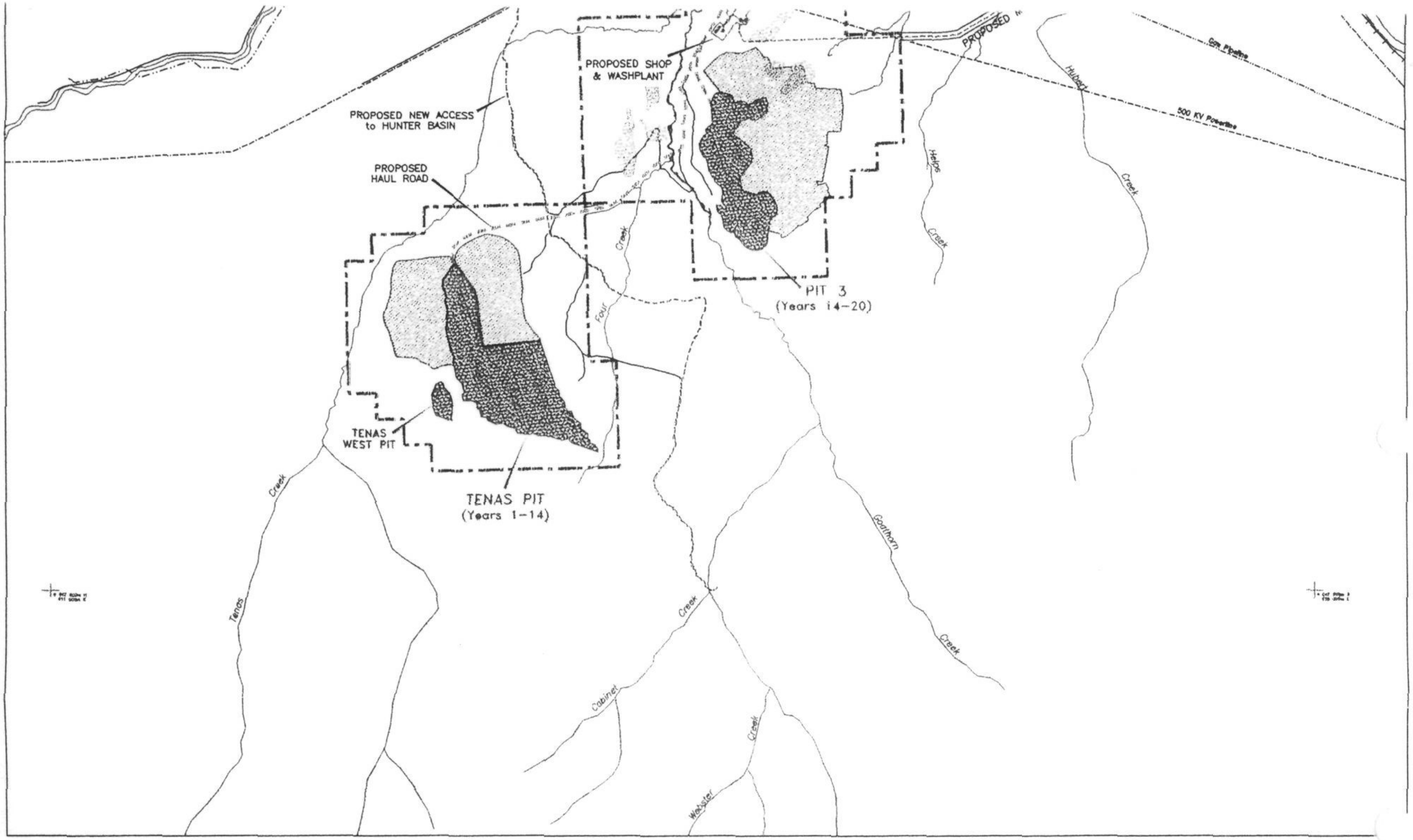
2.1.3 Pit 7 & 8 (Years 20+)

The last area to be developed 20 years into the Project will be two pits north of the Telkwa River. The ultimate pit designs in this area, shown in Figure 2-6, contain approximately 58 million m^3 of waste and 11 million raw tonnes of coal. The two pits will cover roughly 160 ha. Pit 8 will have a maximum depth of 180 m and Pit 7 will have a maximum depth of 150 m. Pit 8 will be developed first in stages, providing backfill room for Pit 7 waste. Approximately 20% of the total waste quantity will be backfilled into previously mined out areas. The end of mining plan for Pit 7 & 8 is shown in Figure 2-7.

The development of Pits 7 and 8 will require the construction of a five km mine haul road with a bridge over the Telkwa River. Power lines will also be installed into the area.

2.2 Coal Preparation

The coal preparation plant will be located north of Pit 3 at the centroid of all proposed mining areas (Figure 2-1). The plantsite will consist of a run-of-mine (ROM) coal handling area, a preparation plant facility, and a clean coal storage area. The plot plan and sections for the coal preparation facilities are shown



LEGEND:

Note: UTM Coordinates are NAD27

- PROJECT BOUNDARY
- PROPOSED RIGHT OF WAY
- ROAD
- POWERLINE
- GAS PIPELINE
- PROPOSED DUMP
- PROPOSED PIT
- POTENTIAL PIT (Exploration in Progress)

FIGURE 2-1

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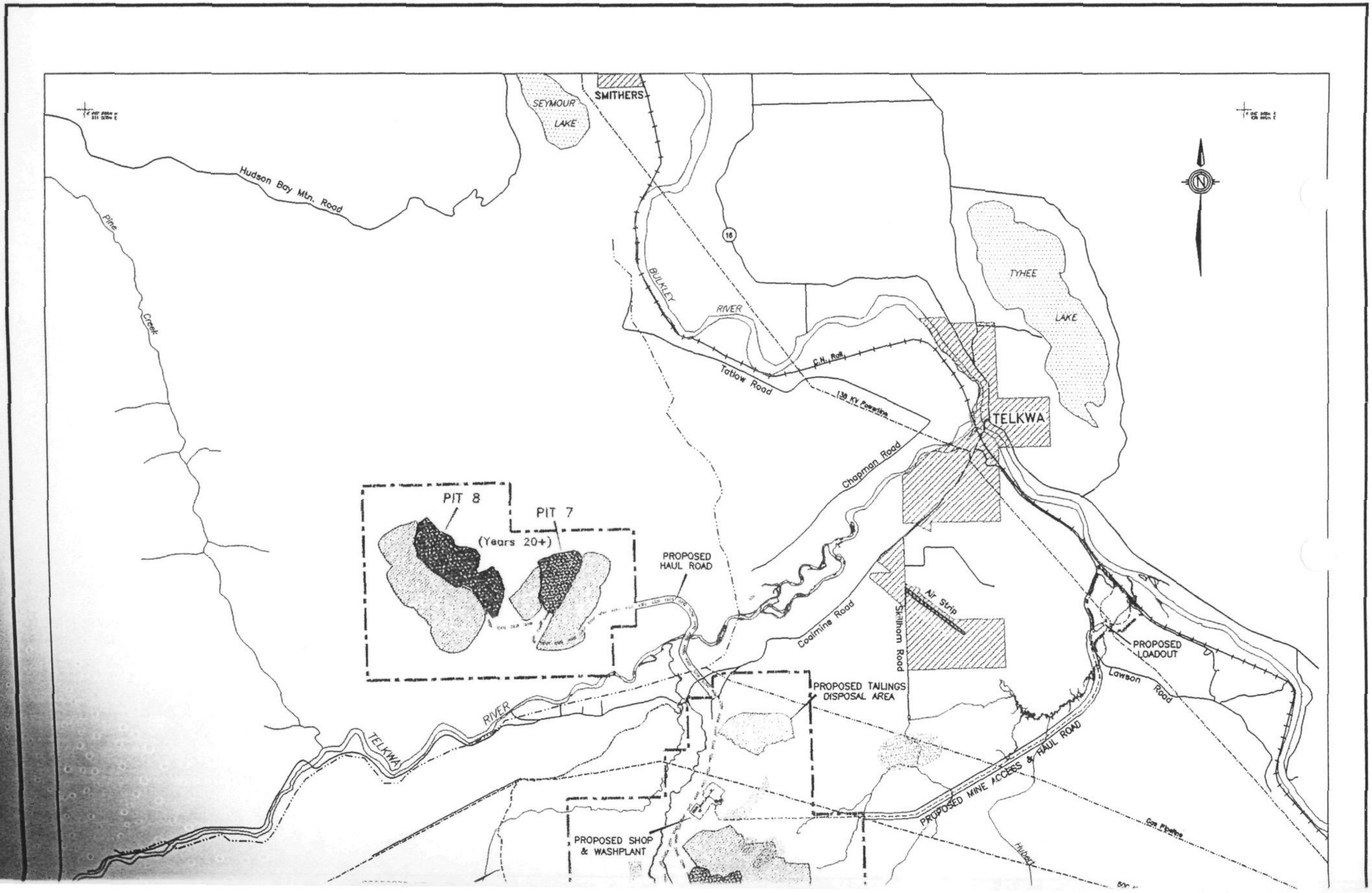
TELKWA COAL PROJECT

CONCEPTUAL MINE PLAN


SMITHERS
SEYMOUR
LAKE
Hudson Bay Mtn. Road
Pine
Creek
16
BULKLEY
RIVER
TYHEE
LAKE
C.N. Rail
Tatlow Road
138 KV Powerline
TELKWA
Chapman Road
PIT 8
PIT 7
(Years 20+)
PROPOSED
HAUL ROAD
Coalmine Road
Skillhorn Road
Air Strip
PROPOSED
LOADOUT
Lawson
Road
PROPOSED TAILINGS
DISPOSAL AREA
RIVER
TELKWA
PROPOSED MINE ACCESS & HAUL ROAD
Gas Pipeline
PROPOSED SHOP
& WASHPLANT

3.0 GEOLOGY

The Skeena Group sediments of the Telkwa Coalfield are an erosional remnant of Lower Cretaceous sedimentary rock which were initially deposited within a large deltaic complex along the southern flanks of the Bowser Basin. Throughout late Jurassic and early Cretaceous time the Bowser Basin was the focus of rapid sedimentation, subsidence and increased tectonic activity, which resulted in thick accumulations of coal-bearing sedimentary rock. Today the coals associated with this deltaic complex, which intermittently extend along the length of the paleoshoreline, form an important resource of coal for British Columbia. In the scope of this text the geology of the Telkwa coalfield is discussed, with particular emphasis paid to the coal measures found within the limits of resource areas identified to date.

Historically the coal resources of the Telkwa coalfield have been exploited on a sporadic basis since the early 1900s, and since 1950 the coalfield has been actively prospected by a variety of companies. Manalta Coal Ltd. has held the coal licences of the Telkwa Coal Property since May, 1992. Since that time Manalta has completed five exploration programs in as many years. Several areas of potential economic interest have been identified to date, including the Goathorn, Bowser, Tenas, Cabinet, Whalen, Helps and Northwest resource areas. The Goathorn, Bowser and Tenas resource areas are currently identified as having the highest resource potential and are considered the main resource areas of the property.

3.1 Exploration

The current geological data base for the Telkwa coal property consists of geological information obtained from historical mine records, surface mapping, exploration drilling, surficial geology boreholes, geophysics, seam trenches, and three bulk sampling programs. The drilling information, upon which most of the data base is based, is derived from drillholes completed since 1979 when geophysical logging was utilized in conjunction with drilling as a tool to reliably and accurately portray subsurface lithologies.

Exploration has been undertaken annually on the property since 1979 with the exceptions of 1980, 1987, 1990 and 1991. Coring has been an integral part of the exploration programs as a means of collecting rock and coal samples for subsequent acid rock drainage (ARD) and coal quality analytical work. The following discussion is based on previous years' geological assessment reports, which provide additional detail on annual geological work completed on the property.

Geological models have been generated for each of the main resource areas, utilizing Minescape, Medsystem, or Lynx mine modelling software. The Goathorn resource area has been modelled with the Medsystem software, due to the structural complexity of the deposit; the Tenas area with Minescape software; and the Bowser area with Lynx. Each has been updated to reflect the most recent exploration for the area with the exception of Tenas, pending an update to reflect 1996 exploration information. The resulting models are considered to be an accurate representation of the geological information obtained to date.

To date, 662 exploration drillholes and 28 surficial geology boreholes have been completed on the Telkwa property, most of which were concentrated within or proximal to identified resource areas. The main resource areas were the focus of the bulk of this drilling activity, as were the bulk sampling programs. All drillholes possess a complete suite of geophysical logs. Drillholes and resource areas are identified on the Regional Geology Map (Figure 3-1) as are property limits, bulk sample locations, tentative facility locations and seam subcrop positions.

3.2 Geologic Setting

Throughout Jurassic and Cretaceous time, much of western British Columbia was formed and moulded by a series of terrains that moved slowly toward and eventually collided with the North American craton. The Bowser Basin, and ultimately the Telkwa coalfield, is the product of sedimentation that occurred as one such terrane, the Stikine Terrane, pushed eastward to eventually become sutured to the North American landmass.

The Bowser Basin, a successor basin that had developed during Middle Jurassic time, formed in response to the approaching Stikine terrane and was a centre of deposition. Bounded on the north by the Stikine Arch, on the south by the Skeena Arch and on the east by the early uplifting of the Columbian Orogeny, the Bowser Basin collected sediment from all sources although it was dominated by the eastern provenance. The result in the Telkwa area is more than 500 m of coal-bearing strata referred to as the Lower Cretaceous Skeena Group.

Sedimentation continued throughout the Lower Cretaceous, during which time deposition was influenced by two regressive / transgressive episodes. As a result, the stratigraphic sequence of the Skeena Group is divisible into four lithostratigraphic units, Units I through IV. The lithologies within Units I and III are representative of the regressive episodes and, in turn, the periods of significant peat development in the Telkwa area.

3.3 Stratigraphy

In the Telkwa coalfield, Skeena Group sediments unconformably overlie Jurassic Hazelton volcanics and, where complete, maintain a cumulative thickness of approximately 500 m throughout most of the Telkwa Coal Project study area. Porphyritic Tertiary and Cretaceous intrusive dykes and sills commonly disrupt the local stratigraphy, however, as does a large Tertiary granodiorite plug identified on the northern coal licences.

The stratigraphic sequence is dominated by marine and non-marine sandstones and siltstones, with lesser amounts of mudstone and conglomerate. Coals normally occur within the lower three lithostratigraphic units although best represented within Units I and III. Coal units commonly occur as multiple seams. Main seams are often correlatable over long lateral distances. The coals within Unit I, collectively referred to as Coal Zone 1, are separated from the Unit III coals by as much as 140 m of mainly marine sediment. Coal seams 2 through 11, represented in Unit III, collectively contribute 20.5 m of coal to the unit's 85.0 m average thickness. Typical stratigraphic columns for the main resource areas (Figure 3-2) clearly illustrate unit relationships and the coal-bearing units.

Lithologies between coal seams consist predominantly of interbedded marine and non-marine sandstones, siltstones and, to a lesser degree, carbonaceous mudstones. Bentonites and bentonitic mudstones are also present, most commonly found associated with the coal zones.

Bedrock on the property is usually obscured by glacial sediments that form an irregular mantle over much of the area, with exceptions occurring sporadically or along sections of deeply eroded river and stream valleys such as Goathorn Creek. Thick accumulations of Tertiary sands and gravels also commonly occur underlying glacial tills, particularly on the south side of the Telkwa River near Cabinet Creek and near the confluence of Goathorn and Tenas Creeks. Till thicknesses are variable, normally ranging from 1.0 to 25.0 m while Tertiary sediments, where present, range up to 165.0 m in thickness.

3.3.1 Unit I

The basal unit, Unit I, was deposited in a fluvial environment and, in the Telkwa area, rests unconformably over an eroded Hazelton volcanic basement of Jurassic age. Because it was deposited over an undulating surface, the Unit I stratigraphy displays variability in thickness, often over short lateral distances. This variability is most evident in the lower sedimentary assemblage, between the basement contact and the lowermost Unit I coals. As such, Unit I can be in excess of 100 m in thickness, consisting mainly of conglomerate, sandstone, mudstone and coal.

Coals within this unit, collectively referred to as Coal Zone 1, formed in poorly drained backswamps and are characterized by lateral variation throughout the study area. Illustrated on the Typical Stratigraphic Columns for the major resource areas, Figure 3-2, the Unit I coals can consist of up to 12 individual seams which collectively contribute up to 11.9 metres of coal to the unit's overall thickness. Sands and gravels were typically deposited in braided channels and bars while mudstones accumulated in floodplains. Indications are that there was periodic marine influence during deposition of the unit Deposition of Unit I ended with a marine transgression and deposition of Unit II.

3.3.2 Unit II

Unit II was deposited within a deltaic / shallow marine environment. It consists of up to 140 m of sandstone, silty mudstone and occasional thin coaly mudstone. Sands were deposited in distributary channels and mouth-bars while mudstones and silty mudstones accumulated in interdistributary bays. Thin discontinuous peat beds, none of which are of economic significance, accumulated in local salt marshes.

3.3.3 Unit III

Unit III is indicative of the second regressive episode for the area. It represents the deposition of the main coal-bearing stratigraphic sequence. The unit averages 85 m in thickness, comprised of sandstone, siltstone, carbonaceous mudstone and thick, laterally extensive coal seams.

Restricted nearshore marine, tidal flat and coastal swamp environments persisted throughout much of the deposition of Unit III. Sandstone units were deposited within tidal channels while interbedded sandstones and siltstones were deposited nearshore within intertidal environments. Mudstones are representative of tidal flat deposits. A significant marine influence during deposition of the entire unit is indicated.

Coal zones 2 through 11, illustrated on the typical stratigraphic columns (Figure 3-2), are represented in Unit III. Unit III collectively contributes up to 17 coal seams of economic significance.

The coal zones were likely formed in freshwater peat swamps, located landward of the tidal flat, somewhat isolated from influxes of brackish water. The presence of sulphur in some of the coal seams suggests, however, that the peat was infiltrated periodically by marine water. Thus, the major coal seams are interpreted to have formed from peat accumulated in a freshwater marsh that was proximal to a brackish environment. The Snuggedy Swamp of South Carolina is considered a modern analog for the paleoenvironment in which Unit III was deposited.

Unit IV overlies the coal measures and represents a marine transgression that terminated coal deposition over the study area. The unit exceeds 150 m in thickness and consists of sandstone overlain by silty mudstone. The basal sandstone is a transgressive lag deposit while the remainder represents deposition within a near-shore, shallow marine environment.

3.4 Structural Geology

Since deposition, the Skeena Group sedimentary package has been modified by faulting and minor folding resulting from continental stresses that persisted throughout much of the Upper Cretaceous and Tertiary. The Telkwa area has undergone at least two episodes of structural significance, the first during the Upper Cretaceous, and the second during the Tertiary.

The Upper Cretaceous in the Bowser Basin reflects a time of deformation, when high angle faulting and plutonism were occurring eastward within the Omineca Crystalline Belt, and increasing uplift was occurring to the west. This was a result of the suturing of the Stikine Terrane to the North American craton and the effects of additional terrains approaching from the west. Although folding in the Telkwa area was not as significant as in other portions of the basin, high angle faulting roughly trending in a north-south direction is apparent in the Telkwa coalfield, especially on the south side of the Telkwa River. Where folding has been observed, fold geometries are typical of those found in other parts of the basin, trending northwest to southeast, with shallow dipping west limbs and steeper east limbs. Porphyritic Late Cretaceous dykes and sills also occur locally within the coal measures.

During the Tertiary, much of the area on the north side of the Telkwa River was intruded by a large granodiorite and quartz monzonite intrusion. The igneous body, which vertically intruded the Skeena sediments, complicated the structural geology of the area further. This is especially apparent at close proximities to the intrusive body on the northern coal licences. Structural repercussions in the Skeena sediments appear to be represented by high angle faulting, establishing a mosaic of structural blocks that have been rotated and tilted into a variety of orientations. Each of the resource areas identified to date are representations of such fault blocks.

No specific orientation has been observed to the faulting although faults are apparent in concentric geometries near the intrusive body and also appear to crudely radiate from the intrusive edge. Fault displacements have been observed to range from only a few metres to more than 150 m.

Although bedding orientations within the Telkwa Coal Property resource areas tend to be fault block controlled, each with independent orientations, dips normally range from 10 to 30 degrees. In the fault blocks associated with the Goathorn resource area dips are typically 20 degrees to the east, while within the blocks of Bowser East and West they average 17 degrees to the east and northeast respectively. In the Northwest Area, block orientations are to the southeast and southwest, with dips ranging from 10 to 35 degrees.

The Tenas resource area lies within a closed northwest / southeast trending synform. Orientations along the west limb are consistently northeasterly dipping, normally ranging from 9 to 22 degrees, while along the east limb dips steepen to 45 degrees in a southwesterly direction.

Within the Whalen Block orientations vary but typically range from 15 to 25 degrees to the east/southeast. Orientations in the Helps area are directionally variable due to faulting, but are typically 20 degrees to the south. The Cabinet resource area has been identified as a structurally complex area where faulting is common and orientations are extremely variable.

3.5 Detailed Geology

Seven potential resource areas have been identified on the Telkwa property to date (Figure 3-1). On the north side of the Telkwa River these include the interpretations portrayed on cross-sections and the area geology map found in this text reflect work completed to the start of 1996, although 1996 drillholes are displayed on area maps.

The typical stratigraphic column for the Tenas Creek area is included on Figure 3-2. Typical cross-sections are presented as Figures 3-4, 3-5 and 3-6. Cross-section locations are referenced on the Tenas Geology Map (Figure 3-3).

Although several seams occur within the Unit I stratigraphy of Tenas, most are thin and not of economic significance. Three seams, however, currently identified as c-seam, 1-Upper seam, and 1-seam, are consistent in nature and form the mineable component of the Tenas resource. The c-seam is separated from the 1U-seam by approximately 13.0 m and averages 1.51 m in thickness. The 1U and 1-seam are separated from one another by a siltstone parting which develops midway through the field, and increases in thickness gradually to a maximum thickness of 2.50 m at the northwest end of the field. The thickness of the 1U and 1-seams, where undisturbed, average 1.93 and 3.45 m respectively.

At the field's northern limits, Tertiary sediments, presumably associated with the glacial paleochannel of the Tenas Creek drainage, overlie the local coal measures stratigraphy. These sediments become increasingly thicker in a northerly direction. Within the confines of the paleochannel the thickly interbedded sand, silt and gravel blanket is in excess of 85 m.

3.5.2 Goathorn Resource Area

The Goathorn resource area was extensively explored between 1979 and 1984, and again in 1993 and 1996, resulting in considerable accumulated information on the area's Unit III coal measure stratigraphy. To date, 169 drillholes, 8.4 km of surface geophysics, and the removal of a 219 tonne bulk sample have been completed within the limits of the resource area.

The vast majority of the exploration activity has been conducted within potential pit areas established on the east side of Goathorn Creek (Goathorn East). The current drillhole spacing for Goathorn East ranges from 125 to 150 m. Most of the area drillholes were cored, yielding considerable seam quality information for the area. Rock units from six of the continuous coreholes were sampled and subsequently analyzed for ARD purposes. The resource area, geology, and all drillholes, including ARD hole locations, are illustrated on the Goathorn Geology Map (Figure 3-7).

Other than a few isolated occurrences of the 1-seam package, mainly on the west side of Goathorn Creek, the Goathorn seams (Unit III, seams 2 to 11) subcrop on the east side of the Goathorn Creek, roughly paralleling the creek valley. Most of the seams deteriorate in an easterly direction, becoming thinner and poorly developed suggesting that locally, during deposition, a restricted nearshore marine environment persisted to the east.

Much of Goathorn area is characterized by an east-dipping stratigraphy, repeatedly broken by a series of north/south trending normal faults. Regional dips range from 10 to 35 degrees, averaging 20 degrees, while normal fault displacements range up to 20 m. Typical geological cross-sections (Figures 3-8 and 3-9) are identified on Figure 3-7. A geological model for the eastern component of the Goathorn resource area was generated in 1996 with Medsystem mine modelling software, upon which detailed engineering work was initiated and resources calculated.

3.5.3 Helps Resource Area

The Helps resource area was identified by exploration drilling in 1996. It has been interpreted to hold coal measures of the Unit III stratigraphic sequence. The three drillholes intersecting the sequence indicate that the area may contain some faulting, as bedding orientations are variable. Additional work is required in the area to determine field limits and further understand the deposit geometry.

3.5.4 Bowser Resource Area

East (Pit 7) Block

To date, 19 drillholes have intersected the Unit III coal measures (Seams 2 - 11) within the Bowser - East Block area (Figure 3-6). Of the 19 drillholes, 14 represent seam quality coreholes including three which were also sampled for ARD analytical work. The drillhole spacing for the block is currently approximately 125 m. In 1989, a bulk sample was extracted from four large diameter coreholes.

The coal measures of East Block trend in a north-south direction and dip east to northeastward until they terminate against a northeast-southwest trending near vertical fault. This normal fault exhibits considerable displacement (approximately 150 m), juxtaposing thin coal seams possibly of the 1 seams against the Unit III coal seams found in East Block.

The coal measures also abruptly terminate to the north where Skeena sediments have been intruded by a large Tertiary granodiorite plug. The intrusive truncates the sediments at nearly 90 degrees to bedding and extends beyond East Block, further disrupting the coal measures of Bowser West Block and Northwest Area.

Small-scale faulting has been identified at close proximities to the intrusive contact in other areas and is suspected at East Block as well. The coal seams shown on cross-sections 7A and 7C (Figure 3-11) subcrop to the west and south.

West (Pit 8) Block

Exploration of the Bowser - West Block resource area has 66 drillholes within the area's limits, 55 of which have intersected the seam 2 - 11 coal package of Unit III. Consequently a drillhole spacing of 150 m or less is established for the block. Of the 55 drillholes, 29 are coreholes which have yielded seam quality information. ARD samples were collected from seven coreholes that intersected the Unit III stratigraphy, and two others that intersected the Tertiary intrusive and nearby Unit I coal measures.

Drillhole data indicate that the area consists of two main parallel trending fault blocks which present a repetition of the Unit III coal-bearing sequence (Figure 3-10). Displacement on the normal fault separating the two blocks ranges from 40 m near its southeastern end to 80 m at its northwestern terminus with the Tertiary intrusive body. Additional normal faulting has also been identified at the block's southeast end.

These faults, trending approximately perpendicular to the regional strike of the area, have displacements ranging from 20 to 80 m and are known to break and juxtapose the 2 to 11 coal seam package into a series of smaller fault blocks. Several other small-scale displacement faults have also been identified, commonly occurring at close proximities to the intrusive body.

The coal seams of West Block subcrop to the southwest and are constrained on the northeast by the granodiorite intrusive. An area of intense faulting and the absence of coal-bearing sediments terminates the Bowser resource area to the northwest. Although displaced by normal faulting the coal trend continues to the southeast, and may continue as far south as the Telkwa River, where the trend is presumed fault terminated. The coals historically exploited by the Aveling Mine are likely extensions of the trend, suggesting that additional normal faulting may occur beyond the current limits of drillhole control. Additional exploration is required to further determine the trend geometry in proximity to the Telkwa River.

Bedding orientations throughout the block area are generally to the northeast, averaging 17 degrees, as indicated by area cross-sections 8B, 8D, 8F, 8H and 8J (Figures 3-12, 3-13 and 3-14). Cross-section locations are referenced on Figure 3-10.

The complete Bowser resource area has been computer modelled utilizing the Lynx Mine Modelling System. The resulting models are considered to be an accurate representation of the geological information obtained to date.

3.5.5 Whalen Block Resource Area

Within the Whalen Block, exploration activities to date include 16 drillholes, three of which have been cored. ARD samples of the Unit I stratigraphy were collected from one outcrop location along the erosional bank of the Telkwa River and from one corehole. Seam subcrops and drillhole locations are illustrated on Figure 3-10. Small-scale faulting is suspected to occur throughout the area.

Lithologies intersected by drilling on the Whalen Block indicate that the Unit I stratigraphic sequence is present along the south and west sides of the block where it directly overlies basement Hazelton volcanics. Exploration has also indicated the localized presence of structurally complex areas where small segments of the Unit III sequence may also exist. Additional exploration is required to fully evaluate seam geometries, particularly near the block's north-central boundary.

3.5.6 Cabinet Resource Area

Drilling and field mapping completed to date on the Cabinet resource area have indicated that coal occurrences in the area are sporadic and discontinuous. To date, field mapping and 20 drillholes have been completed within area boundaries, 3 of which were cored. Much of the area, particularly the southern half of the resource area, is capped by thick accumulations of Tertiary gravels. Where coal measures have been intersected the stratigraphy has been subjected to considerable structural stresses, as faulting and variability in structural orientation is apparent.

The Unit I stratigraphy is represented in the Cabinet resource area, and is believed to be, although fault displaced, a continuation of the stratigraphic and structural trend found at Tenas. Although additional work is required to fully evaluate the resource potential of the area, seams are thinner and not as well developed as those encountered at nearby Tenas. Like the Tenas area coal measures are underlain by volcanic rock, presumably of the Hazelton Group.

3.5.7 Northwest Resource Area

Drillhole information and surface geophysics indicate that the Unit III coal sequence represented within Bowser West Block is re-established at mineable depths in the Northwest Area. The area is, however, characterized by north-south trending faults near the intrusive boundary and a thick till cover which ranges up to 35 m. Some thinning of seams 2 through 5 exists although the package's upper seams continue to be well-developed. The area has not been computer modelled to date, as additional drilling is considered necessary to accurately determine field limits and geometry.

The Northwest area (Figure 3-10) is divided by normal faulting into an east and west component. Bedding orientations within the area's western fault block range from 10 - 35 degrees to the south-southwest, while near the intrusive body within the east block bedding dips range up to 30 degrees to the southeast. To date, 18 drillholes have been completed within the limits of the resource area, 14 of which have been cored. Two of the cores have been utilized for ARD analytical purposes.

3.6 Coal Quality Data Base

Coal in the Telkwa Coalfield varies from High Volatile A bituminous to semi-anthracite by the ASTM classification of coal rank. The vast majority of the area coals, however, are a High Volatile A bituminous product with RoMax vitrinite values generally ranging from 0.80 to 1.00 percent. Within the coal measures of the Skeena Group sediments, coal rank generally tends to decrease slightly for coal units situated higher in the stratigraphic column. Localized occurrences of medium-volatile and semi-anthracite coals are thought to have resulted from either post-Cretaceous heat sources, deeper burial and subsequent uplift of some coal-bearing units, or from localized higher heat flux from the pre-Cretaceous basement. Increases in coal rank have been observed in coals situated at close proximities to the Tertiary intrusive on the northern resource areas as well as some coals within the Cabinet Creek area.

The evaluation of coal quality for each of the resource areas of the Telkwa coalfield is based upon the analytical results of core obtained from diamond and rotary drillholes since 1979, and three bulk sample analytical programs (1983, 1989 and 1996). This data base has established reliable determinations of the raw and clean quality characteristics of the Telkwa coalfield. Analytical seam quality data compiled to date are summarized for each of the major resource areas on Table 3-1. Analytical work for some of the 1996 analytical program is still ongoing, and is not included within the quality summary table.

While the majority of Telkwa coals are relatively consistent with respect to raw calorific value, volatile matter and fixed carbon values, variations in raw ash and sulphur values occur between seams. Sulphur content variations between some seams are attributed to periodic infiltrations of marine water into the developing peat swamp, while inundations are thought to have terminated development of some of the coal seams.

Table 3-1 Clean Coal Quality Summary; Core Washabilities
Telkwa Evaluation
Reported on a Dry Basis

Resource Area	Seams	Seam Quality Characteristics						
		Ash (%)	Sulphur (%)	Specific Gravity (AD)	Calorific Value (kcal/kg)	Volatile Matter (%)	Fixed Carbon (%)	F.S.I. (Range; Avg)
Goathorn East (Pit 3)	2 - 10	11.02	1.13	1.38	7418	28.94	60.04	----
Bowser East (Pit 7)	2 - 6U	9.22	0.90	1.36	7567	28.96	61.94	0.5 - 6.5; 2.5
Bowser West (Pit 8)	2 - 11	12.61	0.99	1.40	7273	27.32	59.72	0.5 - 7.5; 2.1
Tenas	c, 1U, 1	9.38	1.12	1.36	7548	25.20	64.51	1.0 - 4.0; 2.0

Table 3-2 In-situ Coal Resources/Reserves

Resource Area	Geological Resource (M tonnes)	Geological Reserve (M tonnes)	Depth Cutoff (m)	Confidence Level
Telkwa North				
Bowser East (Pit 7)	4.33	4.30	150	Measured
Bowser West (Pit 8)	19.55	6.70	180	Measured
Northwest	11.06	----	----	Indicated & Inferred
Whalen Block	8.63	----	----	Indicated & Inferred
North Total	43.57	11.00		
Telkwa South				
Goathorn East Satellites	1.11	1.00	60	Indicated
Goathorn East (Pit 3)	36.96	10.00	150	Measured & Indicated
Goathorn West Satellites	4.10	4.00	150	Inferred
Tenas	27.37	20.00	100	Measured
Helps	7.31	----	----	Inferred
Cabinet	3.71	----	----	Inferred
South Total	80.56	35.00		
Grand Total	**124.13**	**46.00**		