897

ASSESSMENT REPORT FOR THE MURRAY RIVER COAL PROPERTY
PEACE RIVER DISTRICT

NTS Sheets: 093P02, 093P03, 093I14, 093I15

Licences:	417024, 417404-417449, 417452-417462, 417576-417594	
Located at:	Lat. 55.02°	Long. 121.02°
	UTM: 6098129N	626410 E (NAD 83, Zone 10)

Licences Owned and Operated By:

Kennecott Canada Exploration, Inc.
354 – 200 Granville Street
Vancouver, British Columbia
V6C 1S4

Work Conducted Between May, 2006 and October, 2006

Authors: Melanie Kelman
Steve Hovis

March 12, 2007

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BRITISH COLUMBIA

Ministry of Energy & Mines
Energy & Minerals Division
Geological Survey Branch

ASSESSMENT REPORT
TITLE PAGE AND SUMMARY

TITLE OF REPORT [type of survey(s)]	TOTAL COST
Assessment Report for the Murray River Coal Property, Peace River District	$244,900

AUTHOR(S) Melanie Kelman, Steve Hovis SIGNATURE(S) Melanie Kelman

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S) CX-9-029 YEAR OF WORK 2006

STATEMENT OF WORK - CASH PAYMENT EVENT NUMBER(S)/DATE(S)

PROPERTY NAME Murray River

CLAIM NAME(S) (on which work was done) Murray River, licences 417425, 417447

COMMODITIES SOUGHT coal

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN

MINING DIVISION Liard NTS 93P02, 93P03, 93I14, 93I15

LATITUDE 55 ° 1 ' 13.7 " LONGITUDE 121 ° 1 ' 22.2 " (at centre of work)

OWNER(S)
1) Kennecott Canada Exploration, Inc. 2)

MAILING ADDRESS
354 - 200 Granville Street
Vancouver, B.C. V6C 1S4

OPERATOR(S) [who paid for the work]
1) Kennecott Canada Exploration, Inc. 2)

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354-200 Granville Street
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PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude):
coal, sandstone, siltstone, mudstone, shale, Cretaceous, Fort St. John Group, Bullhead Group, Gates Formation, low-angle bedding

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS

(OVER)

TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area)	2 lines		
Ground, mapping	reconnaissance - totalling 8.66 km	417425-417426, 417436-417437, 417440-417441, 417447, 417452	$4000
Photo interpretation	LIDAR (200 km^2)	all	$1500
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic			
Other	down-hole geophysical surveys	417447	$2400
Airborne			
GEOCHEMICAL (number of samples analysed for ...)			
Soil			
Silt			
Rock	coal core geochemistry (65 samples)	417447	$30,000
Other			
DRILLING (total metres; number of holes, size)			
Core	1 hole, 512 m ~~licence (417447)~~	417447	$165,000
Non-core			
RELATED TECHNICAL			
Sampling/assaying	core logging (512 m)	417447	$7000
Petrographic			
Mineralographic			
Metallurgic			
PROSPECTING (scale, area)			
PREPARATORY/PHYSICAL			
Line/grid (kilometres)			
Topographic/Photogrammetric (scale, area)			
Legal surveys (scale, area)			
Road, local access (kilometres)/trail			
Trench (metres)			
Underground dev. (metres)			
Other	reclamation, off-property costs		$35,000
		TOTAL COST	$244,900

QUALIFICATIONS AND WORK EXPERIENCE OF AUTHORS

Kennecott Canada Exploration, Inc.
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Melanie.Kelman@kennecott.com

I am a geologist employed by Kennecott Canada Exploration, Inc. since May 2006. I received a Bachelor of Science in Geology from the University of Saskatchewan in 1994, a Master of Science in Geology from Oregon State University in 1998, and a Doctorate in Geology from the University of British Columbia in 2005. I have worked as a geologist since 2005.

I was directly involved in metallurgical coal exploration operations at the Murray River property from May through September 2006, and was involved with post-drilling data analysis and reporting. I was not on site at Murray River for the drilling of 06DDMR03. All details of the work performed are accurately described in this report, and I am not aware of any relevant omissions.

Dated at Vancouver, British Columbia this day of Mar. 12, 2007.

Melanie Kelman

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I am a Project Geologist employed by Kennecott Exploration Inc since June 2002. I received a Bachelor of Science Degree in Geology from the University of Idaho in 1996 and a Master of Science Degree in Geology from the University of Minnesota in 2001. I have practiced my profession since 1997.

I was directly involved in the planning and execution of the exploration for metallurgical coal at the Murray River property. All details of the work performed are accurately described in this report, and I am not aware of any relevant omissions.

Dated at Salt Lake City, Utah this day of Mar. 12, 2007.

SECTION I: INTRODUCTION

Introduction

This report presents the results of coal exploration activities conducted during 2006 on the Murray River property in northeastern British Columbia. The property lies within the Peace River coalfield (PRC), which extends from the Alberta-Bristish Columbia provincial border northwest to the headwaters of Halfway River north of the Williston Reservoir on the Peace River (Figure 1, Plate 1). It has been shown to contain thick coal seams with the potential to yield low-volatile hard coking coal (metallurgical coal), produced when Lower Cretaceous coal-bearing strata were buried more deeply, allowing coal maturation to continue.

Objectives

Work on the Murray River property was undertaken with the intent to identify and describe any coal seam in the Gates Formation and collect samples for chemical analysis. These data were to be used to define the character of coal on the property as a preliminary step in outlining an underground-mineable resource of low-volatile coking coal. The plan of work consisted of historic data compilation, diamond core drilling, and a small amount of geological mapping.

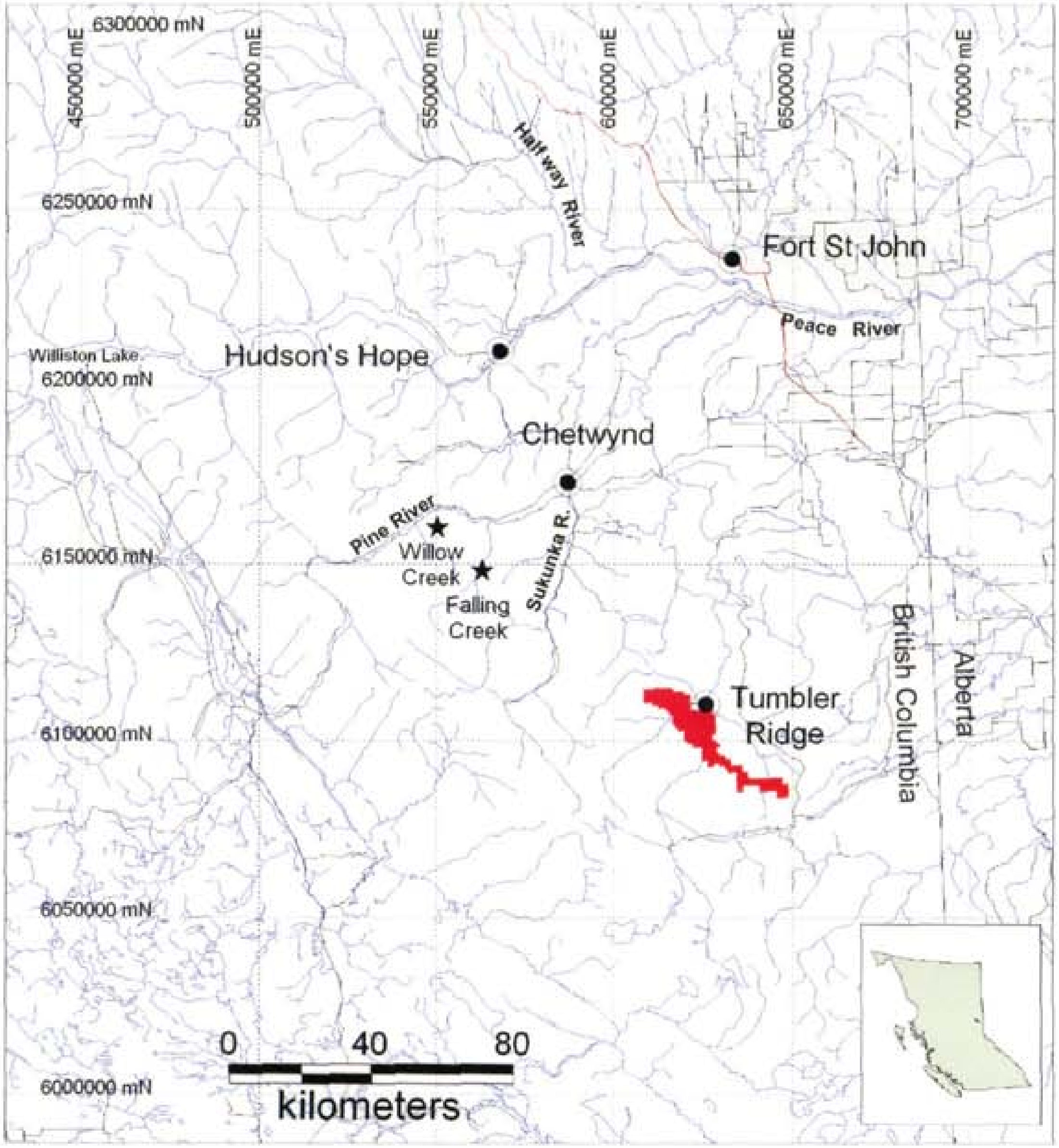

Figure 1. Location of Murray River property and relevant features within northeastern British Columbia. Property outlines reflect the status of active licences and applications at the time of drilling.

Location and Access

The project area is located in the southern Peace River district of northern British Columbia (Figure 1; Plate 1; Plate 2). The licences, plus one currently active licence application, lie on 1:50,000 NTS map sheets 093P02, 093P03, 093I14, and 093I15.

Access can be gained via the Murray River Forest Service Road (Plate 1). At least five gas wells are located within the project area.

Drill sites 06DDMR01 and 06DDMR02, where drilling was not successful, are on licence block 417425 along the Suncor Road (Plate 1; Plate 3). They can be accessed by traveling south from Tumbler Ridge along the Heritage Highway for 12 km, then turning right and going 9 km on the Murray River Forest Service Road, past the inactive Quintette Mine; the drill sites are located on the Suncor Road, which branches off the Murray River Road approximately 150 m west of the Murray River bridge (Plate 1). Both 06DDMR01 and 06DDMR02 are approximately 1.1 km north on the Suncor Road. Drill hole 06DDMR03 is on licence block 417447, also on the Suncor Road, and is located approximately 500 m south of the other drill holes.

Geographic Setting

The topography of the Peace River district varies from the Rocky Mountains in the west to the Interior Plains in the east. The Peace River or its tributaries drain most of the region, with tributaries of the Fort Nelson River draining the northern portions.

The Murray River licences are in the Rocky Mountain Foothills (Figure 2), which are characterized by moderately steep mountains, rolling hills, and discontinuous high plateaus. Relief in the area of active licences and applications ranges from approximately 760-1890 m, though relief in the rest of the Foothills may be up to 2000 m.

Mountain ridges in the Rocky Mountain Foothills are typically north-northwest trending with gentle eastern slopes and steeper western slopes. Well-incised creeks are common and there are numerous scattered small lakes and wetlands, particularly in upland areas.

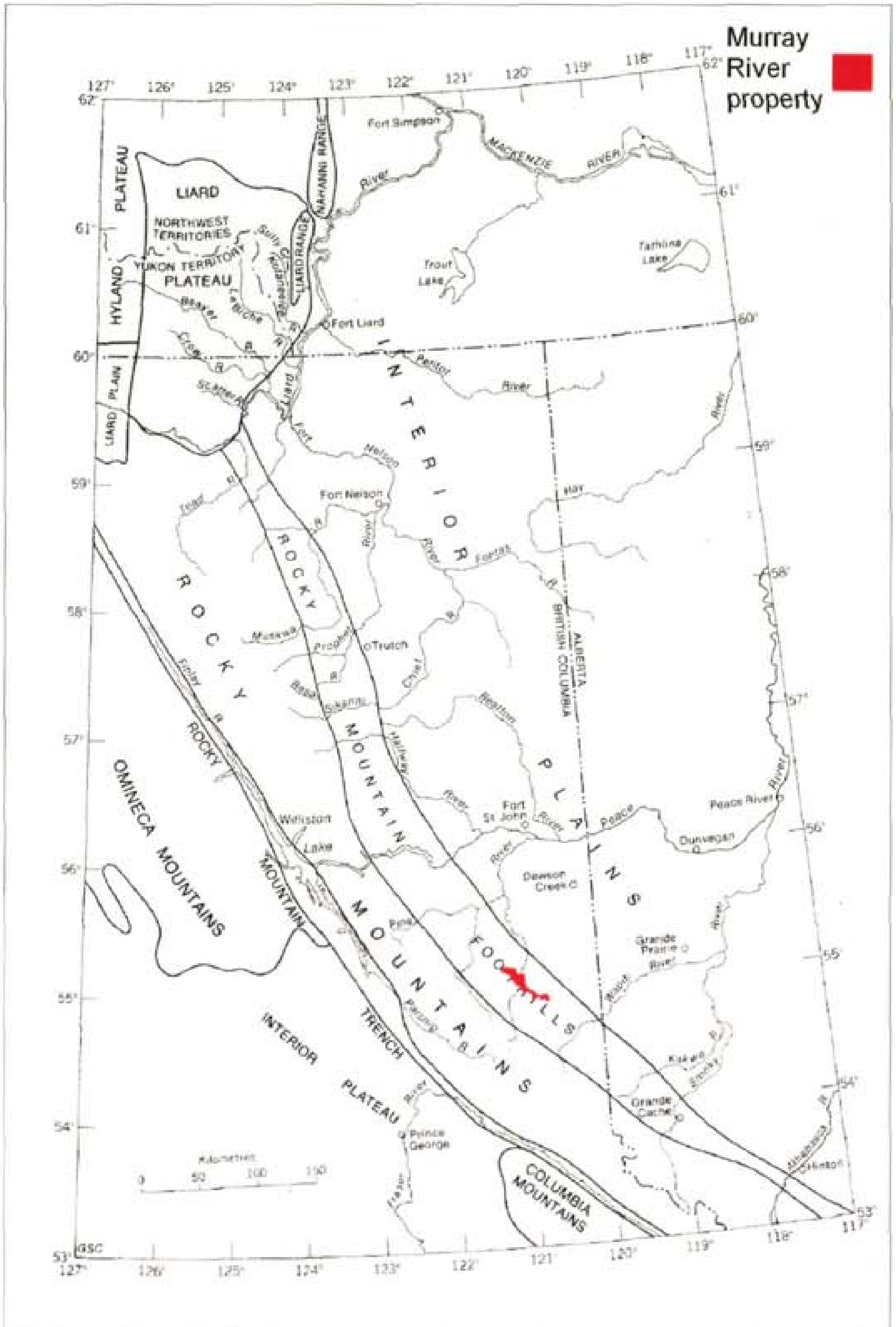

Figure 2. Physiographic belts of western Canada. Modified after Stott (1982).

Coal Licence Numbers

Licences: 417024, 417404, 417405, 417406, 417407, 417408, 417409, 417410, 417411, 417412, 417413, 417414, 417415, 417416, 417417, 417418, 417419, 417420, 417421, 417422, 417423, 417424, 417425, 417426, 417427, 417428, 417429, 417430, 417431, 417432, 417433, 417434, 417435, 417436, 417437, 417438, 417439, 414440, 414441, 414442, 414443, 414444, 414445, 414446, 414447, 414448, 414449, 417452, 417453, 417454, 417455, 417456, 417457, 417458, 417459, 417460, 417461, 417462, 417576, 417577, 417578, 417579, 417580, 417581, 417582, 417583, 417584, 417585, 417586, 417587, 417588, 417589, 417590, 417591, 417592, 417593, 417594

which are contained on the NTS map sheets 093P02, 093P03, 093I14, and 093I15.

Previous Work

Coal was first identified in the Peace River district by McKenzie in 1793. The first coal licences were granted in 1908 and several small mines operated on the Bri-Dowling property in the early 1900's, but the remoteness of the area hindered anything other than very small-scale mining until the 1940's. Further exploration work focused on mapping near recognized coal occurrences such as Carbon Creek (Matthews, 1947) and Pine River (McKechnie, 1955), and from 1946 to 1951, the Coal Division of the British Columbia Department of Lands and Forests conducted mapping, trenching, and diamond drilling in the Willow Creek, Noman Creek, and Falling Creek areas. Lack of infrastructure restricted mining to small operations, and less than 100,000 tonnes were extracted prior to 1980. The first comprehensive regional study was done by Stott (1974), who measured and correlated a series of sections extending from the town of Cadomin, Alberta to the Peace River canyon in British Columbia. Interest was renewed in the 1970's as coking coal markets strengthened and many oil companies, including Esso, Gulf Canada, Shell, and BP commenced exploration at this time (Andrews, 2004). Market conditions and possibly other factors contributed to a lack of exploration after 1983, until the rise in demand and prices for coking coal in recent years, with an explosion of interest since 2004 (Young, 2005).

There are two major coal-bearing formations in northeastern British Columbia, both of which crop out extensively in the Peace River coalfield: in the north, economic coal seams are contained in the Gething Formation, a sequence of nonmarine sediments and coal. In the south, they are typically contained in the Gates Formation, a sequence of nonmarine sandstones and coal.

Previous geologic maps of the southern project area were compiled by Dupont Exploration during the late 1970's as part of the Wolverine project. Additionally, geologic maps have been published for the areas of Sukunka River, Bullmoose Creek, Kinuseo Creek, and Kinuseo Falls, and Amoco produced a seismic marker map for the Gates Formation.

In the vicinity of the Murray River project area, the Quintette Mine operated from the early 1980's through the year 2000 as one of the largest coal open-pit operations in the world; together with the nearby Bullmoose Mine, it produced 5 million tones of metallurgical coal annually.

Outcrops along the Murray River and other geological data show the potential for relatively flat-lying coal seams to the west of Quintette. Oil and gas logs from the 1960's and 1970's indicate that it is present at depths requiring extraction via underground mining methods. Kennecott's Murray River drill sites were selected because they were as close as possible to the crest of an anticline while still being located along roads where significant environmental disturbance was not required to contruct drill sites. The geology of northeastern British Columbia, including the Murray River property, is shown in Plate 2.

SECTION II: DETAILS OF COSTS INCURRED

Coalfield: Peace River

Property Name: Murray River

NTS Sheets: 093P02, 093P03, 093I14, 093I15

Licences Owned and Operated By: Kennecott Canada Exploration, Inc.
354 – 200 Granville Street
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Licences: 417024, 417404, 417405, 417406, 417407, 417408, 417409, 417410, 417411, 417412, 417413, 417414, 417415, 417416, 417417, 417418, 417419, 417420, 417421, 417422, 417423, 417424, 417425, 417426, 417427, 417428, 417429, 417430, 417431, 417432, 417433, 417434, 417435, 417436, 417437, 417438, 417439, 414440, 414441, 414442, 414443, 414444, 414445, 414446, 414447, 414448, 414449, 417452, 417453, 417454, 417455, 417456, 417457, 417458, 417459, 417460, 417461, 417462, 417576, 417577, 417578, 417579, 417580, 417581, 417582, 417583, 417584, 417585, 417586, 417587, 417588, 417589, 417590, 417591, 417592, 417593, 417594

Located At:	Lat. 55.02°	Long. 121.02°
	UTM: 6098129N	626410 E (NAD 83, Zone 10)

Dates of Work: Between July 2006 and September 2006

(Note: Licences 417576-417594 were granted in 2007. At the time of the 2006 drilling, they were encompassed in Application 416865.)

CATEGORY OF WORK	DIMENSIONS	COST
Geological Mapping		
Reconnaissance	3000 ha	$4000
Geophysical		
downhole surveys	512 meters	$2400
Geochemistry	65 samples analyzed	$30,000
Surveys		
LIDAR	20,000 ha	$1500
Drilling		
core (diamond)	512 meters	$165,000
Drilling Contractors		
core (diamond)	Boart Longyear Inc.	
Where Core is Stored:	Kennecott field office in Chetwynd, BC	
Logging	500 meters of drill core logged	$7000
Reclamation Work	0.05 ha	$5000
On-Property Costs		$214,900
Off-Property Costs		$30,000
Total Expenditures		$244,900

Table 1. Costs incurred for the Murray River project.

SECTION III: DRILLING AND DRILLING RECORDS

Introduction

Kennecott Exploration attempted three drill holes on the Murray River property (Plate 3). The third was successful. Drill holes 06DDMR01 and 06DDMR02 were drilled by Target Drilling. Site preparation at 06DDMR01 commenced on May 7, 2006. The site was located in a previously cleared area adjacent to the Suncor Road. Drill hole 06DDMR02 was located 5 m from 06DDMR01. Both were abandoned in the overburden due to drilling difficulties. The site was reclaimed by late May and drilling operations were suspended for several weeks.

Operations at Murray River recommenced on Sept. 18 with a new drilling company, Boart-Longyear Inc. The third drill hole, 06DDMR03, was located at a new site along the Suncor Road. Ten to fifteen large trees were felled during site preparation. Locations of all three holes, and the areas of land used for drill pads, sumps, and water pumps, are shown in Table 1.

	NAD83 Easting (Zone 10)	**NAD83 Northing (Zone 10)**
*Location of drillsite 06DDMR01 and 06DDMR02	626403	6098858
Location of drillsite 06DDMR03	626410	6098129
Location of pump for all 3 sites	626291	6098070
	Area (square meters)	
Area used for drill pad at 06DDMR01, 06DDMR02	5000	
Area used for drill pad at 06DDMR03	4200	
Area used for pump for all 3 sites	54	
Total area disturbed by 06DDSC01	9254	

*Coordinates for 06DDMR01 and 06DDMR02 are the same, since the holes were ~5 m apart.

Table 1. Locations of drill holes 06DDMR01, 06DDMR02, and 06DDMR03, and areas of land affected by drilling activities.

Drilling Equipment and Procedures

Drill hole 06DDMR03 was drilled with an LY-50 diamond drill and personnel provided by Boart Longyear Inc. Each crew consisted of a driller and a driller helper. Drilling was carried out 24 hours per day, on two shifts. A foreman was intermittently present on the site and was available at all times.

Construction on drill site 06DDMR03 commenced in August 2006, and drill setup began on Sept. 16. Twelve by twelve inch wooden beams were used to create a raised platform on which the drill rested. A sump and a flare pit were dug adjacent to the drill. Due to the possibility of encountering gas, a blow-out protector and gate valve were installed. Water was pumped 200 m from a nearby creek. The pump was located in a small open area adjacent to the creek. No trees were felled at the pump site. The drill deck was monitored constantly for potentially hazardous gases, and drillers and helpers also wore portable gas monitors.

	[1]06DDMR01	[1]06DDMR02	06DDMR03
NAD83 Easting (Zone 10)	626403	626403	626410
NAD83 Northing (Zone 10)	6098858	6098858	6098129
Latitude Decimal Degrees	55.02048°	55.02048°	55.01505°
Longitude Decimal Degrees	121.02284°	121.02284°	121.02248°
Latitude Deg Min Sec	55° 1' 13.7"	55° 1' 13.7"	55° 0' 54.2"
Longitude Deg Min Sec	121° 1' 22.2"	121° 1' 22.2"	121° 1' 20.9"
Elevation	771 m	771 m	770 m
Collar Dip	-90	-90	-90
Collar Azimuth	0	0	0
Total Depth	43.25 m	43.25 m	512 m
Date Commenced	May 2006	May 2006	Sept.19, 2006
Date Completed	May 2006	May 2006	Oct.1, 2006
Hole Diameter	96 mm (HQ)	96 mm (HQ)	96 mm (HQ)
Cored Intervals	[2]none	[2]none	all
Depth to Bedrock	43.25 m	43.25 m	43.25 m
Depth of Casing Left in Hole	[3]n/a	43 m	43 m

[1]06DDMR01 is ~5 m from 06DDMR02, so identical coordinates are shown for both.
[2]06DDMR01 and 06DDMR02 did not penetrate the overburden, so no coring was done.
[3]Drill rods were left in 06DDMR01 when it was abandoned.

Table 2. Drillhole parameters for 06DDHH01 and 06DDHH02.

Drill hole 06DDMR03 collared on Sept. 19. Forty-three meters of overburden were penetrated and casing was inserted down to bedrock and cemented in place. Drillhole parameters are listed in Table 2.

The first geological unit encountered was the Hasler Formation. Constant pumping of water down the drill hole made recognition of the water table impossible, however, due to the proximity of the Murray River, it is likely that the water table is close to the surface. There were several encounters with small amounts of methane while drilling through the coal-bearing units, but quantities were not great enough to interfere with drilling.

The hole terminated in the Gates Formation on Oct. 1. A summary lithological log is shown in Table 3. Final depth of the hole was 512 m.

From	To	Interval	Formation
43.25	101.45	58.2	Hasler Formation
101.45	227	125.55	Boulder Creek Formation
227	319.84	92.84	Hulcross Formation
319.84	358.63	38.79	Gates Formation
358.63	359.64	1.01	COAL
359.64	397	37.36	Gates Formation
397	399.4	2.4	COAL
399.4	420.3	20.9	Gates Formation
420.3	422.4	2.1	COAL
422.4	453.7	31.3	Gates Formation
453.7	458.2	4.5	COAL
458.2	474.4	16.2	Gates Formation
474.4	475.2	0.8	COAL
475.2	476.1	0.9	Gates Formation
476.1	477.2	1.1	COAL
477.2	492.6	15.4	Gates Formation
492.6	498.3	5.7	COAL
498.3	499.9	1.6	Gates Formation
499.9	501.2	1.3	COAL
501.2	501.21	0.01	Gates Formation
501.21	502.7	1.49	COAL
502.7	506.5	3.8	Gates Formation
506.5	506.8	0.3	COAL
506.8	512	5.2	Gates Formation

Table 3. Summary lithological log for 06DDMR03.

The hole was cored in its entirety and logged lithologically and geophysically. Downhole logging was conducted on Oct. 1 and proceeded without incident.

Hole Abandonment and Drill Site Reclamation

The hole was abandoned on October 1. Forty-five meters of casing were left in the hole. The hole was cemented from bottom to top, and the casing was cut off below ground level. All sumps were filled with dirt. The area was then recontoured and covered with topsoil and woody debris. Reclamation of the site was completed on October 4.

Core and Coal Sampling and Storage

Overall core recovery rate was 91.8%. Coal core recovery rate was approximately 93%. The core is currently stored in Kennecott's Chetwynd, B.C. field office, except for coal samples sent for analysis. Multiple coal seams were encountered in the Gates Formation. Details of coal stratigraphy are given in Section VI.

Sixty-five samples were collected from ten seams. Samples were sealed in plastic and refrigerated prior to being sent by bus in plastic buckets to Birtley Laboratories in Calgary, Alberta for testing. Results are discussed in Section VI.

Appendix I contains a list of coal samples collected and details of samples combined. Appendix II contains a summary of coal chemical analyses. Appendix III contains quality control information for Birtley Laboratories.

SECTION IV: GEOLOGICAL WORK

Regional Stratigraphy

The Lower Cretaceous strata of the Rocky Mountain Foothills consist of a series of transgressive-regressive clastic wedges deposited in response to periodic uplift of the Canadian Cordillera (Smith et al., 1984): Triassic rocks are carbonates, Jurassic rocks are marine shales, and Cretaceous rocks are a combination of marine and non-marine sand and mud sequences. The Murray River project focused on the Lower Cretaceous rocks of the Fort St. John Group (Table 5). In the Tumbler Ridge area, coal is present in the Lower Cretaceous Minnes Group and Gething, Gates, and Boulder Creek Formations, and in the Upper Cretaceous Dunvegan, Cardium, and Wapiti Formations, but only the Gething, Gates, and Wapiti are major coal-bearing units. As of 1990, the only production was coming from the Gates Formation. Relevant formations are detailed below, beginning with the oldest.

Minnes Group

The Upper Jurassic to Lower Cretaceous Minnes Group unconformably underlies the Bullhead Group and comprises 0-1800 meters of quartzose sandstone alternating with fine sandstone, siltstone, mudstone, and minor conglomerate and carbonaceous sediments (Stott, 1973). It is stratigraphically equivalent to the Nikanassin Formation from adjacent areas of Alberta and further southeast.

Bullhead Group

The Bullhead Group consists of two formations in the Hudson's Hope region, the Cadomin Formation and the Gething Formation, of Upper Jurassic to Lower Cretaceous age. (Many sources report the age of the Bullhead Group as Lower Cretaceous only, but a few sources imply that group boundaries are time-transgressive [e.g. Ryan and Lane, 2002] and it is not clear what age these boundaries are in the Murray River region.)

<u>Cadomin Formation</u>

The Cadomin Formation comprises 0-230 m of massive conglomerate with chert and quartzite pebbles, and minor coarse sandstone, carbonaceous shale, and coal. The contact with the overlying Gething Formation is defined by an upward transition to finer sediments.

Upper Cretaceous		Dunvegan	fine- to coarse-grained sandstone; conglomerate; carbonaceous shale; coal
	Fort St. John	Cruiser	dark grey marine shale with sideritic concretions; minor sandstone
Lower Cretaceous		Goodrich	fine-grained, cross-bedded sandstone; shale; mudstone
		Hasler	silty dark grey marine shale with sideritic concretions; minor sandstone and pebble conglomerate; siltstone in lower part; basal pebble layer
		Boulder Creek	fine-grained, well-sorted sandstone; carbonaceous sandstone; massive conglomerate; siltstone; marine and nonmarine mudstone; minor coal
		Hulcross	dark grey marine shale and siltstone, with sideritic concretions
		Gates	fine-grained, well-sorted marine and nonmarine sandstones; carbonaceous sandstone and mudstone; coal; shale; minor conglomerate
		Moosebar	dark grey marine shale with sideritic concretions; siltstone; glauconitic sandstone; chert pebble conglomerate at base (Bluesky Member)
	Bullhead	Gething	fine- to coarse-grained, brown, calcareous, carbonaceous sandstone; coal; carbonaceous shale and conglomerate; siltstone
		Cadomin	massive conglomerate with chert and quartz pebbles; minor coarse-grained sandstone, carbonaceous shale, and coal
	regional erosional unconformity		
	Minnes		quartzose sandstone; fine-grained sandstone; silty shale; mudstone; minor carbonaceous sediments
Jurassic			

Table 5. Stratigraphic column for Upper Jurassic to Upper Cretaceous sediments of northeastern British Columbia. Modified after Stott (1982).

Gething Formation

The Gething Formation (referred to as the Gladstone Formation in adjacent Alberta) consists of a thick sequence of recessively weathered shale, siltstone, sandstone, and coal of Upper Jurassic to Lower Cretaceous age. It is underlain by conglomerates of the Cadomin Formation. The Gething Formation appears to intertongue with the overlying Moosebar Formation. Lateral facies changes in its coal seams and their associated sedimentary rocks are the norm. This, coupled with the presence of complex structures, makes correlation across the Peace River coalfield, and even between closely spaced drill holes, difficult.

Fort St. John Group

The Fort St. John Group is of Lower Cretaceous age. In the Peace River Foothills, it includes the Moosebar, Gates, Hulcross, Boulder Creek, Hasler, Goodrich, and Cruiser Formations (Table 5). In some regions of the Peace River coalfield (e.g. the Pine River region), the Gates, Hulcross, and Boulder Creek Formations are considered as members of the Commotion Formation. In some regions, the Hasler, Goodrich, and Cruiser Formations are combined into the Shaftesbury Formation.

Moosebar Formation

The Moosebar Formation represents the most important marine transgression in the Lower Cretaceous coal measures and extends southeast beyond the coalfield. It consists of dark grey marine shale with sideritic concretions, siltstone, and glauconitic sandstone, plus a basal pebble layer, to a total thickness of 30-595 m (Stott, 1968; Duff and Gilchrist, 1981). The abrupt basal contact is marked by a 0.25-0.5 m bed of chert pebble conglomerate (Bluesky Member). The contact with the overlying Gates Formation is typically gradational. The Moosebar Formation thins to the north and south of the Pine River.

Duff and Gilchrist (1981)subdivide the Moosebar north of Sukunka River into a Lower Silty Member (Gething Marine Tongue), Mudstone Member, Spieker Member, and uppermost Torrens Member, however, the broad applicability of those divisions is not clear, and intertonguing with the underlying Gething Formation makes correlation difficult.

Gates Formation

The Early to Middle Albian Gates Formation represents seven major transgressive-regressive cycles (Leckie, 1986). It comprises massive to thickly bedded, fine-grained, well-sorted sandstone that is dominantly quartz and chert, but locally includes thin interbeds of platy sandstone and shale, carbonaceous sandstone and mudstone, coal, and minor conglomerate. The coarsening-upward sequences correspond to progradational cycles of a largely nonmarine active delta complex. Nonmarine sediments are thickest in the south and pinch out northward. Lateral facies changes in both coal seams and associated sedimentary rocks are the norm and this, coupled with structure, makes correlation difficult.

The Gates Formation is most commonly divided into three members. The lowermost Torrens Member comprises sandstones deposited in a shoreline environment) (Kalkreuth et al., 1989). Above it, the Grande Cache Member consists of coastal plain sandstone, shale, and major economic coal seams, which grade upward into the Mountain Park Member, which comprises fluvial, fining-upward sandstone, shale, and minor coal seams. Duff and Gilchrist (1981), however, subdivide the Gates Formation differently (Figure 3): The Torrens Member is included as part of the underlying Moosebar Formation, and the lowest member of the Gates is the sandy coal-bearing member, which is approximately coeval with and intertongues with the Gates marine tongue. Both of these are overlain by the upper silty member. Both stratigraphic systems have some merit when applied to the sediments drilled at the Murray River project. However, it was not possible to assign core intervals to members according to either system.

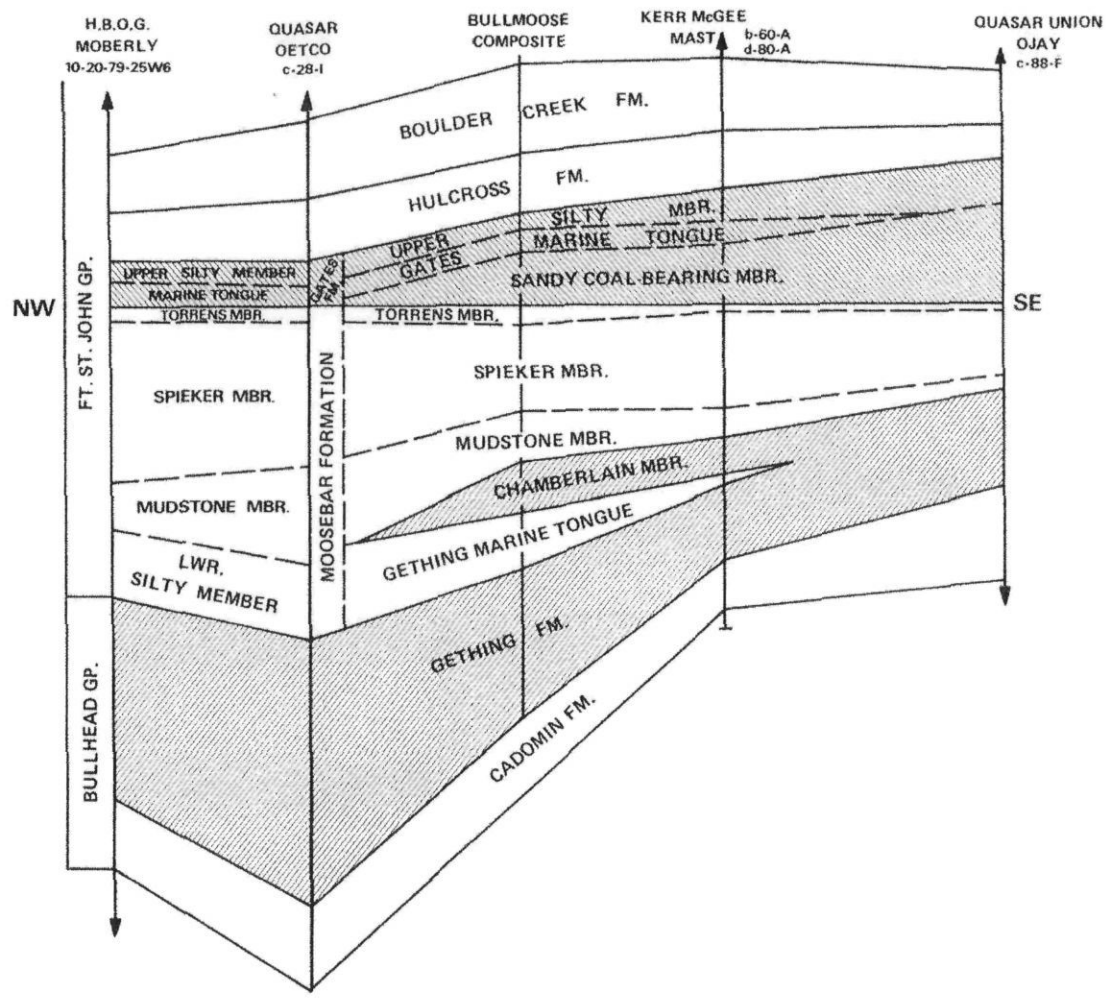

Figure 3. Bullhead-Fort St. John Group nomenclature and revised stratigraphy proposed by Duff and Gilchrist (1981).

Virtually all economic coals in the Gates Formation are found in the lower sandy coal-bearing member and are believed to be stratigraphically equivalent to coals mined from the Luscar Formation at Grande Cache, Alberta (Duff and Gilchrist, 1981). A few coal seams are up to 12 m thick and up to 6 seams are greater than 1 m thick (Matheson, 1986). The southern coalfield contains four seams over 2 m thick, with a total thickness of 23 m (Duff and Gilchrist, 1981). Coal seams thin to the north. Coals vary from banded bright to banded dull (Lamberson et al., 1989). Quality and rank of coal is relatively consistent throughout the southern Peace River coalfield (Ryan, 1997). The coal is interpreted to have formed in protected environments shoreward of a high-energy, wave-dominated coastline also known as a "strandplain" setting (Kalkreuth and Leckie, 1989; Kalkreuth et al., 1989). One to three coal seams are found in the upper silty member above the Gates Marine Tongue. They are rarely greater than 1.5 m thick but are laterally persistent and are found throughout the Peace River coalfield (Duff and Gilchrist, 1981).

As of 1997, there were two mines (Bullmoose and Quintette) extracting coal from the Gates Formation. At Quintette, 9 seams are recognized (Rance, 1985), and banded coal predominates in the Quintette area (Lamberson et al., 1989).

Hulcross Formation

The Hulcross Formation represents a major marine incursion, with a lower fining upward transgressive unit and an upper coarsening upward regressive unit (Duff and Gilchrist, 1981). It consists of dark grey concretionary marine shales and siltstones, and lacks the pure mudstones found in the Moosebar Formation. Thin iron concretion bands are common throughout. Two tonsteins (clay bands) have been correlated nearly the length of the coalfield (Duff and Gilchrist, 1981). Total thickness is 55-136 m (Stott, 1982). The lower contact with the Gates Formation is commonly marked by a layer of chert pebbles (Stott, 1968). The contact with the overlying Boulder Creek Formation is most commonly gradational but is locally erosional.

Boulder Creek Formation

The Boulder Creek Formation consists of conglomerates and carbonaceous sandstones and some marine mudstone, and is 62-168 m thick (Stott, 1982). The basal unit is a well-sorted sandstone overlain by two or three conglomerate units, each separated by silty units. Thin coal seams are locally present above the lower conglomerate and at one site are 3 m thick (Duff and Gilchrist, 1981).

Hasler Formation

The Hasler Formation comprises silty dark grey marine shale with sideritic concretions, siltstone, minor sandstone and pebble conglomerate. It is 152-459 m thick (Stott, 1982).

A pebble layer defines its contact with the underlying Boulder Creek Formation. The upper contact is gradational. Geological correlations involving the Hasler Formation are complicated by the fact that, in some regions, the Hasler, Goodrich, and Cruiser Formations are combined into the Shaftesbury Formation (this can be seen in the Murray River area on Plate 2).

Goodrich Formation

The Goodrich Formation consists of fine-grained cross-bedded sandstone, shale, and mudstone, and is 15-411 m thick (Stott, 1982). Its lower boundary with the Hasler Formation is gradational and is considered to be the base of the thick-bedded sandstone.

Cruiser Formation

The Cruiser Formation consists of dark grey marine shale with sideritic concretions and some sandstone, is 107-244 m thick (Stott, 1982), and straddles the boundary between the Upper and Lower Cretaceous. The top of the Cruiser Formation marks the top of the Fort Saint John Group.

Upper Cretaceous

Dunvegan Formation

The Upper Cretaceous Dunvegan Formation comprises fine- to coarse-grained sandstone, conglomerate, carbonaceous shale, and coal, and is 107-300 m thick (Stott, 1982).

Regional Structure

Laramide convergence along the western margin of North America started in the late Jurassic and continued until the early Tertiary (Leckie, 1986). During that time, several large and exotic terranes collided with the craton margin and compressed miogeoclinal strata on an eastward-verging fold and thrust belt. Adjacent to and east of the fold and thrust belt, a foreland basin developed due to flexure of the crust beneath the increased tectonic load of thrust sheets. This foreland basin contains an offlapping sequence of east-tapering clastic wedges. Clastic material for the northeastern British Columbia

Cretaceous sedimentary sequence was derived from the rising Rocky Mountains to the west (Price and Mountjoy, 1970). The oldest wedges are late Jurassic to Early Cretaceous (Kootenay Formation, Nikanassin Formation, Minnes Group) and Early to Mid-Cretaceous (Bullhead and Fort St. John Groups). The lower Cretaceous Gates Formation is part of the second clastic wedge. These clastic wedges were themselves subsequently folded and thrust faulted during late Cretaceous to Early Tertiary time as the deformation front migrated eastward, creating a third clastic wedge ahead of it. The two lower clastic wedges now form the Foothills structural subprovince of the Rocky Mountain Belt (Leckie, 1986). They are highly folded into synclines and anticlines with axes trending northwest; low-amplitude, long-wavelength folds and widely spaced thrusts are characteristic (Legun, 2002). Several large thrust faults extend tens of kilometers, repeating the strata with much minor faulting. Deformation in the Peace River region is thought to have proceeded from southwest to northeast (Price, 1981), and is estimated to have reached the Inner Rocky Mountain Foothills of Alberta and British Columbia during the Paleocene (Kalkreuth and McMechan, 1984)

Coal rank studies suggest that coalification occurred mainly before the late Cretaceous-Tertiary Laramide deformation (Hacquebard and Donaldson, 1974). Rank variations relate to variations in the thickness of the Gething Formation and variations in the thickness of the post-Gething sedimentary package (Ryan and Lane, 2002), plus variations in the duration of burial beneath younger sediments. Rank increases from west to east across the Foothills largely because diachronous Laramide deformation resulted in an eastward increase in duration and depth of burial (Kalkreuth et al., 1989).

In the Tumbler Ridge area, most fault are thrusts, and the structural style varies eastward across the regional trend of the Rocky Mountain Foothills, depending on lithology and distance from the Front Ranges (Kilby and Hunter, 1990). The middle of the Gates Formation is dominated by major long-wavelength folds, often forming large box anticlines, while the uppermost Gates has strata deformed into gentle warps associated with the Alberta syncline (Kilby and Hunter, 1990). Small faults are common, but there are few major faults, other than the Bullmoose and Gwillan Lake Faults.

Drill Hole Geology

Drill Hole Stratigraphy

A summary lithologic log for 06DDMR03 is shown in Table 3. Bedrock at 06DDMR03 lies beneath 43 m of overburden, which consists of poorly sorted heterolithic material, probably river sediments.

Hasler Formation

The highest geological unit in 06DDMR03 is the Hasler Formation, which is 58 m thick, and consists of laminated to thinly-bedded grey shale and siltstone with minor cross-laminated sandstone. Pyrite is locally present. Bioturbation is widespread. The lower contact with the Boulder Creek Formation is sharp.

Boulder Creek Formation

The top of the Boulder Creek Formation occurs at 101 m, and total thickness is 126 m. It comprises interbedded sandstone with lesser proportions of siltstone and mudstone. The sandstone is grey, coarse to fine-grained, locally pebbly, locally arenitic, and laminated to bedded. The siltstone and mudstone are clay-rich and brittle. All lithologies contain abundant carbonaceous streaks and patches and minor siderite, and show evidence for bioturbation. The base of the Boulder Creek Formation consists of 12 m of well-sorted, bedded lithic arenite.

Hulcross Formation

The top of the Hulcross Formation occurs at 227 m, and total thickness is 92 m. The Hulcross Formation consists of shale thinly interbedded with sandstone and siltstone and interspersed with multiple bentonite bands. All lithologies locally contain minor calcite, pyrite, and carbonaceous material. Breccia is present near the base. The transition to the underlying Gates Formation is gradual.

Gates Formation

The upper contact of the Gates Formation occurs at 319 m. Total thickness is unknown, since the hole terminated within the Gates Formation, but it is at least 193 m thick. The contact with the overlying Hulcross Formation is gradual and is characterized by the highest occurrence of coal bands and stringers. The Gates Formation comprises interbedded mudstone, siltstone, and sandstone with multiple seams of bright and dark coal that is commonly banded and/or bony. Textures range from laminated to cross-laminated to massive, and bioturbation and soft-sediment deformation are common. Many lithologies are carbonaceous. Minor siderite and pyrite are present. Sandstone units are fine to medium-grained, locally arenitic, and locally calcareous, however, mudstone and coal dominate towards the base of the sequence. Multiple meters-thick coal seams are present and are described below. The drill hole terminated in coal at 512 m.

Drill Hole Structure

Structural information obtained from 06DDMR03 was minimal. Bedding in the hole is approximately 10° from the horizontal (locally up to 15° from the horizontal), and beds are not overturned. The most prominent structures are calcite veins that are typically at 10° but are locally 0-30°. Veins are in most cases less than 1 mm thick and are commonly associated with slickensides. Isolated slickensides are typically oriented at 10° but may be as high as 30°. Three breccia zones occur within the Hulcross Formation; they are 13 cm, 78 cm, and 43 cm thick, respectively. The thickest breccia zone may represent a fault, although its orientation is not apparent in core samples. No unequivocal faults were identified in the core.

Geologic Mapping Summary

A reconnaissance of driveable roads in the southern project area revealed few outcrops. Geologic mapping was conducted on July 26-27 by foot along the stream channel south that intersects the Suncor Road south of 06DDMR03, and on July 29 by boat along the Murray River to the north and south of the Murray River Forest Service Road bridge (Plate 4). This work, coupled with previous observations, confirmed the gentle dip of strata over a >1 km distance in the area immediately south of 06DDMR03. The shallowest depth to coal may potentially exist within the core of a gentle anticline hinge adjacent to the Quintette coal plant; beds steepen rapidly to the south of this point.

SECTION V: GEOPHYSICAL SURVEYS

Down Hole Logging

Down hole geophysical surveys were performed by Century Geophysical on 06DDMR03 immediately after the cessation of drilling. A dummy probe was sent down the drill hole prior to geophysical logging in order to minimize the chance of losing a radioactive source down the hole. Three tools were used for the logging; they are described below. Gamma, neutron, density, dipmeter, and deviation logs were recorded to 509 m.

Summary geophysical logs are shown in Plate 5.

Tool Description

9055 Multi-Paramenter E-Log, Neutron: This tool contains a single detector, neutron system using a 1.0 curie, Am241 Be source to record neutron porosity of the formation. It also records natural gamma, spontaneous potential, single-point resistance, and borehole deviation.

9139 Compensated Density: This tool uses two focused density detectors to compute borehole compensated density real time while logging. It has a 200 mCi Cesium-137 radioactive source. It also records natural gamma, caliper, medium guard resistivity, and borehole temperature.

9410 Dipmeter: This tool is a formation strike and dip directional probe. It also records natural gamma, X-Y calipers, and bore hole deviation computed from the slant angle and bearing measurements calculated from the inclinometer and magnetometer sensors.

The geophysical data were useful in helping to define formation boundaries. The gamma, neutron, and density logs show the transition from overburden to bedrock as gradual. The

Hasler-Boulder Creek Formation contact is indicated by a downward decrease in the gamma log and an increase in the neutron log, both of which correspond to the shift from mixed mudstone, sandstone, and siltstone of the Hasler Formation to purer sandstone of the upper Boulder Creek Formation. The contact between the Boulder Creek and Hulcross Formations, a shift from arenitic sandstone to silty mudstone and sandstone, shows as a gradual increase in the gamma log and a decrease in the neutron log. The transition from the Hulcross Formation to the Gates Formation is represented by a local drop in the gamma log and an increase in the neutron log. These changes do not persist below the Hulcross-Gates contact, however, but the overall pattern of both the gamma and neutron logs changes: both logs show more variation in the Gates Formation. This change in the nature of the gamma and neutron logs reflects the shift from more homogeneous silty mudstones (and other sediments) of the Hulcross Formation to the alternating sandstone, siltstone, and coal of the Gates Formation. Gates Formation coal seams are prominently visible in density, gamma, and neutron logs, even when seams are as thin as 50 cm.

Deviation of the hole was minimal.

SECTION VI: COAL

Coal Seam Stratigraphy and Quality

The first significant coal was intersected at approximately 358 m, in the Gates Formation, in a bony banded seam 1.01 m thick. A 2.4 m thick seam of mostly banded coal was intersected at 397 m. Additional coal seams were intersected at 420 m (2.1 m thick), 453 m (4.5 m thick), 476 m (1.1 m thick), 492 m (5.7 m thick), and 499 m (1.3 m thick). All of this coal was banded (typically a mixture of bright and dull bands) and a small proportion of it was bony (contained shale). The deepest coal intersections occurred at 501 m (1.49 m thick) and 506 m (0.3 m thick) and comprised banded bright coal. The hole terminated in this final zone of banded coal, still within the Gates Formation. Minor shearing was present in several of the seams.

The following 2 pages contain coal quality data and remain confidential under the terms of the *Coal Act Regulation*, Section 2(1). They have been removed from the public version.

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All licences and applications are to be retained. The main change from the time of drilling is the status of application 416865: it was granted and now comprises licence numbers 417576 thru 417594 inclusive. Figure 4 shows the status of licences and applications for the Murray River project as of March 2007.

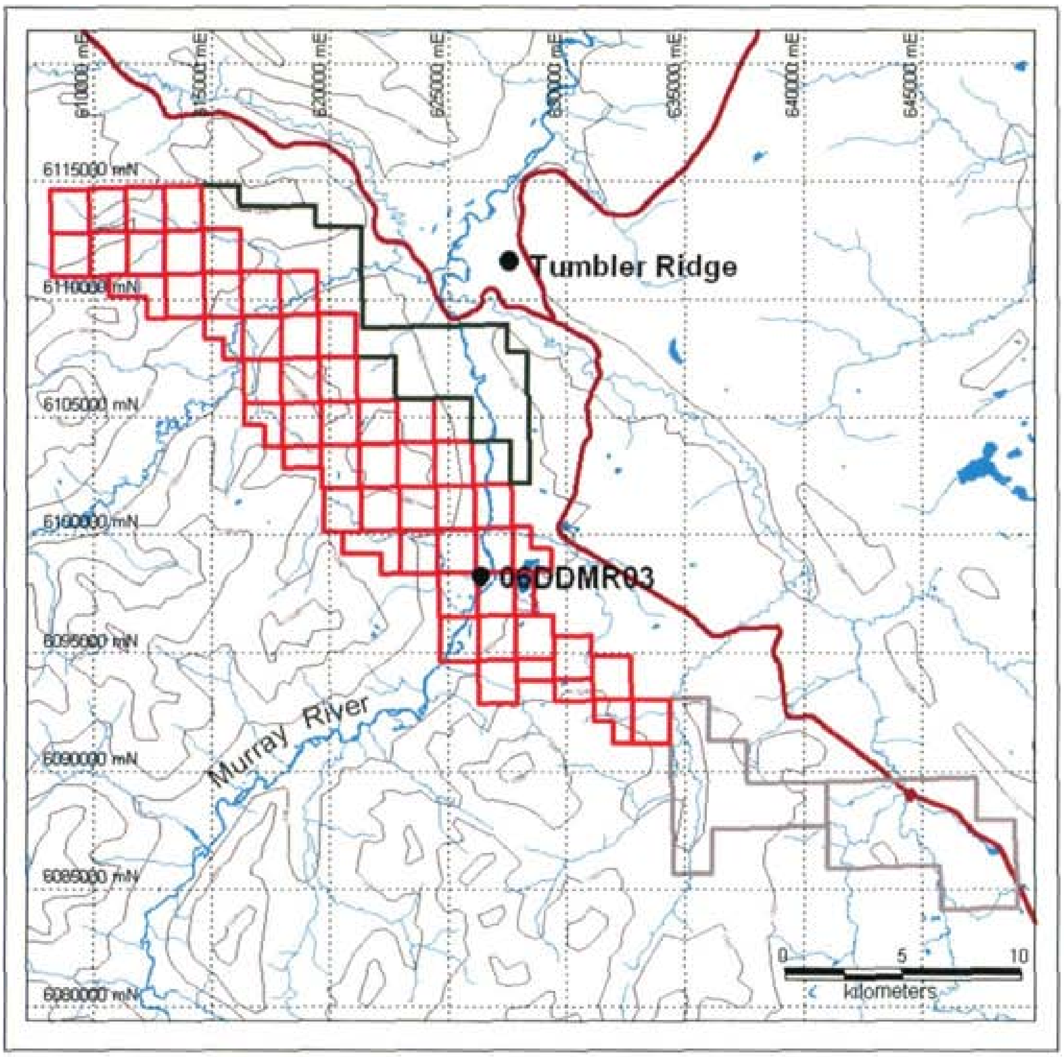

Figure 4. Murray River updated licence and application status (as of March 2007). Retained licences (all) are outlined in red. Application 416865 (shown in grey) has been granted. The area shown in green is still in application status (417024).

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APPENDIX I:
SAMPLE NUMBERS, INTERVAL THICKNESSES, AND COMBINED SAMPLES

Sample Number	from (m)	to (m)	Thickness	Seam Thickness	Sample Type	Comment
NA103112	355.63	355.83	0.2	1.01	Coal	Combines samples NA103112, 113
NA103114	355.83	356.06	0.23		Non Coal	
NA103115	356.06	356.18	0.12		Coal	
NA103116	356.18	356.21	0.03		Non Coal	
NA103117	356.21	356.51	0.3		Coal	
NA103118	356.51	356.55	0.04		Non Coal	
NA103119	356.55	356.64	0.09		Coal	
NA103120	395.88	396.64	0.76	2.01	Coal	Combines samples NA103120, 121, 122, 123
NA103124	396.64	397.07	0.43		Coal	Combines samples NA103124, 125
NA103126	397.07	397.89	0.82		Coal	Combines samples NA103126, 127
NA103128	419.21	419.42	0.21	2.14	Coal	
NA103129	419.42	419.47	0.05		Non Coal	
NA103130	419.47	419.97	0.5		Coal	
NA103131	419.97	420.32	0.35		Coal	
NA103132	420.32	421.14	0.82		Coal	
NA103133	421.14	421.2	0.06		Non Coal	
NA103134	421.2	421.35	0.15		Coal	
NA103135	421.77	422.79	1.02	1.15	Coal	Combines samples NA103135, 136
NA103137	422.79	422.92	0.13		Coal	
NA103138	452.62	453.34	0.72	4.66	Coal	Combines samples NA103138, 139, 140
NA103141	453.34	453.51	0.17		Non Coal	
NA103142	453.51	454.42	0.91		Coal	Combines samples NA103142, 143, 144
NA103145	454.42	455.07	0.65		Coal	Combines samples NA103145, 146
NA103147	455.07	455.1	0.03		Non Coal	
NA103148	455.1	455.18	0.08		Coal	
NA103149	455.18	455.19	0.01		Non Coal	
NA103250	455.19	455.87	0.68		Coal	
NA103251	455.87	456.5	0.63		Coal	
NA103252	456.5	457.2	0.7		Coal	
NA103253	457.2	457.28	0.08		Non Coal	
NA103254	473.18	473.64	0.46	0.93	Coal	Combines samples NA103254, 255
NA103256	473.64	473.69	0.05		Non Coal	
NA103257	473.69	473.95	0.26		Coal	
NA103258	473.95	473.99	0.04		Non Coal	
NA103259	473.99	474.11	0.12		Coal	
NA103260	475.05	475.4	0.35	1.13	Coal	Combines samples NA103260, 261
NA103262	475.4	476.18	0.78		Coal	Combines samples NA103262, 263
NA103264	491.88	492.48	0.6	4.64	Coal	
NA103265	492.48	492.51	0.03		Non Coal	
NA103266	492.51	493.46	0.95		Coal	Combines samples NA103266, 267
NA103268	493.46	494.72	1.26		Coal	Combines samples NA103268, 269
NA103270	494.72	495.97	1.25		Coal	Combines samples NA1032670, 271
NA103272	495.97	496.52	0.55		Coal	
NA103273	498.21	498.35	0.14	1.49	Non Coal	
NA103274	498.35	499	0.65		Coal	
NA103275	499	499.7	0.7		Coal	
NA103276	505.11	505.56	0.45	0.45	Coal	

APPENDIX II:

GEOCHEMICAL ANALYSES

Appendix II contains coal quality data and remains confidential under the terms of the *Coal Act Regulation*, Section 2(1). It has been removed from the public version.

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APPENDIX III:

SUPPLEMENTAL INFORMATION FOR BIRTLEY COAL AND MINERALS TESTING

Quality Control Procedures

Bulk Handling, Sampling and Processing

- Whether received loose (in a dump truck) or packaged (in barrels or bags), a bulk sample is dumped onto a clean steel mixing pad outdoors or a clean concrete floor indoors for homogenization and sample extraction

- ASTM prescribed procedures or alternate acceptable methods* are closely adhered to in the sampling stage, with particular attention given to minimum weight of sample taken in the reduction step to maintain representativeness of the sub-sample

- During homogenizing and sampling, special care is taken to prevent unnecessary attrition of coal particles which can bias the size consist of the sample. Also, dusting losses during this stage are kept to a minimum by considering the wind factor before work is initiated outdoors

- Applicable portions of samples are kept indoors for further testing while the residual material is left covered outdoors

B. Sample Preparation

- Upon receipt, individual samples are first sorted and placed in order, either numerically, lithologically, or in some chronological manner prior to being catalogued. Each sample is then sequentially assigned its own unique laboratory number

- Sample Preparation Technicians examine the samples to identify certain aspects of a sample or its container when received, e.g. potential weight loss or damage during shipping, and physical characteristics like color, smell, mass, average size, etc. of the sample. Observations are recorded and relayed to the client if discrepancies exist between sample shipped and that received

- A plastic tag, encoded with the laboratory number and a concise description of the sample, accompanies said sample at all times during preparation. A series of samples are processed in numerical sequence whenever possible

- All equipment (screens, crushers/mills, rifflers, pans/receptacles) including the analytical pulp container as well as all float sink liquids are cleaned between samples. Workbenches are cleared of debris before samples are weighed and processed

- Before each use screens are inspected for tears and aperture correctness

- A sample's initial weight (usually as received weight) is recorded for mass balance and for cross checking purposes

**Coal samples vary in physical characteristics often from mine to mine and sometimes from seam to seam. Applicable sampling methods may be adjusted from the norm to suit the particular sample. Therefore, procedural applications for one client's coal may not be wholly relevant to that of another client's coal.*

C. Laboratory Analysis

- ASTM methods for coal analyses are used where applicable. We also use ISO procedures, as well as modified methods for some tests where applicable and necessary. Procedures followed adhere to the specific client needs

- When a prolonged series of measurements is made (ex. sequential calorific values or SC-32 sulfur analyses) control samples (ex. benzoic acid) as well as duplicate runs of samples are made
- Check analyses are performed alongside most analyses. For example, a mineral analysis of ash is done in duplicate in a batch of samples to be analyzed. Unknown check samples are also given to laboratory technicians to check instrument and operator repeatability
- Where applicable, cumulative analyses are checked with the head sample results. For example, float sink cumulative ash should be within limits for the ash result for the size that was float sank
- If there is a problem with checks, instrumentation, or if control samples are outside limits, the technician notifies the supervisor and then depending on the problem corrects it themselves or the supervisor investigates and rectifies if required
- Notebooks are kept for each instrument to record maintenance and problems and the dates associated with them
- To verify sample test reproducibility Birtley subscribes to the CANSPEX program. This program compares test results of duplicate blind samples sent to subscribing laboratories and reports comparative results to the subscribers. Birtley can then compare its test results against the consensus of the other participating laboratories (~100) from around the world.
- Control charts are kept of the upper and lower limits of repeatability and reproducibility for the CANSPEX round robin program. If problem areas exist, it is then possible to assess and rectify those problems

(This information is quoted verbatim from the Birtley Coal and Minerals Testing brochure.)

Statement of Qualifications of Lab Personnel

Operations Manager

Ms. Heather Dexter graduated with a Chemical Technology Diploma from the Southern Alberta Institute of Technology (SAIT) in 1984. In 1989 Heather joined Birtley as a Laboratory Technologist and over the last 17 years has served in various roles including Safety Coordinator, Office Manager and Training Coordinator. Since joining Birtley, Heather completed a Business Management Certificate at SAIT (1999) and has been working on her Bachelor of Science Degree from the University of Waterloo in Ontario. Her current key roles include: supervising, training and coordinating laboratory staff; maintaining quality control systems; communicating with clients and determining testing requirements; and preparing reports for clients.

Sample Preparation Supervisor

Mr. Jack Abad joined Birtley in 1973 as a Plant Technician and has been promoted through various jobs to his current position as Supervisor. Over the past 30 years, Jack has gained considerable experience with all coal types and is considered an expert on all aspects of sample preparation. Jack is currently responsible for supervising and coordinating sample preparation, quality control, advising and designing programs for special projects, and preparing reports of results.

(This information is quoted verbatim from the Birtley Coal and Minerals Testing brochure.)

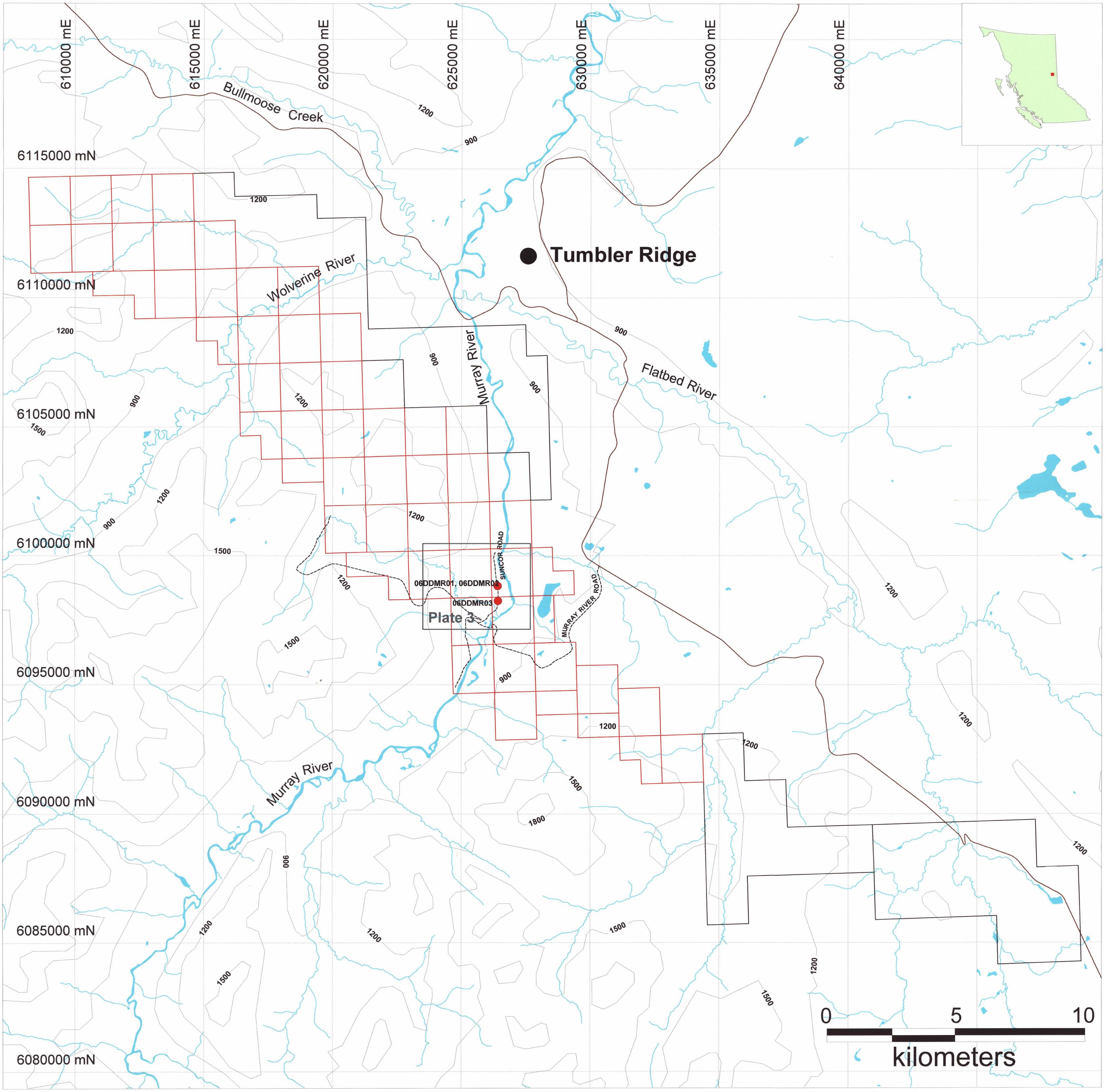

Plate 1. 1:50,000 map of KCEI's Murray River coal licences (red) and applications (black) at the time of the 2006 drilling. The location of Plate 3 is shown in grey. Contour interval = 300 m.

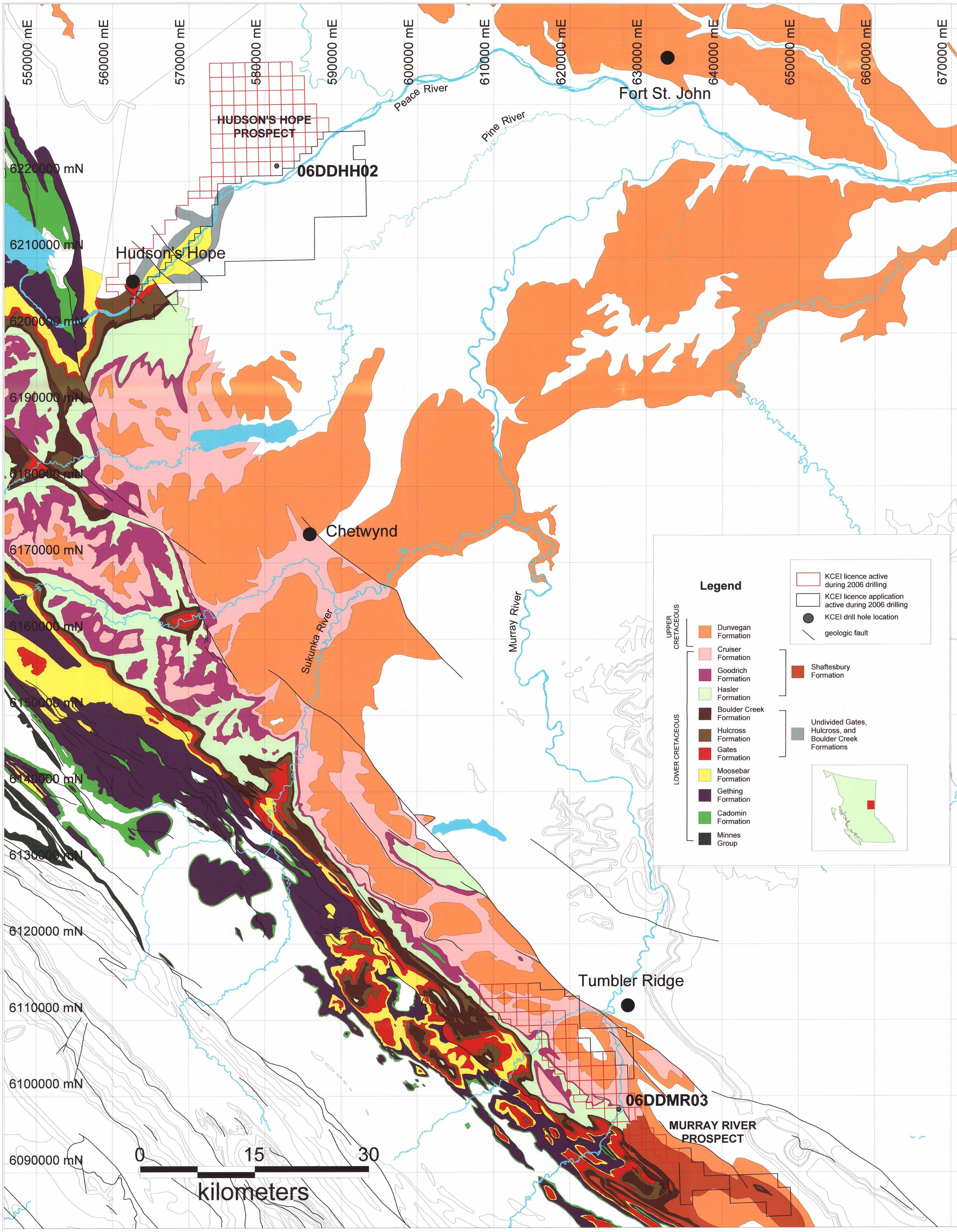

Plate 2. Geologic map of northeastern British Columbia, showing KCEI's licences and applications that were active at the time of drilling. Geology is from Crown Publications' "New Digital geology of B.C." (2005).

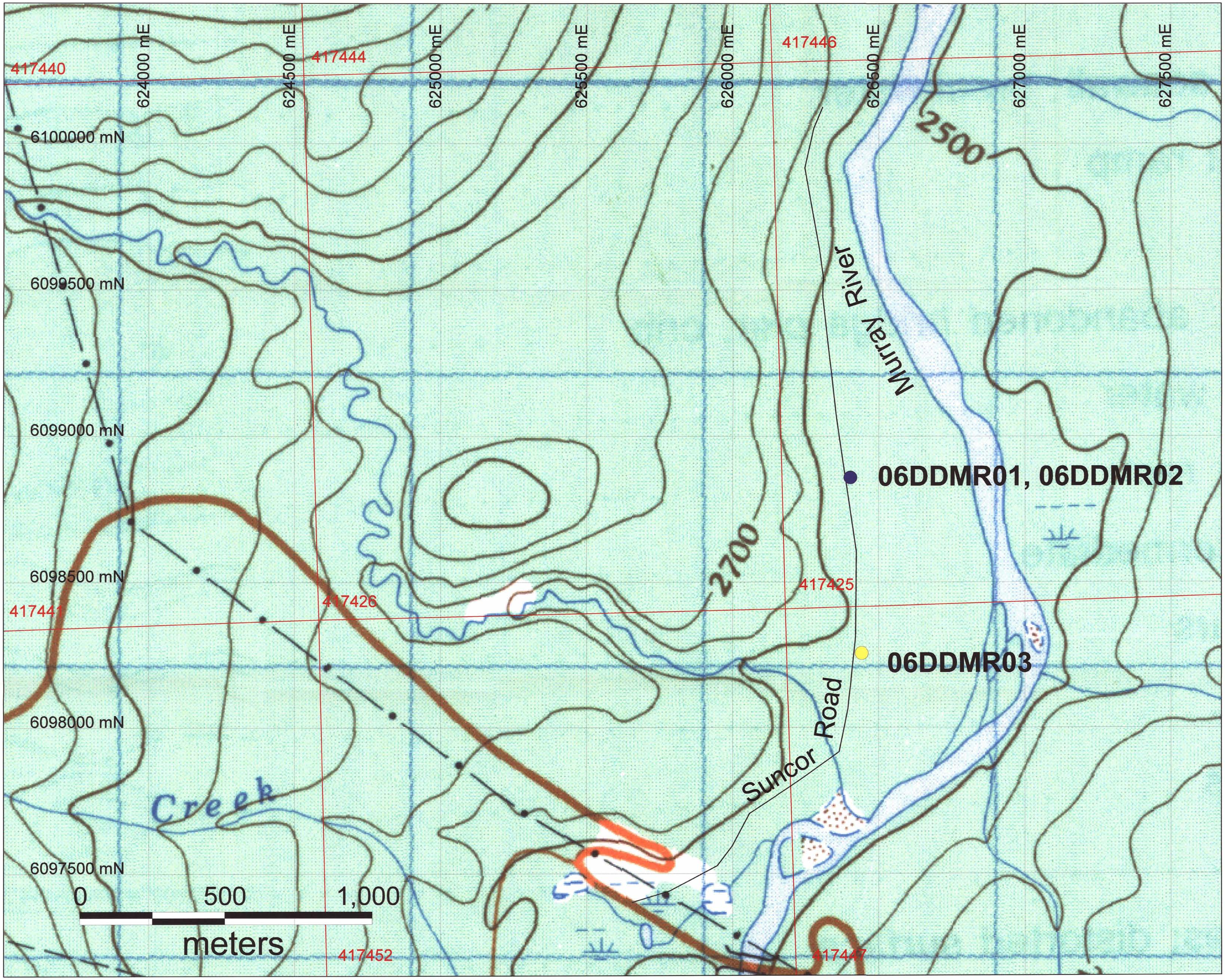

Plate 3. 1:5000 map of the Murray River drill sites. The red lines mark boundaries of the Murray River licences. The red numbers are licence numbers.

STRIP LOG: 06-DD-MR-03

Easting	Northing	RL	Azimuth	Dip	Depth
626540.0	6097940.0	746.0	0.0	-90.0	512.0

Vertical scale 1:465

STRIP			
2	Formation	PAT	LABEL
			Bouldercreek
			GatesFormation
			Hasler
			Hulcross
			Overburden
			coal
5	Dip / DipDirect	TADPOLE	Bottom ref

Plate 5

Kennecott Canada

Murray River

October, 2006