BC Geological Survey
Coal Assessment Report
1018

COAL ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TITLE OF REPORT: Groundhog Property 2015 Geological Assessment Report

TOTAL COST: $1,795,592.33

AUTHOR(S): Hayden Mackenzie

SIGNATURE(S):

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S):
Permit Number: CX-1-001
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YEAR OF WORK: 2015

PROPERTY NAME: Groundhog

COAL LICENSE(S) AND/OR LEASES ON WHICH PHYSICAL WORK WAS DONE:

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN:

MINING DIVISION: Omineca
NTS / BCGS: 104 A 16
LATITUDE: 56° 53'
LONGITUDE: 128° 15' (at centre of work)
UTM Zone: 9N EASTING: 545000 NORTHING: 6305000

OWNER(S): Atrum Coal Groundhog Inc.

MAILING ADDRESS: 780 – 580 Hornby Street, Vancouver, BC V6C 3B6

OPERATOR(S) [who paid for the work]:

MAILING ADDRESS:

REPORT KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude. **Do not use abbreviations or codes**)

Anthracite; Groundhog

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:

SUMMARY OF TYPES OF WORK IN THIS REPORT		EXTENT OF WORK (in metric units)	ON WHICH TENURES
GEOLOGICAL (scale, area)			
	Ground, mapping		
	Photo interpretation		
GEOPHYSICAL (line-kilometres)			
	Ground (Specify types)		
	Airborne		
	(Specify types)		
	Borehole		
	Gamma, Resistivity,		
	Resistivity		
	Caliper		
	Deviation		
	Dip		
	Others (specify)		
	Core		
	Non-core		
SAMPLING AND ANALYSES			
Total # of Samples			
	Proximate		
	Ultimate		
	Petrographic		
	Vitrinite reflectance		
	Coking		
	Wash tests		
PROSPECTING (scale/area)			
PREPARATORY/PHYSICAL			
Line/grid (km)			
Trench (number, metres)			

Part of the Summary, Section 6, Appendix 2, and Appendix 5 remain confidential under the terms of the Coal Act Regulation, and have been removed from the public version.

http://www.bclaws.ca/civix/document/id/complete/statreg/251_2004

2015

Groundhog Anthracite Project

GEOLOGICAL ASSESSMENT REPORT 2015

ATRUM COAL

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1. Summary

The Groundhog Anthracite Project (Groundhog) is situated within the Groundhog Coalfield, located in north-western British Columbia's Cassiar Land District. The project lies close to the northern extremity of the Skeena Mountains within the Bowser Basin approximately 180 km north of Hazelton and 150 km north-east of Stewart, British Columbia, Canada. Other nearby cities include Smithers, British Columbia 240 km to the South, and Prince George, British Columbia 490 km to the south-east. Current access to Atrum Coal's Groundhog Project is limited to the Kluatantan airstrip which is located to the south-east of the property.

Geologically, the Groundhog Coalfield is located in the northern portion of the Bowser Basin, bounded by the Skeena Arch to the north and the Stikine Arch to the south.

Using the nomenclature coined by Cookenbnoo and Bustin in 1991, the formations of the Bowser Lake Group from oldest to youngest are as follows: the Ashman Formation, Currier Formation, McEvoy Formation, and the Devil's Claw Formation. The coal measures are located within the Currier Formation, which at Groundhog is approximately 600 metres thick and comprised of siltstone, mudstone, sandstone and coal. There are at least 21 known coal seams within the Currier Formation on the Groundhog Property, these are broken into four horizons starting with the Davis Horizon at the top followed by the Discovery, Duke and Trail Horizons. Seams within these horizons are given a letter starting with 'A' at the top, and additional letters for each new seam down stratigraphy. Coal seams range in thickness from tens of centimetres to more than 7 m, and typically range from 0.5 to 3.0 m for the main seams. The sediments of the Bowser Basin have undergone two major deformation events, the first of which was of the highest intensity. Compression from the northeast and the southwest occurred during the uplift of the Coast Crystalline Belt. Locally the result of this F1 deformation can be observed in the northwest-southeast trending Beirnes Synclinorium.

In May 2012 Atrum Coal Groundhog Inc. (Atrum) acquired licences within the Groundhog coalfield and conducted their first field program in September and October of that year. In 2013 a more extensive program ran from May to October with a focus on the north-west section of the property, now referred to as 'Groundhog North'. Towards the end of 2013 and into 2014 Atrum acquired a number of additional licences which resulted in an expansion of licence area from 11,118 to 22,364 hectares. Atrum currently owns 32 licences and 25 applications. Application land area is 35,225 hectares and with licence land gives a total of 57,589 hectares.

The 2014 exploration program had two objectives. The first was to define an area for potential bulk sample extraction and identify marker horizons within Groundhog North. This was achieved by drilling 33 holes within a 500 m by 500 m square called the Bulk Sample Area (BSA). The second objective was to drill holes on a regional scale to identify any areas of interest in land recently converted from application to licence. Seven holes were drilled regionally, six on the eastern part of the property and one south of Currier Creek. Following the exploration program, 10 holes were drilled for water monitoring which was managed and supervised by Knight Piesold Consultants. A total of 10,700 m were drilled in 2014 on Atrum's Groundhog property. All exploration drilling was done with HQ3 diamond drill bits; core was logged in a shack at Groundhogs base camp at the Kluatantan Airstrip. Coal samples were sent to ALS Laboratories in Richmond, BC once they were logged. Selected samples were processed under advice from A&B Mylec (Australia) with a focus on defining product specifications for major coal seams.

In July 2014, Atrum excavated 200 tonnes of anthracite coal from a combination of two trenches at the Groundhog property. The main purpose of the trenches was to prove the supply chain of getting coal from Groundhog to Stewart Port, recover at least 100 tonnes of coal, validate drillhole data and collect structural information to aid with the structural interpretation of the BSA. A representative sample from the coal stockpile was taken to Stewart Port and to ALS Laboratory in Richmond, BC.

Coal on the Groundhog Coalfield is anthracite in rank by the ASTM classification of coal rank with RoMax vitrinite values generally ranging from 3.83 to more than 5 %.

[redacted]

[redacted]

The last full coalfield resource estimate was done by Xstract Mining Consultants in April 2013; this was completed on the original plus extension lands and utilised the 2012 drilling data. Since this estimate was done, the property size has grown significantly and considerably more drilling has taken place.

The 2013 estimate found that coal resources have been estimated and reported according to resource classification in two large resource blocks – namely, Block "Res_01" located on the eastern side of the Skeena River, and Block "Res_02" located on the western side of the Skeena River. Resource blocks are limited by tenement outlines, a 100 metre offset from the Skeena River and by an interpreted fault boundary in the south east. The summary coal resource table for reporting under the JORC Code, 2004, is shown below

Table 1.1: Resource Estimation Table

Depth	Measured (Mt)	Indicated (Mt)	Inferred (Mt)	TOTAL (Mt)
<50 m	2	61	91	154
<100 m	7	168	240	415
<200 m	13	388	592	993
<300 m	16	521	883	1420
<400 m	16	553	998	1567

2. Introduction

2.1 Location and Physiographic Setting

The Groundhog Anthracite Project (Groundhog) is situated within the Groundhog Coalfield, located in north-western British Columbia's Cassiar Land District. The project lies close to the northern extremity of the Skeena Mountains within the Bowser Basin approximately 180 km north of Hazelton and 150 km northeast of Stewart, British Columbia, Canada. Other nearby cities include Smithers, British Columbia 240 km to the south, and Prince George, British Columbia 490 km to the southeast (Figure 2.1).

Figure 2.1 Location of Groundhog Anthracite Project and the Bowser Basin

2.2 Access

During Atrum's exploration, Smithers has been the point of access to the site and is where the majority of expediting has been based out of. Minor amounts of equipment have been mobilised to site out of Meziadin Airstrip. Current access to Atrum Coal's Project is limited to the Kluatantan airstrip located to the southeast of the property. The Kluatantan airstrip lies directly beside the project's base camp and is used regularly by fixed wing aircraft and helicopters providing transport and supplies to the camp.

A portion of the British Columbia Railway (BCR) extends from Prince George northwest to Bear Lake. Prior to 1977, steel for the rail was laid from Bear Lake to the Chipmunk airstrip located 30 km southeast of the property but the railway was not completed. North of the Chipmunk airstrip a construction road was graded and cleared parallel to the east bank of the Skeena River and continues to 5 km southeast of the property. From this point to just beyond the northern edge of the Groundhog property line, the rail grade has been graded and cleared but remains in poor condition.

Atrum Coal plans to rehabilitate the rail line and make it a functional transport route to allow access to the site. This will provide access to sea ports along the west coast as well as towns and other infrastructure to allow efficient transport of goods to site and to transport product to market. The distance by rail from Atrum's property to Fort St. James, Prince George, Prince Rupert and Vancouver is 381 km, 497 km, 1,234 km, and 1,294 km respectively.

2.3 Climate

Project-specific meteorological baseline data have been collected at the Groundhog meteorological station since July 19, 2013. The majority of atmospheric parameters monitored during 2013 at the station, and at a station approximately 200 km northwest (Dease Lake EC-MSC station) are similar, indicating that climates at these two locations are comparable. However, the monitoring period for data collected from the Groundhog station is short and definitive statements on local climate cannot be made at this time.

Based on the climate normal data, it can be expected that mean monthly Groundhog station temperatures can typically range between -15ºC and 15ºC, with December and January being the coldest months and July and August being the warmest. Because the temperature variation at the Groundhog station is similar to the temperature variation at the Dease Lake (AUT) station, it is expected that hourly temperatures at the Groundhog station can range between -40ºC and 35ºC, annually.

Based on the climate normal data, it is expected that monthly precipitation at the Groundhog station will typically be highest between August and November, and lowest between March and May. The ClimateWNA climate normal estimate for the Groundhog station location estimates the lowest monthly precipitation to be 40 mm in March and the highest to be 132 mm in November, with an annual total of 926 mm. Climate WNA is a high-resolution climate modelling program which utilises historical weather station data to project future seasonal and annual climate variables in Western North America.

Long term climate normal records show that there is typically no snow from June to September and snow starts to accumulate towards the end of October, with the deepest accumulation in late winter.

Winds during the monitoring period blew from the southwest direction, approximately 12 % of the time, with a secondary wind from the south-southeast which occurred approximately 9 % of the time. The most frequent wind speeds were calm which occurred approximately 50 % of the time. The monitored wind speeds were fairly low and monitored wind speeds exceeded 4 m/s for only 0.2 % of the time.

2.4 Historical Perspective

During the 1872 to 1878 gold rush, prospectors traveling to Cassiar from Fraser Lake made the first coal discoveries near the Groundhog Coalfield. It was not until 1900 though, that the first report mentioning the Groundhog Coalfield was given to the Canadian Department of Railways and Canals by V.H. Dupont. His report detailed the existence of several outcroppings of coal located at the convergence of Didene Creek and the Spatsizi River approximately 50 km northwest of Atrum Coal's current Groundhog Project.

In 1903 the first claims were staked in the Groundhog Coalfield by James McEvoy and W.W. Leach, who also had holdings on the Skeena River and the Discovery, Currier and Davis Creeks. Preliminary exploration of the area commenced in 1904 and inquiries were made into the building of a rail route near the coalfield.

During the period between 1910 and 1912 exploration was carried out by various companies and individuals. G.H. Malloch completed a geological evaluation of the southern Groundhog Property in 1911 and was the first to begin applying nomenclature to the local stratigraphic formations. The abundance of interest in the area around this time was partially due to the expectation that the Canadian Northeastern Railway would be built to extend near the Groundhog Coalfield's location. With the onset of World War 1 all exploration ceased along with the railway construction.

Activity at the Groundhog Coalfield did not resume until several years after the end of the Second World War. In 1948 A.F. Buckman and B.A. Latour of the Geological Survey of Canada (GSC) conducted geological reconnaissance and compiled a report of their findings along with the details of all previous exploration that had taken place. The GSC revisited the Groundhog Coalfield in 1957 with Operation Stikine. This resulted in the creation of a base map but no definitive correlation of coal seams, stratigraphy, or structural information.

In 1966 Coastal Coal acquired coal exploration licences on the Discovery Property in the Groundhog Coalfield. Two years later in 1968 Professor R.V. Best and a team spent nine weeks conducting helicopter assisted exploration of the licenced areas during which approximately 3,885 km^2 was mapped. From this exploration, Best was able to divide the local strata into four definable unites: Lower Conglomerate, Lower Shale, Upper Shale and Upper Conglomerate. The 56 surface samples taken during this time were subjected to proximate analysis. The report written by J.M. Black detailed the results of this analysis but did not indicate which laboratory processed the samples. Black's report also provided the sample's locations on extensive hand drawn geological maps of the property.

From 1969 to 1970, W.D. Tompson led a joint venture in the Groundhog Coalfield between Quintana Minerals Corporation, National Coal Corporation Ltd, and Placer Development Ltd. Exploration consisted of surface mapping and six diamond drill holes, most of which plot just west of Atrum Coal's current Groundhog Property. Samples were taken from coal seams within the six drill holes and sent for proximate analysis and specific gravity testing at Commercial Testing and Engineering (CT&E) in Ladner, British Columbia.

Tompson's team determined that the property was directly underlain by rocks of what was termed the "Coal-Bearing Lithosome". This lithosome was part of the nomenclature Tompson had designed for the stratigraphic sequence he assembled for the property, which is listed in depositional order as follows: McEvoy Ridge Lithosome, Coal-Bearing Lithosome, Devil's Claw Conglomerate Lithosome and the Lonesome Mountain Lithosome. The local strata were further subdivided into three facies and correlated with the depositional and tectonic history of the Bowser Basin in 1974 by G.H Eisbacher.

Eisbacher examined the eastern margin of the basin and applied the following titles to his subdivisions: Duti River-Slamgeesh Facies, Groundhog-Gunanoot Facies, and the Jenkins Creek Facies.

In 1977 BC Hydro considered using coal to operate a thermal power generating plant and appointed W.D. Tompson, from the previously mentioned joint venture, to review all work that had been done in the Groundhog Coalfield. All drilling, trenching, sampling and mapping was detailed in an extensive report. After examining all existing information, Tompson stated "The coalfield is in the very early stages of exploration, so therefore it is not possible to accurately calculate the coal reserves or the tonnage of recoverable clean coal. However, it is shown that the area between Evans Creek and Discovery Creek is underlain by relatively undisturbed coal seams." From this data Tompson determined four exploration targets for BC Hydro to explore.

In 1978 Groundhog Coal acquired seventy-seven coal exploration licences in the Groundhog Coalfield. The company started out with a large exploration program aimed at reviewing and confirming previous work done in the area, but after some initial analysis it was decided that the local geology was not as clearly defined as originally anticipated. The project was reorganized with a focus on the more promising targets, and coal exploration licences were reduced from seventy-seven to three which encompassed parts of Upper Discovery Creek and Davis Creek. Traverses along both Upper Discovery Creek and Davis Creek were carried out by B. Mountford in the field seasons of 1978 and 1979. Mountford dug out and measured partially exposed coal seams along Upper Discovery Creek but noted he was unable to locate several of the coal seams along Davis Creek which had been mentioned in previous reports.

In 1980 Mountford, accompanied by L.G. Scott, completed a helicopter assisted preliminary geological program on the three remaining Groundhog Coal exploration licences. Kerr reported after mapping a 25 km area with evenly spaced 25m grids that coal outcroppings were few and far between and generally only found adjacent to the main creeks. When encountered, the coal seams were sampled and mapped in detail. Measurements taken during these field excursions led Kerr to conclude that there was no evidence to support the existence of any major structural disturbances in the Groundhog Coalfield aside from gently dipping 10^o to 20^o beds with strikes varying from 130^o to 185^o. Surface samples taken were sent for proximal analysis at Commercial Testing and Engineering (CT&E) in Ladner, British Columbia.

Later in 1980, L.G. Scott obtained six more coal exploration licences in the Groundhog Coalfield, of which John Kerr and team completed a cumulative eleven day preliminary analysis. These new licences covered several known and projected coal outcroppings near Telfer Creek, Beirnes Creek, and Currier Creek.

In 1981 coal exploration licences were issued to Petro-Canada for the eastern boundary of the Groundhog Coalfield. After initial exploration of the area, Petro-Canada concluded that insufficient thickness and quality of the coal seams, in conjunction with tight folding, made the area unsuitable for conventional mining. Despite suggesting that the currently held licences be abandoned, Petro-Canada recommended the close monitoring of any GSC programs taking place in the Bowser Basin as well as any exploration being conducted by other licence holders in the area.

Other work completed in 1981 within the Groundhog Coalfield included six diamond drill holes completed by Imperial Metals near or on the current Groundhog Property. No official report was released but geophysical logs, strip logs, and descriptive logs were filed with the BC government.

In 1982 and 1983 Suncor acquired twenty-nine coal exploration licences amounting to a 6,439 hectare property located in the southern portion of the Groundhog Coalfield near Mount Jackson. In 1983 Suncor carried out a helicopter supported geological mapping, trenching, and sampling program spanning all the licences held. Sixteen trenches totaling 104.2 m were dug, and samples taken were sent to Calgary for analyses by Birtley Coal and Minerals Testing Ltd. Field teams traversed the exposed south facing slopes of Mount Jackson and Falconer Mountain. From these traverses, stratigraphic columns were created and it was interpreted that coal seams should be present underneath the lower north facing slopes of Mount Jackson and extend beneath the Jackson Flats, McEvoy Flats, and Trail Creek.

In 1984 Groundhog Coal Limited commenced an exploration program on six licences they obtained in 1982. The licences were located west of the Skeena River valley between Beirnes Creek and Currier Creek. The program consisted of geological mapping, trenching, and sampling but no drill program was conducted. A total of twelve trenches were dug, from which 23 representative coal samples were taken and subjected to analysis at Cyclone Engineering Sales Ltd. (Cyclone) in Edmonton, Alberta.

Indicated resource estimates calculated by Groundhog Coal Limited following their 1984 exploration program included information obtained from samples, trenches, and diamond drill holes completed by National Joint Venture's 1970 program and Imperial Metals' 1981 program. Estimates were based on the classifications adopted by Cordillera Region and Energy, Mines and Resources Canada in Report ER79-9, Coal Resources and Reserves of Canada. In their report Groundhog Coal Limited further defined their indicated resources as "those computed partly from specific measurements and partly from reasonable geologic projections. For the mountainous regions the maximum distance between points of observation should be 600 metres or less". According to those parameters, Groundhog Coal Limited calculated the historical in-situ indicated resources at 11.5 million tonnes within their coal exploration licence area.

Gulf Resources Canada Limited also conducted exploration programs in 1983 and 1984 on thirty-two coal exploration licences making up their Evans Creek Property just east of the licences held by Groundhog Coal Limited. The programs consisted of helicopter supported 1:10,000 scale geological mapping based along drainage channels, and nine hand trenches. Representative samples taken from trenched coal seams with a true thickness greater than 0.5 metres were sent to C T & E in 1983 and Loring Laboratories Ltd in Calgary, Alberta for analysis in 1984.

Between 1985 and 1988 Gulf added eighteen new licences to the south of their initial thirty-two licences. Work done in 1985 on the Evans Creek Property was used as the basis for a speculative coal resource estimate amounting to 504 Mt. After an exploration program consisting of geological mapping, trenching, and sampling was carried out in 1988, Gulf's speculative coal resources estimate for the expanded Evans Creek Property was brought up to 1,538 Mt.

In 2008, an 11 hole drill program was completed by West Hawk on the Groundhog Property primarily focusing on the historic area around Discovery Creek with all exploration falling between Davis and Currier Creeks. The work consisted of geologic mapping, trenching, diamond drilling, downhole geophysical logging, sampling and subsequent analytical work. Samples were subjected to both coal quality analyses and one sample was tested for vitrinite reflectance.

In 2012 Moose Mountain Technical Services built a geological model for Atrum Coal based on twenty-three historic diamond drillholes totaling 4,643.2 m and 30 hand trenches totaling 95.5 m. This was done prior to Atrum conducting any field work.

In May 2012 Atrum Coal Groundhog Inc. (Atrum) acquired the Groundhog Anthracite Property and conducted their first field program in September and October 2012. This program involved drilling 15 holes totalling 4,992 m.

Atrum conducted an extensive field program consisting of diamond core drilling, field mapping and hand trenching from May to October in 2013. This program involved approximately 8,000 m of drilling in 64 holes. 43 of the drill holes were HQ sized for exploration and 17 were PQ sized to gather large diameter samples for washability testing.

In 2014 Atrum Coal continued exploration, focusing primarily on the Bulk Sample Area (see Section 5.3) within the north-west to define an area to extract a bulk sample as well as regional drilling on tenures recently converted from application to licence to identify potential future targets. The 2014 drilling program involved 10,700 m of drilling with a total of 52 holes. The 2014 exploration program also involved a seismic reflectance survey in winter to assist with structural interpretation; unfortunately, this program had limited success due to the structural complexity of the area surveyed. A trenching program was also undertaken with an excavator and dozer. Approximately 200 tonnes of coal were removed from two trenches as a trial excavation with samples from this sent to ALS laboratories in Richmond, BC for coal quality and washability testing.

In 2015 Atrum did not conduct any drilling or geophysical work, but focused instead on permit applications, interpretation of data and a limited field mapping and trenching program to verify office based studies. The small trenching program focused on one outcrop east of the Bulk Sample Area where Atrum's main target seam, Duke E, was identified. This is the first positive identification of the Duke E seam in outcrop and confirmed geological modelling and interpretations from the 2014 exploration program. This period of consolidation proved necessary and was critical to the interpretation of the Groundhog Coalfield and has allowed Atrum to grow a solid understanding of the geological situation.

2.5 Acknowledgements

The work undertaken on the Groundhog Project in 2015 was conducted by various contractors, consultants and staff under the management and supervision of Atrum staff. This report was prepared by Mr. Hayden Mackenzie and Daniel Campbell of Atrum Coal with the input from other Atrum geological staff and the following groups:

- ALS Laboratories for coal quality analyses
- Birtley Coal for coal quality analyses
- GEEL Enterprises for Camp Services and Expediting
- Silverking Helicopters for helicopter field support
- Tsayta Aviation for fixed wing air support
- Knight Piesold for hydrogeology program management and base line hydrogeology work
- SRK for geochemical baseline and mine drainage work.
- McElhanney for road design and LiDAR surveys
- ECOFOR for archaeological investigations
- Kleanza for archaeological reporting
- Greenwood Environmental for environmental and permitting consulting
- A& B Mylec for coal quality interpretation and advice

Mr. Hayden Mackenzie of Atrum Coal Groundhog received a Bachelor of Science in Geology and a Master of Science in Engineering Geology from the University of Canterbury. Hayden has been employed as a Geologist and Engineering Geologist with CRL Energy in New Zealand with published research on acid rock drainage remediation as well as extensive experience in exploration project management for coal and Coal Bed Methane programs in New Zealand, Indonesia and Vietnam. He worked as a Senior Geologist for Coal Marketing International, managing exploration programs in Indonesia and Australia and conducting research and analysis of international coal markets and trading. Hayden has been working directly and indirectly through DMT Geosciences with Atrum Coal since May 2013 and is now the Atrum Coal Geology Manager.

3. Tenure

The Groundhog Anthracite Property currently consists of 32 contiguous licences covering 22,364 Ha and 25 adjoining coal licence applications covering 35,225 Ha for a total of57,589 Ha.

The property coal licences are held by Atrum Coal Groundhog Inc. Licences are summarised in Table 3.1 and shown in Figure 3.1. A larger map is appended (Appendix 4).

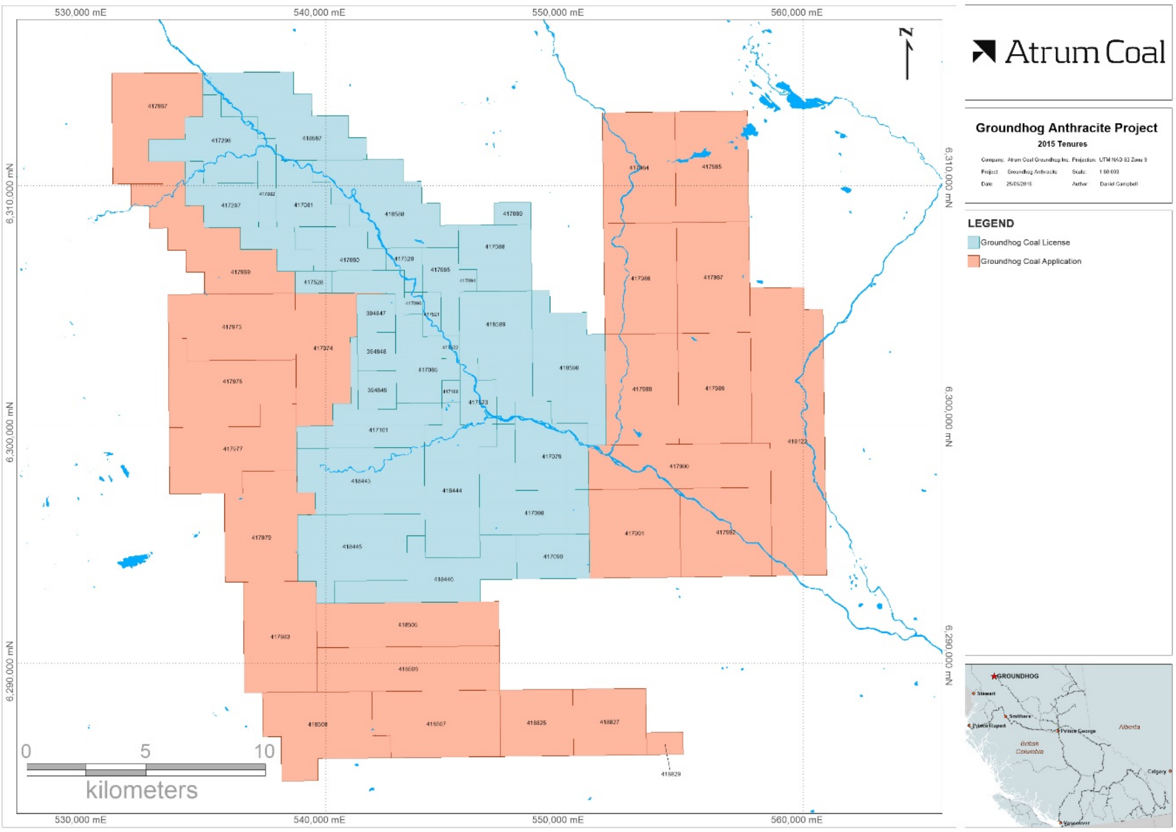


Figure 3.1 Groundhog Project Area and Tenures

Table 3.1 Groundhog Project Area Tenures (2015)

Tenure Number	Business Unit	Tenure Type	Tenure Sub Type	Good to Date	Area (Ha)
394847	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	259
394848	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	259
394849	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	259
417079	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	991
417080	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	565
417081	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	636
417082	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	212
417085	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,031
417088	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	777
417089	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	142
417090	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	568
417094	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	71
417095	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	425
417096	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	71
417098	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,204
417100	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	71
417101	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	960
417297	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	918
417298	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,059

417520	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	212
417521	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	142
417522	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	71
417523	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	354
417528	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	142
418443	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,416
418444	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,416
418445	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,417
418446	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,205
418587	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,411
418588	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,412
418589	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,273
418590	Atrum Coal Groundhog Inc	Coal	License	2016/may/31	1,415
				Subtotal	22,364
417967	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,411
417969	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,413
417973	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,414
417974	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,265
417975	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,415
417977	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,416
417979	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,418
417983	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,418

417984	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,412
417985	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,412
417986	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,413
417987	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,413
417988	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,415
417989	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,415
417990	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,416
417991	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,417
417992	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,417
418122	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	3,375
418505	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,500
418506	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,500
418507	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,500
418508	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	1,500
418825	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	900
418827	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	900
418829	Atrum Coal Groundhog Inc	Coal	Application	1900/jan/01	150
				Subtotal	35,225
					57,589

4. Geology

4.1 Regional Geology

4.1.1 Bowser Lake Group

The Bowser Lake Group comprises a 3,500 m thick sedimentary succession in the Groundhog project area and consists of the following formations as shown in Figure 4.1 from youngest to oldest.

- The Devil's Claw Formation;
- The McEvoy Formation;
- The Currier Formation; and,
- The Ashman Formation

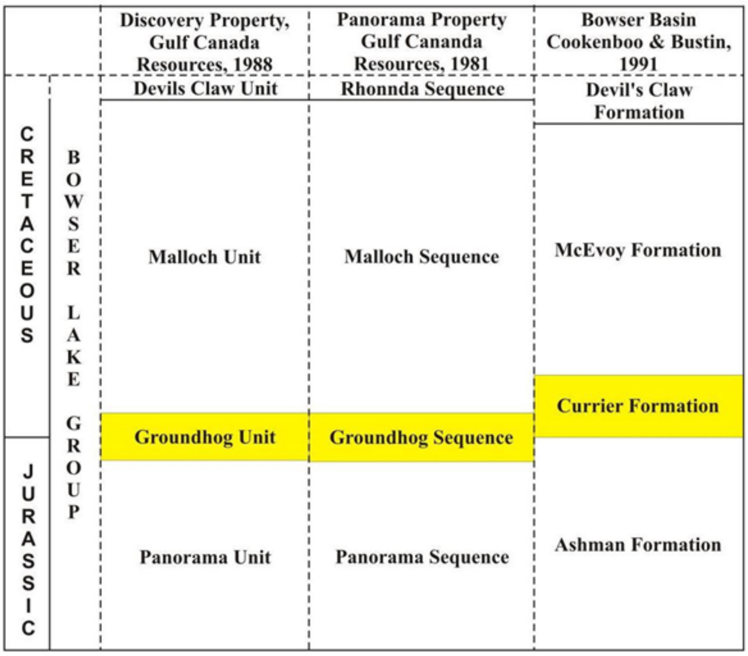


Figure 4.1 Stratigraphic Column - Bowser Lake Group (MMTS, 2012)

4.1.2 Devil's Claw Formation

The Devil's Claw Formation overlies the McEvoy Formation and consists primarily of thick successions of conglomerates with minor interbeds of sandstone, siltstone and shale. This 300 to 500 m thick formation is interpreted as being deposited in a high energy environment such as that on an alluvial fan. Both large-scale cross bedding of conglomerates with pebble to cobble sized clasts and homogenous conglomerates can be seen in the Devil's Claw Formation. Both are clast-supported and composed of well-sorted and well-rounded chert, volcanic quartz and occasional granodiorite clasts.

4.1.3 McEvoy Formation

The McEvoy Formation overlies the Currier Formation. Strata from the 600 to 1,000 m thick McEvoy Formation are interpreted as being deposited in paralic and brackish waters from a fluvially dominated delta system. Coarsening-upward, silt mudstones are the dominant facies but sandstones and conglomerates are present, as well as thin sub-anthracite seams.

4.1.4 Currier Formation

The approximately 1,000 m thick Currier Formation overlies the Ashman Formation and is the primary coal bearing formation of the Groundhog Coalfield. It is deltaic in origin and records a change from the underlying Ashman Formation to alternating marine and non-marine deposition. The formation consists of alternating beds of shale and sandstone with lesser amounts of siltstone, conglomerate and coal.

Prior to 1991 the Currier Formation was referred to either as the Groundhog Sequence or Groundhog Unit.

4.1.5 Ashman Formation

The approximately 1,800 m thick, fully marine Ashman Formation is the oldest formation in the Bowser Lake Group. The Jurassic age formation is composed of mostly dark bluish grey to black shale that coarsens upwards repetitively to shallow-marine sandy mudstone and sandstone.

4.1.6 Bowser Basin

The Bowser Basin covers an area of approximately 50,000 km^2 and is the largest contiguous basin in the Canadian Cordillera. The Bowser Basin developed as a result of tectonic compression and uplift of the Coast Mountains during the Upper Jurassic. This created an inland basin from which the sea regressed leaving behind a sequence of coarsening upwards clastic sediments of the Bowser Lake Group ranging in age from the Upper Jurassic (175 million years) to Cretaceous (130 million years).

The Bowser Basin is defined by the outcrop extent of the Bowser Lake Group and is bounded by the Stikine Arch to the south.

There is good coal development in the Currier Formation across a broad area of the northern Bowser Basin with at least 25 individual coal seams documented.

Structurally the sediments of the Bowser Basin have undergone two major deformational events; this is described in detail in Section 4.5 Structural Geology.

A stratigraphic column for the Bowser Lake Group is shown in Figure 4.2

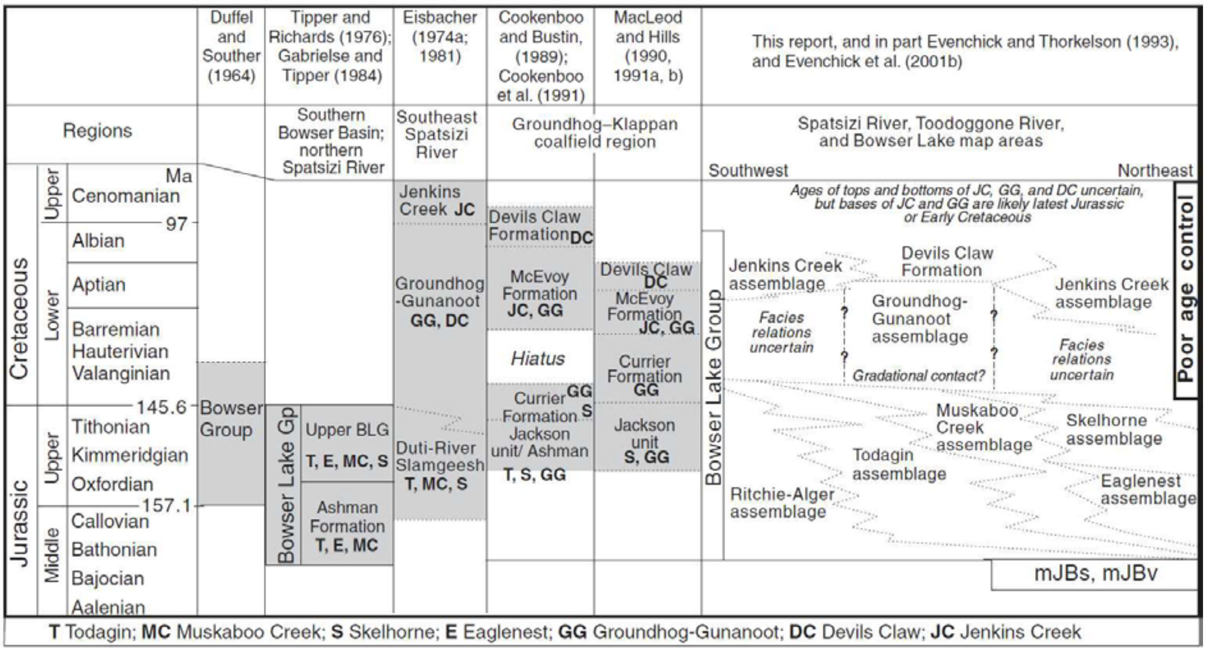


Figure 4.2 Stratigraphy of the Bowser Lake Group, Groundhog Coalfield

4.2 Local Geology

Following the 2014 field season, Atrum geologists along with consultants spent approximately two months working on coal seam correlation and interpreting all available data to build a better understanding of the local geology. This work began with identifying marker horizons (see Section 4.2.2), which enabled the identification of structure in the areas of interest with high accuracy. Geologists were then able to assign coal seam names working outwards from marker horizons. This was checked against core photographs, dipmeter data, geophysical logs, core logs and coal quality results to ensure a high level of confidence. Initially this work took place for the Bulk Sample Area (BSA) where a considerable amount of drilling took place in a small area (Figure 4.3). Once this area was correlated it was possible to move out of the BSA and apply the same methodology to drill holes on a project-wide scale and to historic drill holes. Data interpretation continued through 2015 with input from various consultants and different modelling methods being trialled to build the most accurate model as possible with the data Atrum had.

4.2.1 Coal Seam Geology

The coal-bearing Currier Formation consists of alternating beds of shale and sandstone, with lesser amounts of siltstone, conglomerate and coal. Strata are generally arranged in coarsening-upward units ranging from 30 to 60 m thick in the lower part of the formation. Within Groundhog tenure areas, the thickness of the coal-bearing unit, locally known as the Currier Formation, is approximately 600 m thick.

Coal occurrences indicate the base of the Currier Formation.

Atrum's 2014 exploration drilling program had two objectives, the first was to define an area known as the Bulk Sample Area (BSA) within Groundhog North, this was to accurately determine the coal occurrence and coal quality in a potential bulk sample area. The focus on the BSA in 2014 was a consequence of positive coal intersections derived from drill holes drilled in 2012 and 2013. The secondary objective was to drill regional drill holes to identify new areas of interest within tenure areas recently converted from application to licence. Drill hole site locations are shown in Figure 4.3.

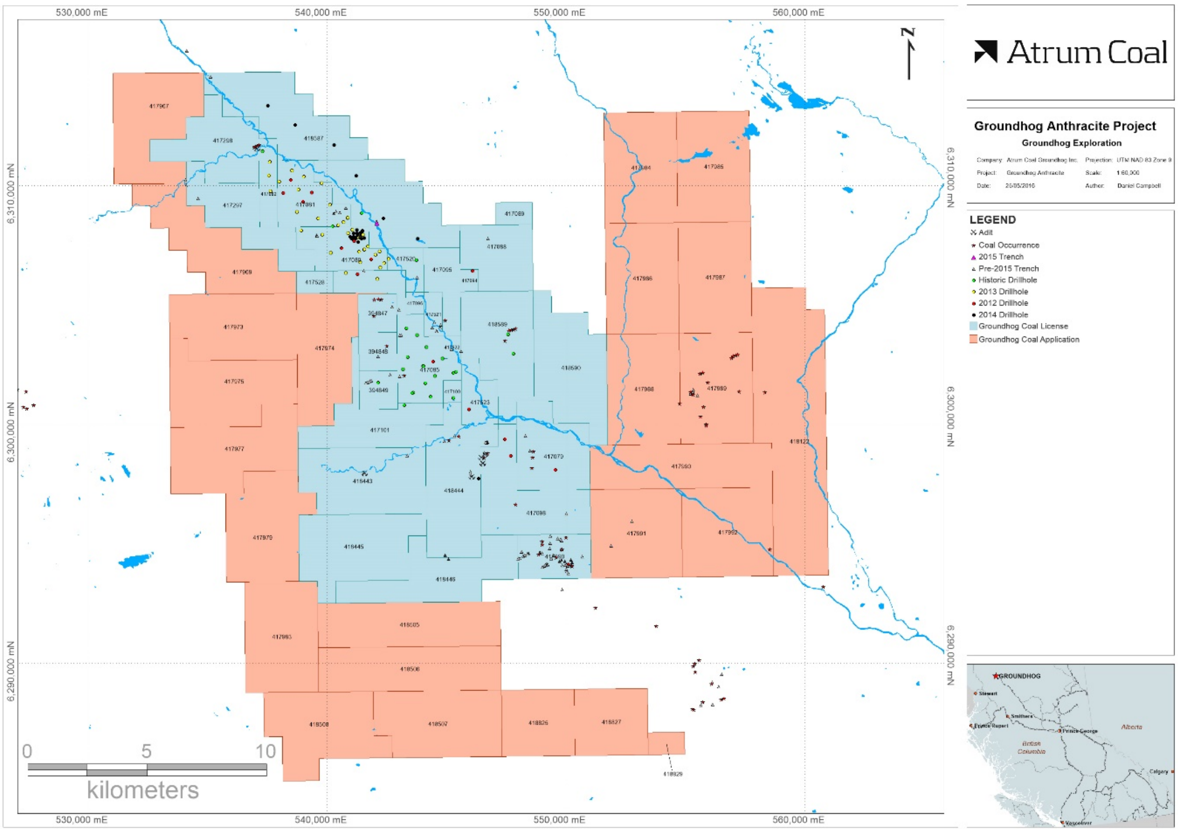


Figure 4.3 Drillhole locations at Atrums Groundhog Project

4.2.2 Marker Horizons

A significant aim of all Atrum drilling programmes was to identify a distinct marker horizon within the Currier Formation to aid with coal seam correlation and improve drill program effectiveness by increasing the ability to accurately target specific coal seams. During the re-correlation exercise which took place in the second half of 2014, two distinct marker horizons were identified which have now been called 'Marker 1' (M1), and 'Marker 2' (M2). These are a distinct sequence of lithologies and characteristics within the coal measures and are described below.

4.2.2.1 Marker 1

Marker 1 is a massive, clean sandstone 3 to 8 m thick with accessory quartz veining. It is distinctly recognised in geophysical logs by its clean gamma signature (Figure 4.4). Marker 1 is bound by siltstone above and below, with a sharp upper contact and a gradational lower contact (Figure 4.4 and Figure 4.5). The younger siltstone is capped by fine grained sandstone with a distinctive darker mudstone bivalve horizon defining the fine grained sandstone / siltstone contact. The bivalve horizon rests approximately 5-10 m above Marker 1. Below the clean sandstone is a sequence consisting of siltstone with sandstone, and the subsequent Discovery B coal seam. The sandstone of Marker 1 has an average thickness of 5 m and a range in thickness from 3 to 8 m.

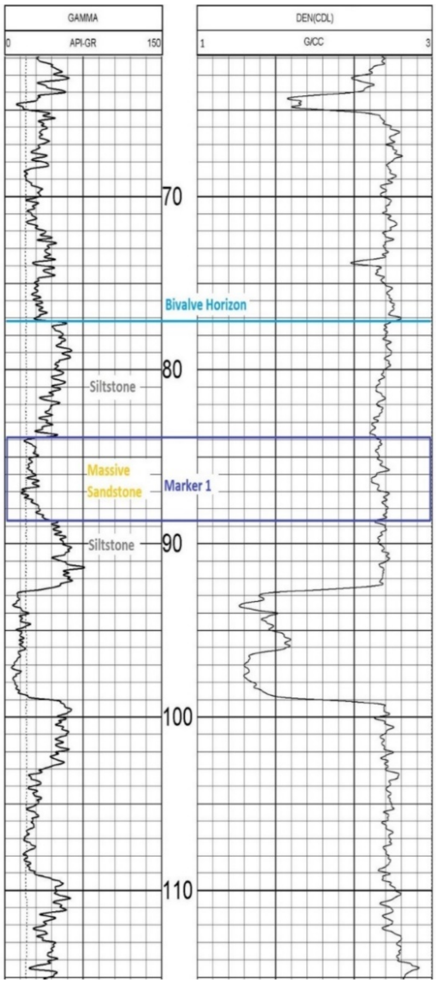


Figure 4.4 Geophysical log from drill hole DHGH14-12 displaying gamma (left) and density (right) of Marker 1. The low gamma signature of the clean, quartz-rich sandstone of Marker 1 is evident.

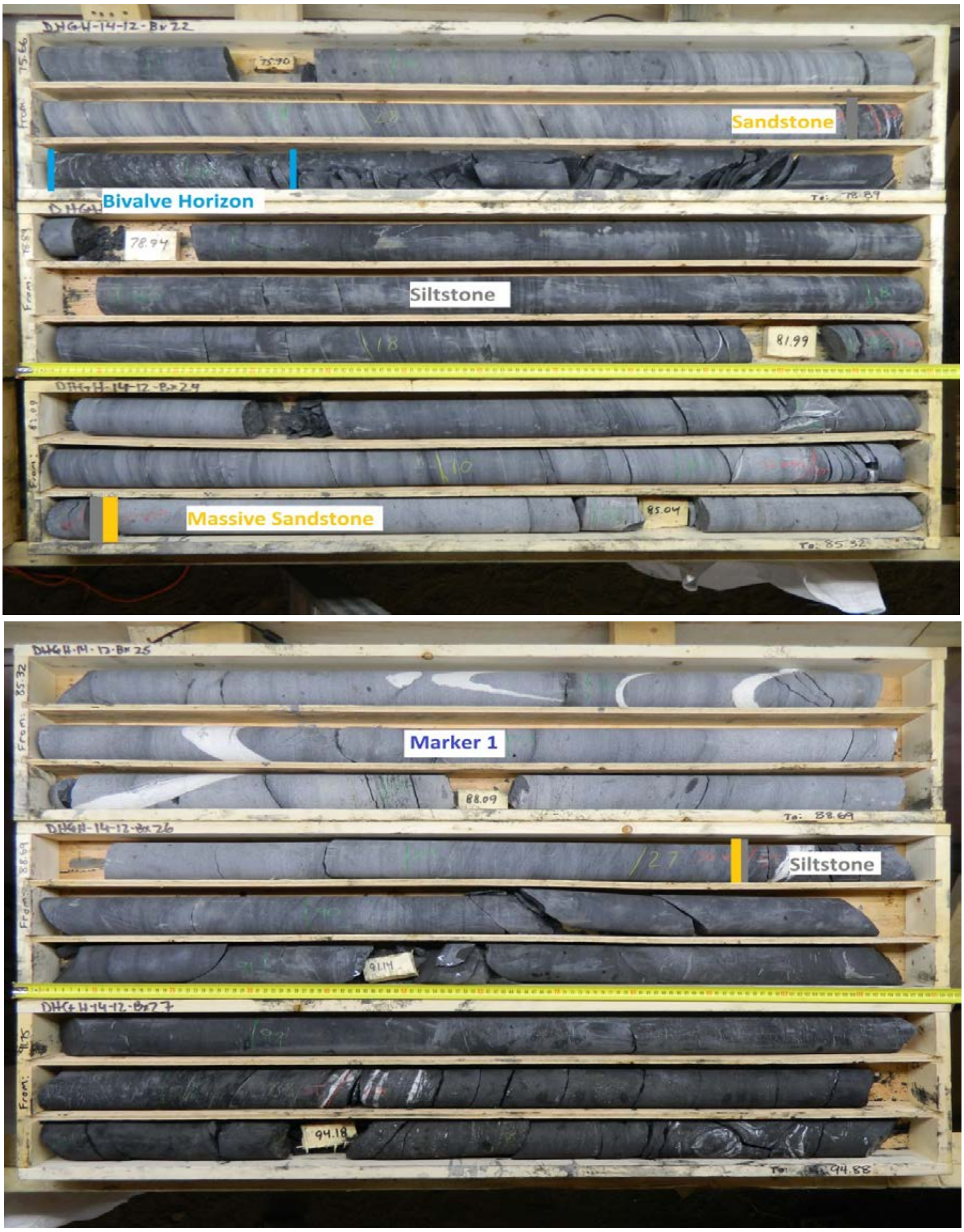


Figure 4.5 Marker 1 as it appears in drill core from drill hole DHGH-14-12, displaying a clean sandstone with accessory quartz veins. The bivalve horizon is visible above the marker.

4.2.2.2 Marker 2

Marker 2 occurs stratigraphically deeper than Marker 1; it is comprised of three units. A clean, massive sandstone 3 to 5 m thick with accessory to common quartz veining to poorly developed quartz stockwork marks the beginning of Marker 2. It sharply overlies 1 to 2 m of siltstone, which grades into a sandstone with siltstone bands, 2 to 5 m thick. The upper sandstone unit is easily distinguished in geophysical logs by its clean, low gamma signature (Figure 4.6). The deeper sandstone is finer grained, contains siltstone laminations to bands, and is generally thinner than the shallower sandstone; this is identified by a slight decrease in the gamma signature. This pattern of three lithologies is readily distinguishable in geophysical logs and drill core photos (Figure 4.6 and Figure 4.7). At times, the shallower sandstone is underlain by a single interlaminated sandstone and siltstone unit. The lower sandstone unit grades into a poorly developed siltstone, the base of which is constrained by a bivalve horizon that spans across the contact into poorly developed sandstone.

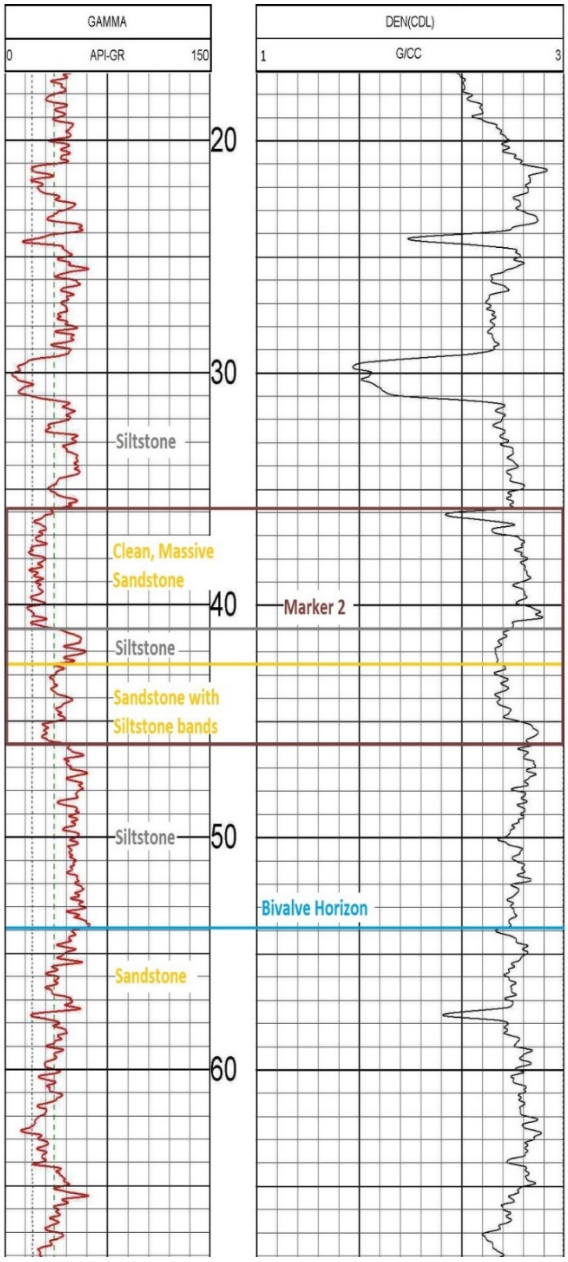
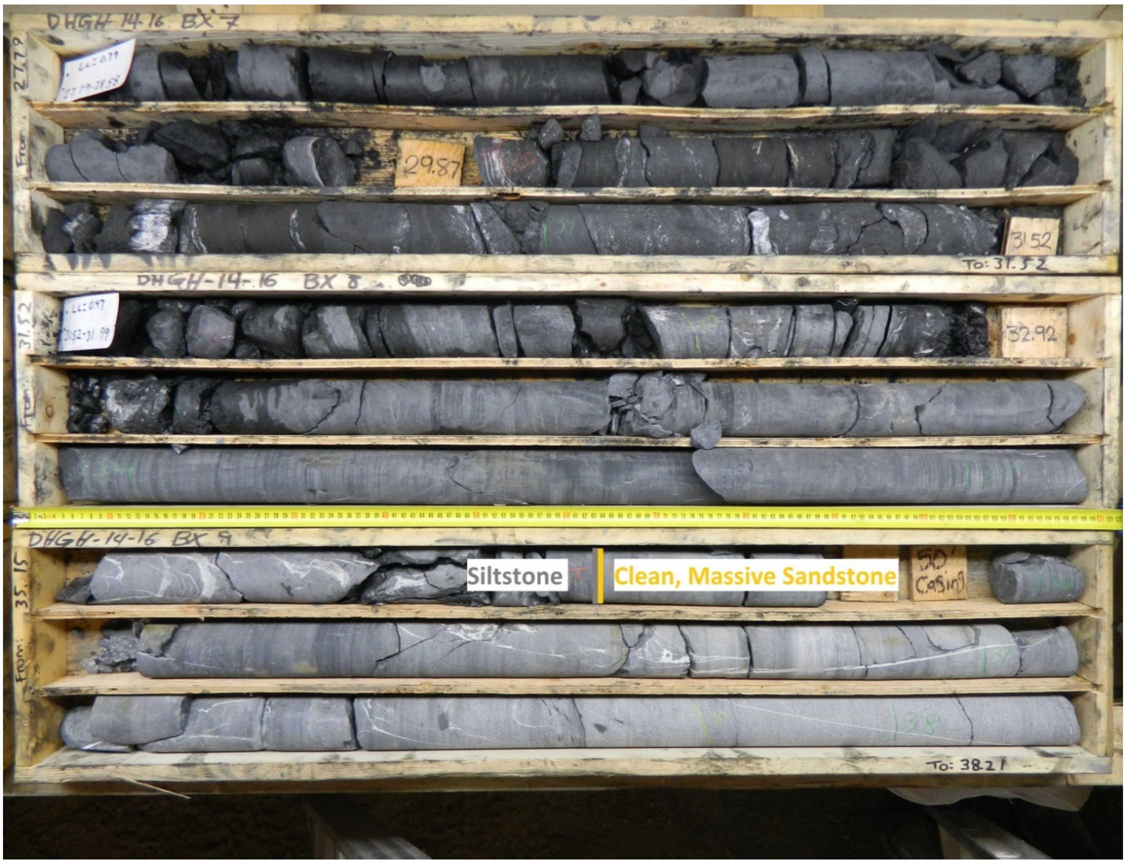
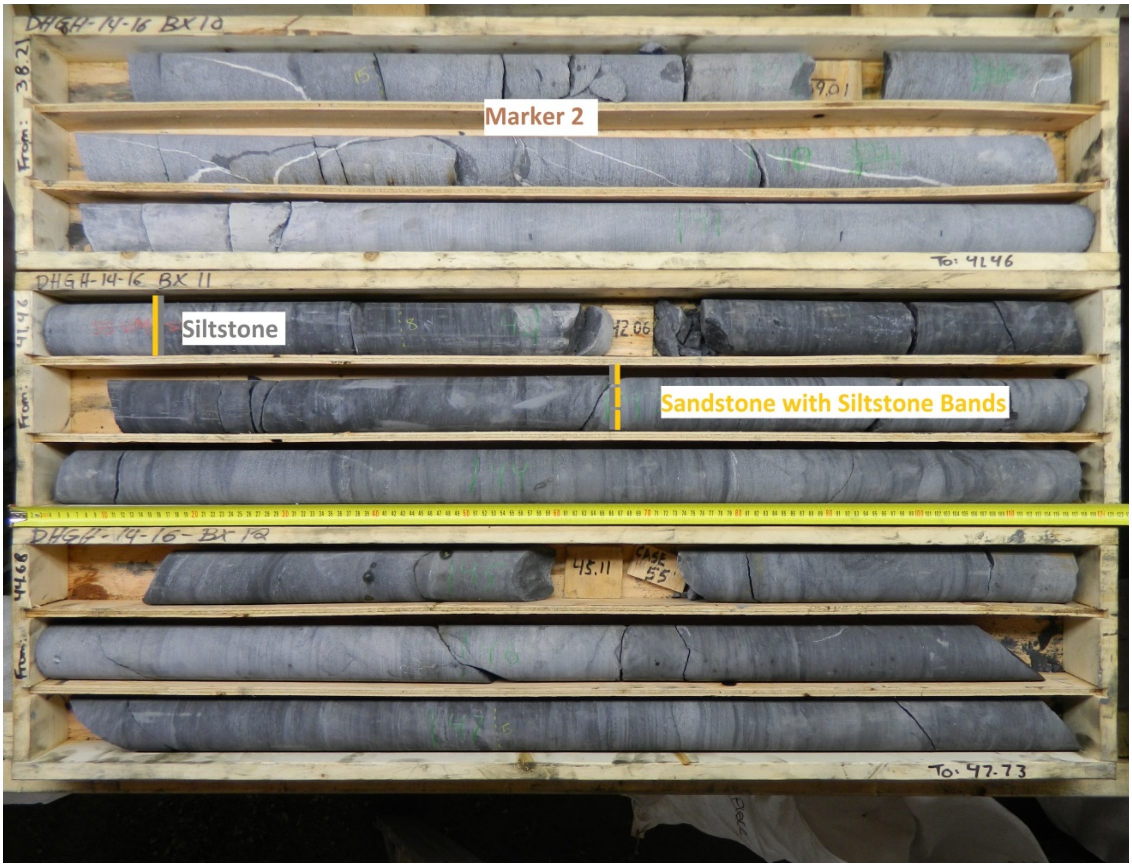


Figure 4.6 Geophysical log from drill hole DHGH-14-16 showing the gamma (left) and density (right) signatures of the units which make up Marker 2.


Siltstone
Clean, Massive Sandstone


Marker 2
Siltstone
Sandstone with Siltstone Bands

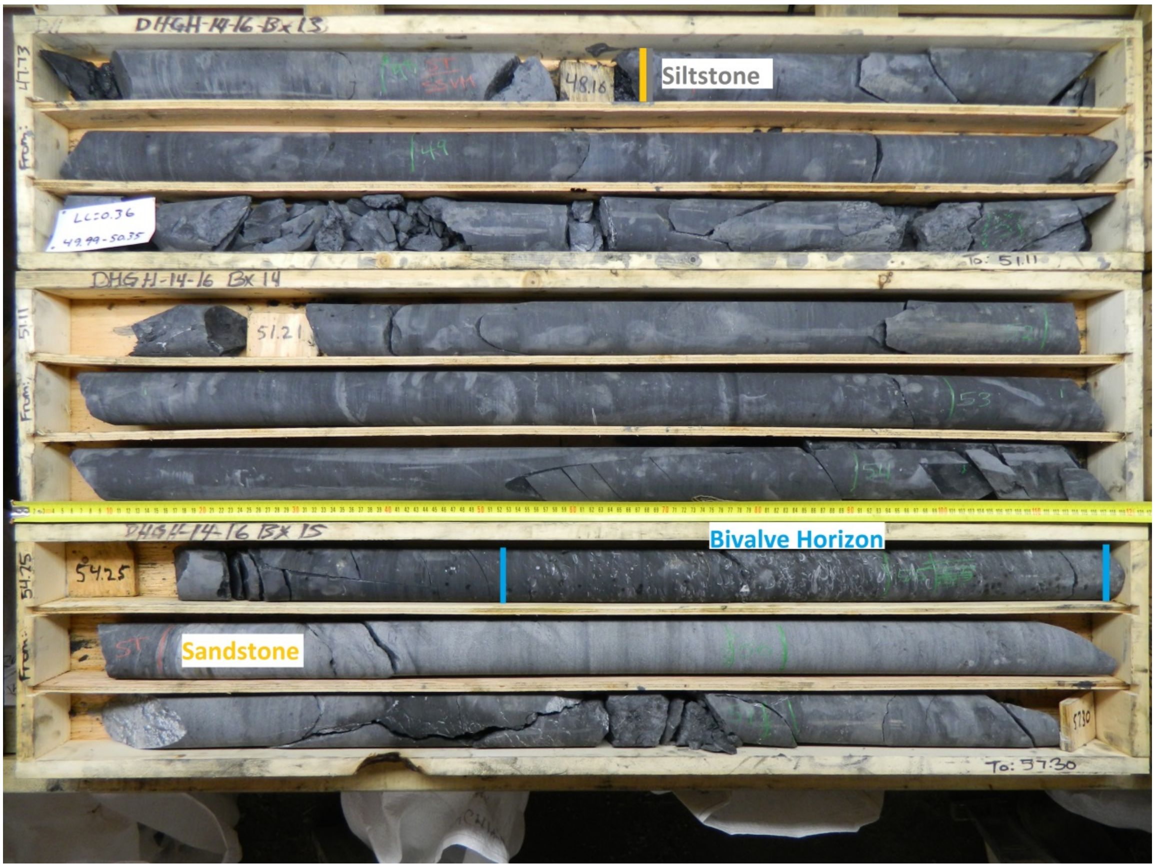


Figure 4.7 Dill core photos from drill hole DHGH-14-16 displaying the three units that comprise a typical Marker 2. The uppermost sandstone is most recognisable by its clean, massive appearance and sharp contact with the underlying siltstone. Following the marker, the bivalve horizon is visible, which further constrains the position of Marker 2.

4.3 Interburden, Veins and Sulphides

The interburden sediments that separate coal seams in the NW area are comprised mainly of interbedded siltstone, sandstone and carbonaceous mudstone beds with minor conglomerate. A schematic drillhole showing typical intersections of the coal seam and interburden stratigraphy is shown in Figure 4.8. The siltstones and sandstones display numerous thin carbonaceous laminations and shelly fragments sometimes forming into pebbly lag beds. Bioturbation and dewatering structures are common within the sediments. Bedding dips range from horizontal to near vertical.

Localised veining occurs within both the sediment and coal seams with veins primarily comprised of quartz, dolomite and minor siderite. Within the coal seams, thin quartz veins and pyrite (lenses or disseminated) are locally abundant, an example of quartz veins and disseminated pyrite is shown in Figure 4.9.

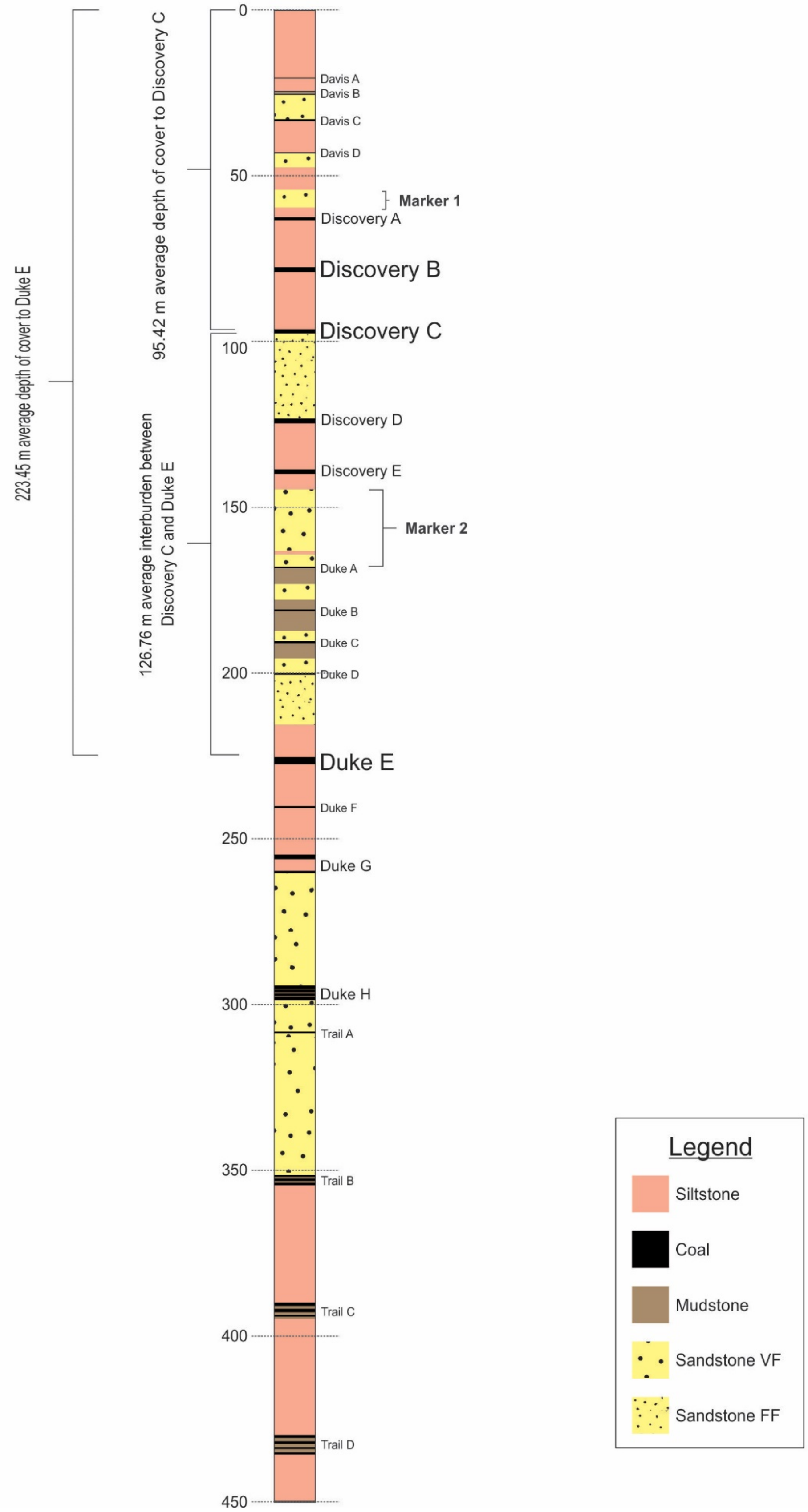


Figure 4.8 Schematic showing typical stratigraphy of Groundhog North

Figure 4.9 Example of disseminated pyrite and quartz veining within DHGH13-03

4.4 Target Coal Seams

Atrum's primary exploration focus in the 2014 field season was to define the occurrence of what was known as Seam 70 within the Bulk Sample Area (BSA), an area chosen following the 2013 field season as a prospective bulk sample site. Following the 2014 field season an extensive period of data review and correlation took place and as a result of this process a new coal seam naming convention was introduced that was still honoured through the 2015 exploration season.

At least 21 known coal seams occur within the Currier Formation on the Groundhog property. These are broken into four horizons starting with the Davis Horizon at the top followed by the Discovery, Duke and Trail Horizons. Seams within these horizons are given a letter starting with an 'A' at the top and additional letters for each new seam down stratigraphy (Table 4.1). Coal seams range in thickness from tens of centimetres to more than 7 m, and typically range from 0.5 to 3.0 m for the seams considered amenable to mining.

Atrum geologists introduced the new coal seam nomenclature following an extensive correlation exercise which evaluated each drill hole independently with drill core photos, drill logs and geophysical logs. As the correlation exercise developed it became apparent that there were more coal seams than previously thought in Groundhog North and that two coal seams (Discovery B and Discovery C) were both being called Seam 70 in previous correlations. The Discovery B and Discovery C coal seams vary in their quality and thickness but typically one or both of the coal seams are greater than one metre in thickness at any point. In previous correlations it was assumed that Seam 70 split and had a large parting in areas where both coal seams are strongly represented; however, upon closer examination made possible by the close drill hole spacing in the BSA, it was proven not to be the case.

As marker horizons were identified, obvious lithological horizons became evident, typically bound by marker horizons or zones with large sandstone beds. This led to the development of the four lithological horizons mentioned above and shown in Table 4.1.

Table 4.1 Nomenclature for each of the identifiable seams in the Groundhog Property. Individual coal seams are given a horizon name and the associated seam; e.g. Duke E.

Horizon	Seam
Davis	A
	B
	C
	D
Marker 1	
Discovery	A
	B
	C
	D
	E
Marker 2	
Duke	A
	B
	C
	D
	E
	F
	G
	H
Trail	A
	B
	C
	D

Within the newly configured horizons, and based on coal seam thickness and lateral extent, Discovery B and Duke E coal seams appear to be most amenable for resource development and these coal seams will be discussed in greater detail below. There are more intersections of the Discovery Horizon than other horizons within Groundhog North due to this horizon outcropping within the BSA. The Davis Horizon has already outcropped in a large portion of the Groundhog property and is usually encountered closer to high topography. The Duke and Trail Horizons were originally thought to occur only deep in drillholes but 2015 exploration results indicate that the Duke E seam surfaces east of the Skeena River. These finding also indicate the Trail Horizon to be shallower east of the Skeena River than previously thought.

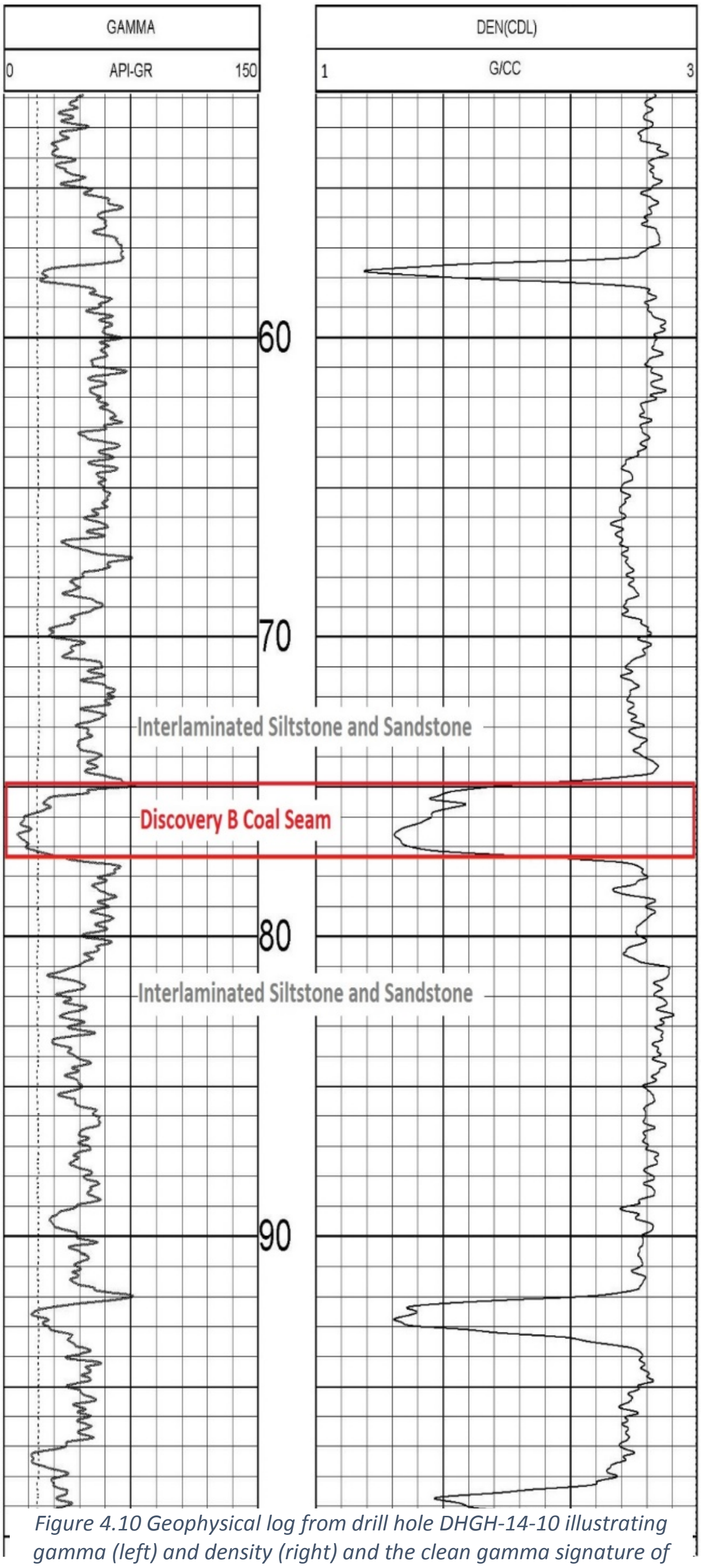


Figure 4.10 Geophysical log from drill hole DHGH-14-10 illustrating gamma (left) and density (right) and the clean gamma signature of Discovery B coal seam.

4.4.1 Discovery B Coal Seam

The Discovery B coal seam is characterized by a clean, low gamma signature and planar, sharp contacts (Figure 4.10 and Figure 4.11). The Discovery B coal seam is comprised of clean, high quality coal; ranges from 0.30 to 4.30 m in thickness with the largest measurements due to local structural thickening. Overall, the Discovery B coal seam has an average thickness of 1.50 m. Typically, 97 % of coal seam thickness is logged as coal; the remainder is comprised of minor quartz-carbonate veining and cleat infill. The Discovery B coal seam was intersected 70 times in drill holes and is stratigraphically the uppermost seam of importance in the Groundhog Property that we currently know about. The continuity, thickness, and shallow depth make the Discovery B coal seam a very viable prospect with respect to further resource development and potential mining.

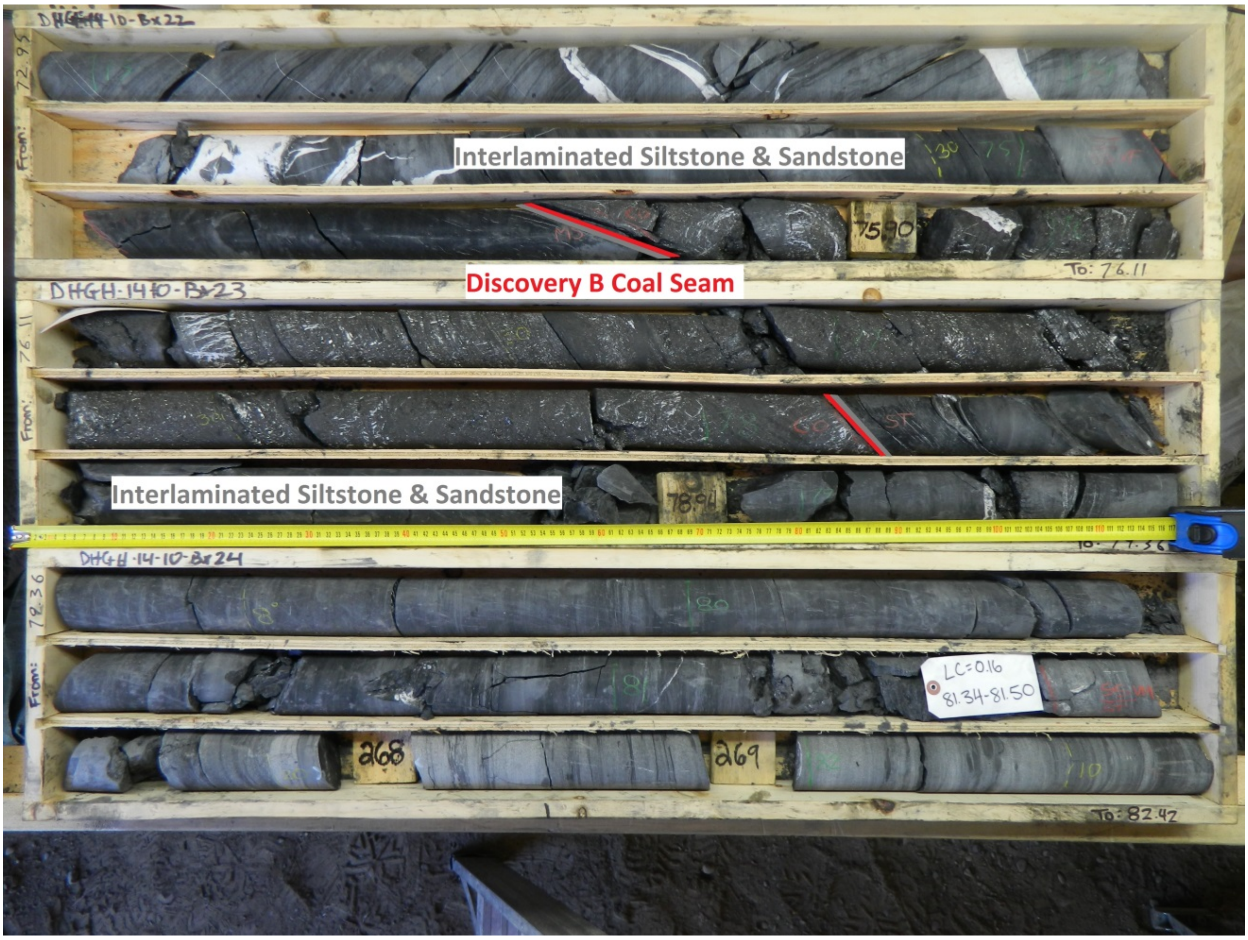


Figure 4.11 Drill core photo of the clean, low density Discovery B coal seam from drill hole DHGH-14-10

4.4.1.1 Plies

The Discovery B coal seam in some instances includes thin, generally less than 10 cm, mudstone partings within the coal seam. Table 4.2 summarises the occurrence of seam parting material within the Discovery B coal seam.

Table 4.2 Discovery B coal seam and parting thickness summary

	Total Cumulative Coal Thickness (m)	Total Cumulative Parting Thickness (m)	Total Thickness (m)	Total % of Section Parting
Average	1.45	0.05	1.50	3
Maximum	4.30	0.74	4.30	50
Minimum	0.3	0	0.3	0

4.4.1.2 Seam Dip

Due to a series of synclines and anticlines trending northeast-southwest, the Discovery B coal seam dips vary considerably from almost horizontal to sub-vertical and in rare situations, overturned in Groundhog North.

4.4.1.3 Depth of Cover

The Discovery B coal seam is considered to be one of the shallower coal targets within Groundhog North; the depth ranges from 0 to 300 m. However, within the main exploration areas the Discovery B coal seam is typically intersected between 0 and 60 m below surface. The Discovery B coal seam dips to the west and topography rapidly increases in height resulting in compounding depth of cover. There are only rare intersections of the Discovery B coal seam on the east side of the Skeena River due to it outcropping and also with limited data points.

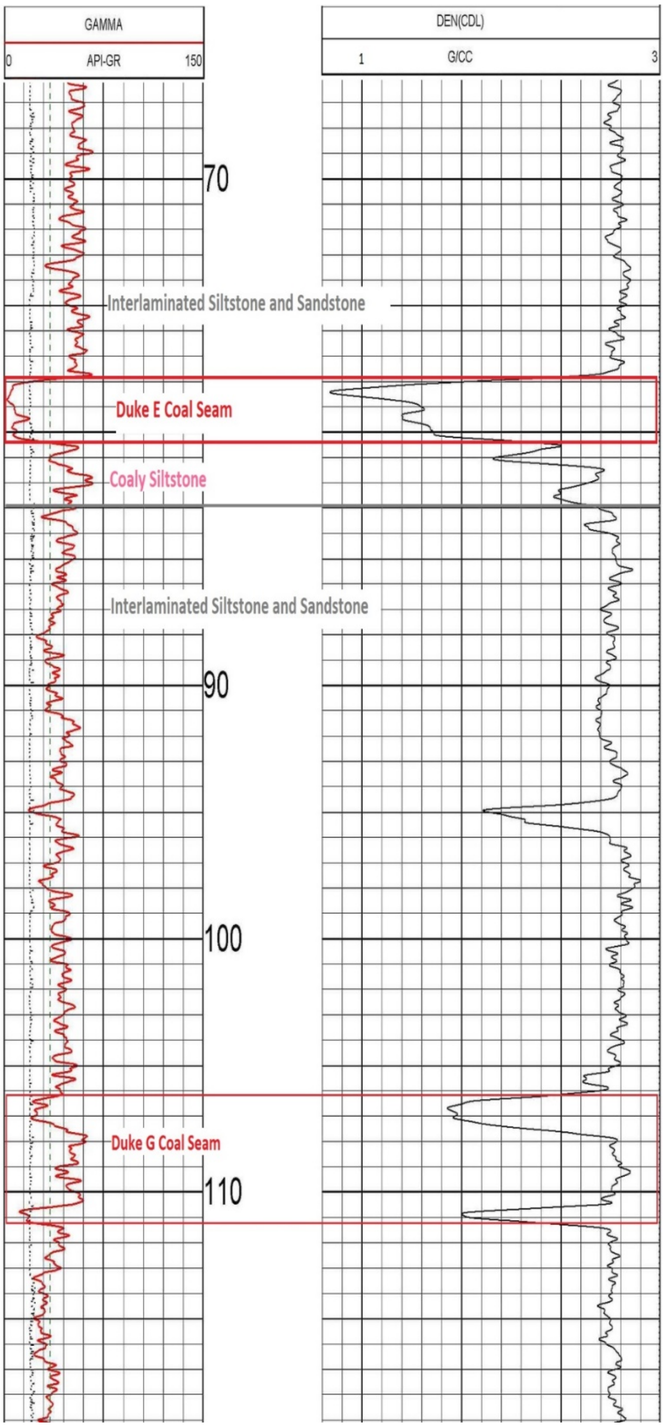


Figure 4.12 Geophysical log from drill hole DHGH-14-35 of gamma (left) and density (right) of the typical Duke E coal seam signature. The sharp contacts and clean coal characteristics are obvious.

4.4.2 Duke E Coal Seam

The Duke E coal seam is distinguished by its very sharp contacts and clean, high grade coal (Figure 4.12) The lower contact is underlain by 1 to 3 m of coaly mudstone that grades out into a coaly siltstone unit. The Duke E coal seam has an average thickness of 2.11 m. In intersection, Duke E coal seam can range in thickness from 0.36 m to up to 8.76 m due to structural thickening. Structural thickening is supported by drill core photos, dipmeter, and drill hole geophysical logs. The Duke E coal seam currently represents the stratigraphically lowermost coal seam of economic importance of the Groundhog Property. This is further substantiated due to the low number of drillholes that penetrate deeper than Duke E coal seam. The Duke G coal seam occurring stratigraphically lower has a very distinct geophysical signature; a 'Marker' perhaps which further constrains the position of the Duke E coal seam (Figure 4.12).

4.4.2.1 Plies

Duke E coal seam in some instances includes thin, generally less than 15 cm, mudstone partings within the coal seam. Table 4.3 summarises the occurrence of partings in the Duke E coal seam.

Table 4.3 Duke E coal seam and parting thickness summary

	Total Cumulative Coal Thickness (m)	Total Cumulative Parting Thickness (m)	Total Thickness (m)	Total % of Section Parting
Average	2.02	0.09	2.11	4
Maximum	8.21	0.74	8.76	69
Minimum	0.36	0	0.36	0

4.4.2.2 Seam Dip

The Duke Horizon bedding dip including the Duke E coal seam has been documented to exhibit far shallower dip angles than that seen higher up in the Currier Formation. There are localised areas where structure increases the dip of the coal seam; but typically the Duke E coal seam dips between 0 and 15 degrees. This is primarily due to the interpretation that the Duke Horizon is structurally less complex than the overlying horizons as a result of thicker, more competent rocks surrounding the seams in the Duke Horizon.

4.4.2.3 Depth of Cover

Duke E coal seam is considered to be one of the deeper coal targets within Groundhog North. The depth ranges from 0 to 300 m below surface within the areas Atrum has conducted most of their exploration. The Duke E coal seam rises closer to the surface east of the Skeena River where it has been intersected in drillholes as shallow as 78 m and has been identified in outcrop at surface on the eastern banks on the Skeena River. To the west of Groundhog North, Duke E coal seam dips downwards and topography increases in height rapidly resulting in increasing depths of cover.

4.4.2.4 Interburden

The interburden thickness between the targeted Discovery B and Duke E coal seams is typically 130 to 160 m. These interburden thicknesses indicate that minimal interaction effects can be expected between the two seams in an underground mining environment.

4.4.3 Other Coal Seams of Significance

During the 2014 drilling program and correlation exercise, two other coal seams of significance were identified. These are the Duke H and Trail B coal seams. There is limited information about these coal seams due to the small number of drill hole intersections; however, the intersections are positive and will become targets for future drilling.

4.5 Structural Geology

The sediments of the Bowser Basin have undergone two major deformational events, the first of which was of the highest intensity. Compression from the northeast and the southwest occurred during the uplift of the Coast Crystalline Belt. Locally the result of this F1 deformation can be observed in the northwest-southeast trending Beirnes Synclinorium (Figure 4.13) and thrust faulting that is more intense in the southern portion of the Groundhog Coalfield than in the north. The southwest limb of the synclinorium dips gently, bringing coal seams in the area closer to surface near the outer most extent of the limb. Evidence for shearing of the coal seams in this portion of the synclinorium is minimal. The northeast limb, however, is overturned and associated with extensive cleavage and shearing in the coal seams as the limb approaches the Skeena River. Cleavages related to F1 deformation are well developed in fine grained lithologies near the fold axes.

Northwest-southeast compressional F2 deformation is coaxial to that of F1, forming shallow, open northeast-southwest trending folds that affect the plunge of F1 folds by approximately 5°. F2 folds vary in wave length from 100 m to 700 m and vary in amplitude from 100 m to 200 m. Flat laying thrust faults resulting from the F2 deformation event are thought to be related to the hanging walls of drag folds and have displacement visible along bedding surfaces.

Bustin and Moffatt (1983) suggested that the style of deformation in the Bowser Basin is related to lithology. This hypothesis is supported in the way that the higher, more competent, massive beds of the Devil's Claw and Upper McEvoy units are characterized by broad, open, low-amplitude folds while the relatively thin-bedded, fine-grained lower McEvoy and Currier units are characterized by high amplitude, shorter wavelength folds that tend to be disharmonic with the overlying units.

The Groundhog Thrust Fault is the principle fault within the Groundhog Coalfield. Striking approximately 310°, with an unknown dip, the fault extends from Currier Creek northwest outside of Atrum's property. Along the fault, rocks of the McEvoy Formation are commonly thrust over those of the Currier Formation. The front of the fault is serrated with multiple lobes of McEvoy Formation rock protruding over Currier Formation rocks.

Approximately 6.5 km west of the Groundhog thrust fault lies the Upper Currier Creek normal fault. Striking approximately 315° to 340°, with a believed near vertical dip, the fault extends north from the headwaters of Currier Creek.

Historic reports and associated maps suggest multiple anticlines and synclines trending northwest-southeast within the Beirnes Synclinorium, but additional mapping to confirm previously reported measurements is needed.

Following the 2013 field exploration and drilling program it was apparent that the structure of the coal field can be very complicated in localised zones as a result of the two phases of deformation, this made correlation of coal seams particularly difficult; however, a much greater understanding of the structural environment is now known.

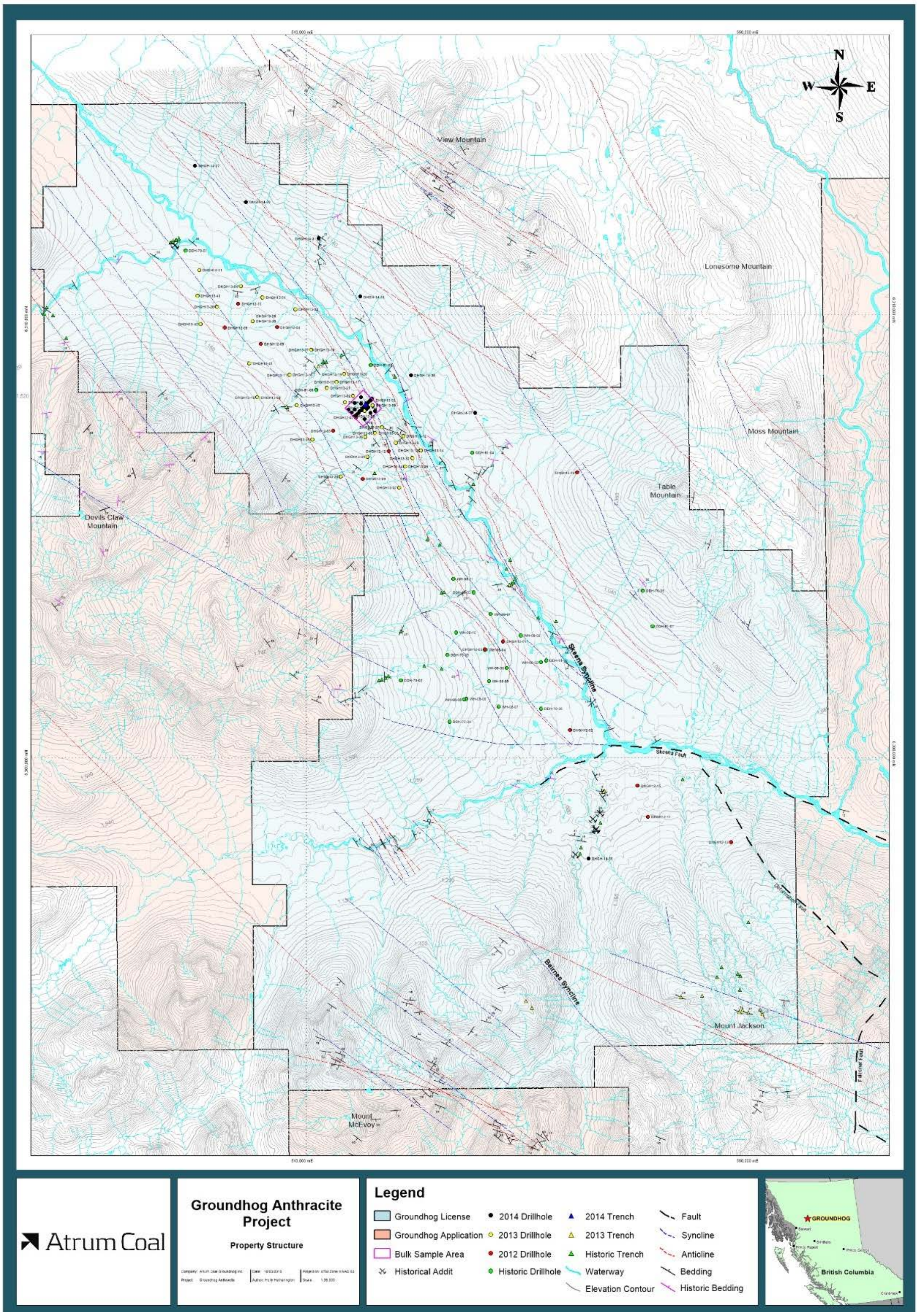


Figure 4.13 General Structure of the Groundhog Coal Field.

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4.6 Deposit Type

The definition of "Deposit Type" for coal properties is different from that applied to other types of geologic deposits. For coal deposits this is an important concept because the classification of a coal deposit as a particular type determines the range of values that may be applied during the estimation of reserves and resources.

As specified in Geological Survey of Canada (GSC) Paper 88-21, which is a reference for coal deposits as specified in NI 43-101, coal “Deposit Types” are either surface mineable, underground mineable, non-conventional or sterilized. All of the deposits of interest at Groundhog in this report refer to the surface mineable coals. In addition to “Deposit Types” the GSC Paper 88-21 also refers to “Geology Types”, which are a definition of the amount of geological complexity, usually imposed by the structural complexity of the area. The classification of a coal deposit by “Geology Type” determines the approach to be used for the resource estimation methodology and the limits to be applied to certain key estimation criteria.

The identification of a particular deposit type for a coal property defines the confidence that can be placed in the extrapolation of data values away from a particular point of reference. The classification scheme of the GSC is similar to many other international coal reserve classification systems but it has one significant difference. This system is designed to accommodate differences in the degree of tectonic deformation of different coal deposits in Canada. Four classes are provided for that range from the first, which is for deposits of the Plains type with low tectonic disturbance, to the fourth which is for Rocky Mountains type deposits such as that of Byron Creek, which is classed as "severe". The second class is referred to as "moderate"; the gently to moderately dipping but only moderately faulted strata of the Panorama properties are typical of this class. The Mount Klappan Anthracite deposit to the north is classified as “complex” due to the tight folds, steep and overturned limbs and common faults. However, portions of that property that are not so deformed are also considered “moderate”.

In 2012 Moose Mountain Technical Services (MMTS) evaluated the Groundhog Coal Field for Atrum Coal in 2012 prior to initial tenure acquisition, at the time MMTS classified Groundhog as structurally moderate, but recent exploration has shown that at least portions of the deposit are likely complex structurally.

5. Atrum Exploration Programs

All exploration programs on the Groundhog property to date have been conducted with the use of aircraft. This has typically involved airplane to access the camp using an Otter, Islander, Beaver or SkyVan. Helicopters have been used extensively to access exploration areas and conduct drill rig and equipment moves, facilitate pad construction and move people around in the field. Winter access has been limited to Otter and Beaver fixed wing aircraft due to their optional snow ski attachments and helicopter use.

An SRS 3000 helicopter portable hydraulic drill is the primary drill rig used to complete drilling programs on site provided by Driftwood Diamond Drilling of Smithers, BC. However, in 2014, Geotech Drilling of Prince George, BC provided an HP200 drill for drilling water monitoring wells. Most holes drilled have been cored with a diamond bit to recover HQ or HQ3 sized core.

5.1 2012 Exploration Program

In May 2012 Atrum acquired the Groundhog Property and conducted their first field program in September and October of that year. At that time the property consisted of 16 contiguous licences covering 7,472 ha and seven adjoining coal licence applications covering 11,118 ha for a total of 18,590 ha.

The exploration program was designed to test the extent of the coal measures within approximately 300 to 350 m of surface throughout the coal licences. Much of the area had not been previously tested by drilling, but surface mapping and trenching information from legacy data in previous assessment reports helped guide the general layout of the drill program.

The 2012 exploration programme consisted of 4,992 m of drilling in 15 diamond drill cored holes on the coal licences.

5.2 2013 Exploration Program

As a consequence of the positive coal intersections derived from the cored drillholes drilled during the 2012 season, Atrum's 2013 exploration drilling program focussed on the north-western portion (known as 'Groundhog North') of the Groundhog Anthracite Project where eight holes were drilled in 2012.

The 2013 exploration programme consisted of approximately 8,000 m of drilling in 64 diamond drill cored holes located on the coal licences. 43 of the drill holes were HQ holes and 17 were PQ size. A further 4 PQ holes were drilled to the south west of Groundhog North between Davis and Discovery Creeks (Borehole PQ12-01- 1 to PQ12-01-4). The exploration took place between June and September 2013.

The deepest drill hole was drilled to more than 470 m (DHGH13-07). Most drill holes were vertical but 10 of the HQ holes were inclined. Typical casing depth was less than 4 m.

5.3 2014 Exploration Program

Following the 2013 field program, three locations were identified with shallow coal intersections and good coal quality results. One of these areas was chosen as a potential Bulk Sample Area (BSA) based on coal quality results. The focus of the 2014 exploration program was to define the BSA to a level where bulk sample mining could take place. This program took place over two phases with the first being in winter when six holes were drilled between the 3rd and 18th of April. This work ceased over the spring break up as snow melted and continued again in summer once the ground was clear of snow when an additional 27 holes were drilled within the BSA.

5.4 2015 Exploration Program

No drilling was conducted during the 2015 exploration season.

5.4.1 Trenching

During a small reconnaissance program in August of 2015, Atrum identified a 2.33 m thick coal seam outcropping near the Skeena River west of the Bulk Sample Area. Although this was the only seam trenched during the 2015 exploration season, (trench ID TR-GH-15-01) the finding had significant value.

Most importantly, it was the first time a coal at surface has been correlated with certainty and used to update the geologic model. The seam was positively identified as Duke E due to its clean characteristics, mudstone parting approximately 0.5 m above the seam floor and dewatering structures 5 m above the seam. The dewatering structures were originally identified in drill core in

2014 and have been used as a correlation tool between drill holes in identifying the location of Duke E since. Identifying Duke E at surface also highlighted how shallow the seam occurs on the eastern side of the Skeena River; an area that was considered a favourable mining target but had yet to be proven.

Not only did the discovery of Duke E in outcrop show how shallow the primary target seam occurs, but also provided verification of the geologic model and proved that the accuracy of modelling was increasing.

5.4.1.1 Trench TR-GH-15-01

The trench identified as TR-GH-15-01 was the only trench identified and logged from the 2015 exploration season. Table 5.1 summarises the trench seam thickness and location. A geologic description of the trench can be found in Appendix 1.

Table 5.1 Summary of 2015 Trenching Program

Trench ID	Easting	Northing	Azimuth	Dip	Seam Thickness (m)	Seam Name
TR-GH-15-01	542086.3	6308423	0	-90	2.33	Duke E

5.4.2 Correlation and Internal Model

Due to the lack of new data in 2015, Atrum Coal made minor changes to its geological model and stratigraphic package within the Groundhog Property.

5.5 Data Acquisition

Atrum Coal geologists have typically been employed on a seasonal basis; however, each year they undergo thorough training in data acquisition and drill core description. In 2014 Atrum Coal introduced Task Manager; software used to capture data, specifically drill core data. Atrum geologists received comprehensive training in this software prior to logging drill core in the field and are constantly required to cross check work against other geologists to ensure data is collected in an accurate and consistent manner. A senior geologist on site checks every drill core sample selection prior to sampling to ensure coal quality data is maintained to the highest standard possible. Once measured, described and photographed, coal intersections and selected rock samples are bagged and labelled for subsequent analysis. High quality core photography has proved very valuable when reviewing data during correlation following the field season.

Drill core is typically HQ3 size; it is recovered using wireline drill core retrieval and typically drill core recoveries are greater than 90%. Once drill core reaches the surface it is placed in core boxes and flown back to camp by helicopter where it is logged in a core shack then stored on site to the north of the Kluatantan Airstrip.

Upon completion of a drill hole, water is circulated in the drill hole to clean the drill hole ahead of downhole geophysical logging. Initially, the drill hole is geophysically logged through the drill rods for gamma and density. Following the through-rod logging, drill rods and pulled and geophysical logging resumes ‘open-hole’ with gamma, calliper, density, dipmeter, neutron, sonic and occasionally Acoustic Televiewer (ATV).

5.5.1 Drilling

The 2012 drilling program consisted of 4,992 m of drilling in 15 diamond drill cored holes located on the coal licences.

The 2013 drilling program comprised of 43 HQ diamond drill holes (both inclined and vertical), and an additional 19 PQ holes.

The 2014 exploration programme consisted of 41 HW diamond drillholes, (five of which were inclined) and an additional 10 air drilled holes for water monitoring.

Combined with the historic drilling and trenches, a total of 104 drill holes and six trenches are located within Groundhog North, as shown in Figure 5.1.

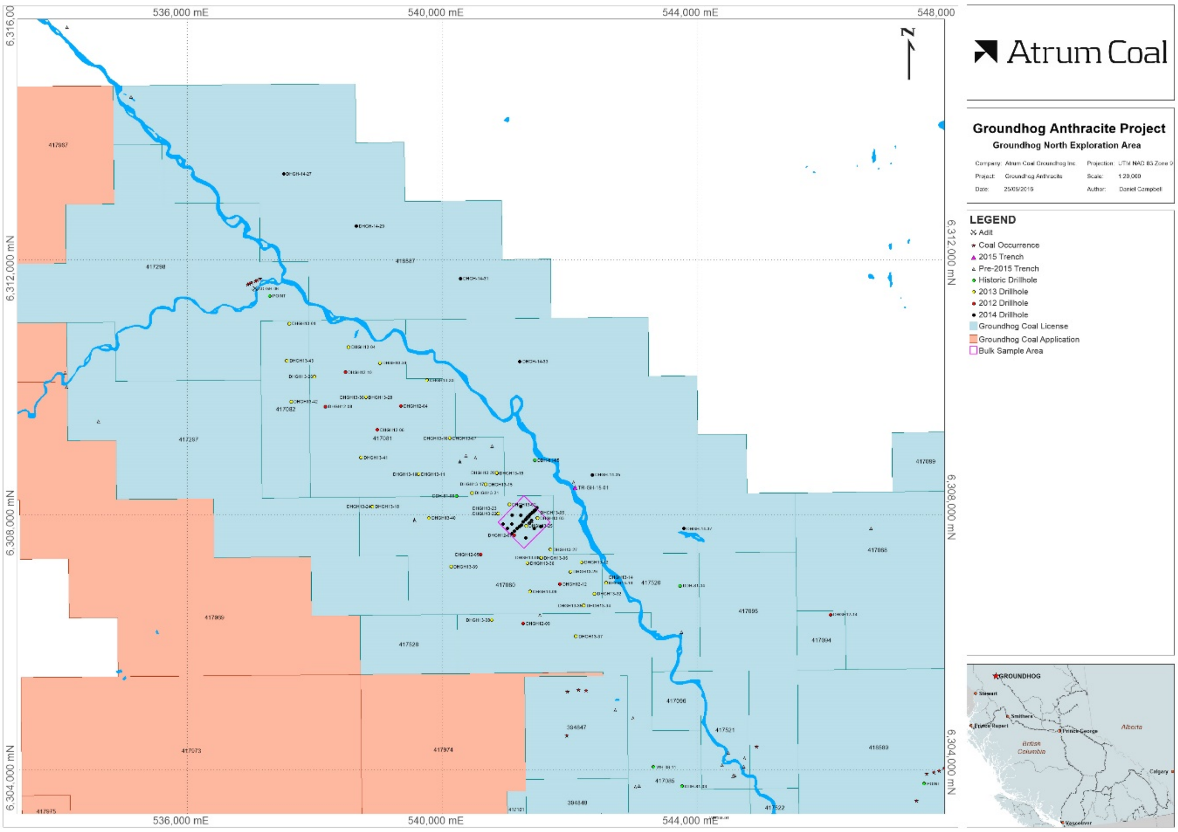

Figure 5.1 Exploration within Groundhog North

Drilling based on current geological interpretations has correlated a total of 21 seams. As shown in Table 4.1, the seam naming convention is based on four horizons with individually lettered seams within each horizon.

5.5.2 Drill Hole Geophysical Logging

All 15 holes drilled in the 2012 drilling program were logged with a slim-line gamma-density tool lowered through the drill rod stem (through rod survey) to obtain at least one complete geophysical log of the drill hole. Detailed logging (1:50 scale) was undertaken only over significant coal seam intervals. Whenever possible exploration drill-holes were also logged open hole (only DH-GH-12-01).

In general, all drill holes were logged through the drill stem to obtain a gamma density log at 1:100 and 1:200 scale, a neutron log at 1:100 scale, and an expanded scale gamma density log at 1:50 scale.

Due to the late timing in the season of the drill program, and the restriction to air access only (helicopter) to drill sites, geophysical logging was restricted to through the drill stem only after drill hole DH-GH-12-01 to reduce risk and time.

All 64 drill holes drilled in the 2013 exploration program were geophysically logged. In general, all drill holes were logged through the drill stem to obtain a gamma density log at 1:100 and 1:200 scale and a neutron log at 1:100 scale to provide at least one complete geophysical log of the drill hole. Detailed logging at a scale of 1:50 was undertaken over the significant coal seam intervals.

In the 2014 drilling program 39 of the 41 exploration drill holes were logged with geophysical tools. The typical suite of tools for the 2014 program included gamma, calliper and density with many drill holes also having neutron, deviation and dipmeter logging. 19 holes had sonic tools run on them to help determine geotechnical properties of the rock and five drill holes were scanned with an acoustic televiewer (ATV), three of which were processed and interpreted.

As part of the correlation exercise following the 2014 field program, it was noted that dipmeter data was very beneficial in aiding correlation and should be run on all future drillholes.

As the project has progressed more data has typically been collected for each drillhole. Table 5.2 summarises available data for each of the years of exploration on Atrum Groundhog licences. Data from the 2014 program are the most comprehensive allowing for more reliable correlations.

Table 5.2 Available data from Groundhog drilling programs

	1970 National Coal Corp. Ltd.	1981 Imperial Oil Ltd.	2008 West Hawk Resources Corp.	2012 Atrum Coal	2013 Atrum Coal	2014 Atrum Coal
Strip logs	✓	✓	poor quality	✓	✓	✓
Gamma		poor quality	✓	✓	✓	✓
Density		poor quality	✓	✓	✓	✓
Core Photos			3 drillholes, poor quality	poor quality	✓	✓
Dipmeter			1 drillhole		12 drillholes	✓
ATV					1 drillhole	5 drillholes
Sonic						✓

6. Coal Quality

The evaluation of coal quality for the 2012 to 2015 exploration programs is based upon the analytical results of drill core (coal samples) obtained from drill holes, and from bulk samples of coal collected from the Groundhog Project Area including the trench excavated in 2014 within the BSA mentioned in 5.4.1. The primary purpose of the drill coring programs was to obtain sufficient samples of significant coal seams for reliable preliminary determinations of the raw and clean quality characteristics of the coal within the Groundhog Project Area.

Specific lab analyses on drill core samples were typically performed more recently by ALS Laboratories of Richmond, British Columbia with most samples from 2012 and some samples from 2013 being tested by Loring Laboratories Ltd. of Calgary, Alberta. The change to ALS was due to the additional testing capabilities of the ALS laboratory for mechanical testing such as the drop shatter test. Most samples collected were representative of selected coal units and their associated internal partings.

Roof and Floor samples were also collected for most significant seams, although only a limited amount of roof and floor samples have been analysed.

In total 833 core samples were collected from the 2012 drilling program, of which 507 individual ply samples were analysed for raw coal quality. From the initial ply samples, 80 composite samples were made to represent potential product intervals; basic size and washability work was done on these composites. In addition, 10 coal samples were selected and petrographic analysis was performed by Pearson and Associates of Victoria, BC.

The 2013 laboratory program was progressively more extensive than in 2012; laboratory testing not only included coal quality but also environmental analysis, mineral properties and geotechnical parameters. In total, 1,216 core samples were collected from the 2013 drilling program of which 216 individual ply samples were analysed for raw coal quality. From the initial ply samples, 43 composite samples were made and analysed for washability as clean coal composites.

The 2014 laboratory program was similar to the 2013 program and included coal quality and environmental analysis. In total 2,002 samples were collected, 92 of which were rock samples specifically for geochemical analysis and acid base accounting. A focus was made on defining product specifications for each major coal seam in 2014 to determine what products would be available to markets. Of the samples collected, 265 underwent coal quality analysis.

The 2015 laboratory program was a continuation of the 2014 program coal quality analyses but focused primarily on drillholes east of the Skeena River. Coal quality results from the analysis is attached in Appendix 2.

[redacted]

[redacted]

[redacted]

7. Resources

Atrum coal has had 3 JORC (Joint Ore Reserves Committee, which is the Australian Code for Reporting Exploration Results, Mineral Resources and Ore Reserves) Compliant resource estimates completed on the Groundhog property since August 2012. The first two estimates were completed by Moose Mountain Technical Services based entirely on historic data, prior to Atrum's exploration and the most recent estimate was completed by Xstract Mining Consultants based on historic data and Atrum's 2012 drilling results.

- The first Resource Estimate was completed by Moose Mountain Technical Services dated November 20, 2012. This report was completed on the original Groundhog Licence blocks acquired by Atrum (Moose Mountain Technical Services, November 20, 2012).

- The second Resource Estimate was completed by Moose Mountain Technical Services dated January 3, 2013. This report was completed on the original Groundhog Licence blocks acquired by Atrum, plus the extension coal application lands subsequently acquired by Atrum (Moose Mountain Technical Services, January 3, 2013).
- The third and most current resource report was completed by Xstract Mining Consultants, effective April 2013. This report was completed on the original plus extension lands, plus utilizing the 2012 exploration drilling information (Xstract, April, 2013).

Atrum Coal has produced its own geological model and resource estimates; however, these are not independently verified at the time of writing this report so therefore do not comply to NI-43-101 or JORC standards. At the time of writing this report Atrum has approached a geological consulting company to provide independent evaluations of this model to ensure full compliance. Until a valid independent resource report is published Atrum will continue to use the most recent independent report dated April 2013.

The following is an excerpt from the Xstract Resource Estimate Report outlining the methodology and resource.

7.1 Resource Estimate

Coal resources have been estimated and reported according to resource classification in two large resource blocks – one located on the eastern side of the Skeena River (Res_01), and the other on the western side of the Skeena River (Res_02). Resource blocks are limited by tenement outlines, a 100 m offset from the Skeena River and by an interpreted fault boundary in the southeast.

The large majority of historical and recent exploration has taken place in Block “Res_02” and this is the focus of economic interest.

Table 7.1 summarises the in-situ coal resources as at 31 March 2013 and classifies them appropriately for public reporting in accordance with the JORC Code (2004).

Table 7.2 provides a summary of the resource assessment

Table 7.1 Overall Summary of Cumulative Coal Resources Increasing with Depth

Depth	Measured (Mt)	Indicated (Mt)	Inferred (Mt)	Total (Mt)
<50m	2	61	91	154
<100m	7	168	240	415
<200m	13	388	592	993
<300m	16	521	883	1,420
<400m	16	553	998	1,567

Table 7.2 Summary of Resource Assessment

Assessment of drilling and sampling data

Criteria	Assessment
Sampling techniques	Diamond core, historical and current drilling included in resource estimate.
Drilling Techniques	Diamond core (HQ and NQ).
Drill sample recovery	Only >80% recovery used for resource estimation.
Logging	Geological logging codes adequate for geological description. All Atrum drilling has associated down-hole geophysical logs.
Sub-sampling techniques and sample preparation	Core samples submitted to laboratory for raw coal analysis and washability testing.
Sampling for specific gravity and geotechnical logging required.	Relative Density is calculated from the raw Ash (ad) according to the regression curve supplied.
Quality of assay data and laboratory tests	Atrum's 2012 laboratory test results are of high quality. The QA/QC status relating to the historical results is unknown, however Xstract has no reason to doubt their validity.
Verification of sampling and assaying	Laboratory results from Atrum 2012 drilling (15 holes) have been reviewed in detail. Historical raw coal quality results have been accepted at face value.

Assessment of modelling and resource estimation

Criteria	Assessment
Database integrity	Data supplied in spreadsheet format and loaded into Minescape. Data validated using a range of mining software (Ventyx Mincom Minscape v4.119, Microsoft Excel (VLookUp) and Xstract in-house validation routines.
Geological interpretation	Coal seams interpreted using combination of lithology, geophysics and assay quality distribution. Seam correlation were refined through an iterative modelling process. Internal dilution incorporated where necessary to maintain continuity. Model is a "Parting" model allowing the optional exclusion of in-seam dilution for reporting purposes.
Dimensions	The resource model covers Atrum's tenement areas at the Groundhog Project, covering both "granted" and "under application" tenements, ~15,500 ha.
Estimation and modelling techniques	The Minescape Schema settings for the project controlled the model settings, parameters and constraints. Table Models were converted to Grid Models were created for both structure and quality.
Moisture	Moisture (and other proximate analyses) were supplied on an as received, a dry and an air-dried basis. Modelling and resource estimation is reported on an air-dried basis.
Cut-off parameters	Seams where excluded where thickness was less than 0.4 m. Tenement boundaries. 100 m offset from the Skeena river.
Mining factors and assumptions	Resource estimation assumes open pit extraction, but underground mining may also be considered for early start up and for deep seams.
Metallurgical factors and assumptions	Uncertain. No direct information available at this stage. Atrum's preliminary washability testing from the 2012 drilling is still in progress. Early results indicate that various low ash, ultra-low volatile anthracite products may be produced with reasonable yield from selected seams.
Relative density	From coal sample RD vs. Ash regression.
Classification	Resource classification is in accordance with the JORC Code, 2004. Guidelines outlined in the Geological Survey of Canada (GSC) Paper 88-21 have also been followed.

7.2 Resource Classification

The following resource classification criteria were adopted:

- Points of observation for resource classification purposes were defined as cored drillhole intersections of seams with 80% or better core recovery and coal quality composites (at least raw coal moisture, ash and total sulphur) that pass all Quality Assurance/Quality Control checks. Interval correlations and thicknesses must also be supported by down-hole geophysics.
- The resource is classified as "Measured" if the distance between valid points of observation is less than 500 m (effective maximum 250 m radius around points of observation).
- The resource is classified as "Indicated" if the distance between valid points of observation is greater than 500 m and less than 1,800 m (effective maximum 900 m radius around points of observation). This is in accordance with guidelines contained in the GSC Paper 88-21 and recommended for Geology Type "moderate" structural complexity.
- The resource is classified as "Inferred" if the distance between valid points of observation is greater than 1,800 m and less than 4,000 m (effective maximum 2,000 m radius around points of observation).
- At least two intersecting points of observation radii were required for classification (i.e. no isolated drillholes allocated areas of influence).

8. Archaeology

During the 2015 exploration season, Atrum continued to collect and evaluate archaeological data from Groundhog. This included report writing and finalization of an Archaeological Impact Assessment (AIA) that was used for part of the Bulk Sample Permit application. Atrum also conducted a small archaeological field reconnaissance program in 2015 to find the best route to put in an exploration trail from the Bulk Sample Area to the east side of the Skeena River (less than 1 km). Both archaeology reports are attached in Appendix 5.

9. Environmental Studies

Environmental studies were a key focus of the 2015 exploration season. Several consulting companies provided reports to summarize findings in both the Groundhog hydrology and wildlife. A substantial portion of the environmental studies were organized by a consulting company, Greenwood Environmental Inc. (Greenwood). The Bulk Sample Permit application environmental aspect was also monitored by Greenwood.

9.1 Hydrology

Knight Piesold performed the hydrology studies for Atrum and summarized them in reports to help facilitate the Bulk Sample Permit application requirements. The hydrology at Groundhog will be ongoing and some of the previous works will be summarized in reports over the following years. However, there are several reports in Appendix 6 that summarize the hydrology that was condicted during the 2015 exploration field season. Those reports include baseline water collection, water quality models, as well as surficial geology and hydrogeology characterization.

9.2 Wildlife

The Bulk Sample Permit application also required baseline studies regarding wildlife in the area. ERM Consultants Canada Ltd. (ERM) collected and reported their findings for within the Groundhog coal licences. This included a summary of fish and wildlife baseline, a wildlife characterisation baseline report, as well as a bat management protection plan. These reports can also be found in Appendix 6.

10. Infrastructure

Preliminary infrastructure studies were conducted in 2015 on the Groundhog project. This included a road design that would travel south of the project as well as bridge designs within the Groundhog coal licences. McElhanney performed a bulk of the field research and summarized their findings and designs with the reports in Appendix 7.

11. Costs Incurred

Details of costs incurred for work conducted during the 2014 exploration program is provided within the Cost Summary Report (Appendix 3).

Exploration costs incurred to date is summarised in Table 11.1.

Table 11.1 Groundhog Exploration Expenditure Summary

Exploration Year	Expenditure
2012	3,049,171.87
2013	8,661,287.98
2014	20,097,643.74
2015	1,795,592.33
Total	**33,603,695.92**

12. Conclusions

Significant resources of high rank Anthracite coal have been identified within the Groundhog Property limits currently held by Atrum Coal Groundhog Ltd. The 2014 exploration season and the 2015 knowledge consolidation period contributed great value to Atrum's understanding of the geological environment and resource. Additional drilling, surface mapping and trenching are required to increase the confidence level of the current resources. With proposed ground access and bulk sample extraction becoming available in 2016, alongside a comprehensive field program, the 2016 field season will see Atrum take large steps towards development.

13. References

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Suncor Inc. Resources Group, *Geological Appraisal of the Mt. Jackson Coal Property, B.C.* Assessment Report 107, 1982.

Suncor Inc. Resources Group, *Geological Appraisal of the Mt. Jackson Coal Property, B.C.* Assessment Report 108, 1983.

West Hawk Development Corp., *Technical Report, Groundhog Coal Property*. NI 43-101 Report, 2007.

Xstract Mining Consultants, Groundhog Anthracite Project – Resource Estimate, April 2013.

Appendix 1 – Trench Descriptive Log

Data Type	DHID	From /m	To /m	Thickness	Seam Name	Sample ID	Lithology	Lith Qualifier	Color	Comments
Trench	TR-GH-15-01	0.00	0.10	0.10	Duke E		COAL	C2	Black	when broken with hands; crumbles easily with minimal hand pressure; no cleat fill
Trench	TR-GH-15-01	0.10	1.50	1.40	Duke E	Bag 1	COAL	C1	Black	minor c2; 1-2cm cleats occur throughout the entire interval; bright when broken
Trench	TR-GH-15-01	1.50	1.78	0.28	Duke E	Bag 2	COAL	C2	Black	moderately weathered; C2; no cleat fill; hard-semi hard coal
Trench	TR-GH-15-01	1.78	1.93	0.15	Duke E		Carb Silt		Grey	parting; xt with st; very hard when shovel hit this layer
Trench	TR-GH-15-01	1.93	2.13	0.20	Duke E		Coal	C3	Black	moderately weathered; c3; soft with shovel; does not crumble as a brittle material; similar to a playdough texture
Trench	TR-GH-15-01	2.13	2.33	0.20	Duke E		Coal	C5	Black	moderately weathered; c5; soft with hands; maleable characteristics; moderately weathered

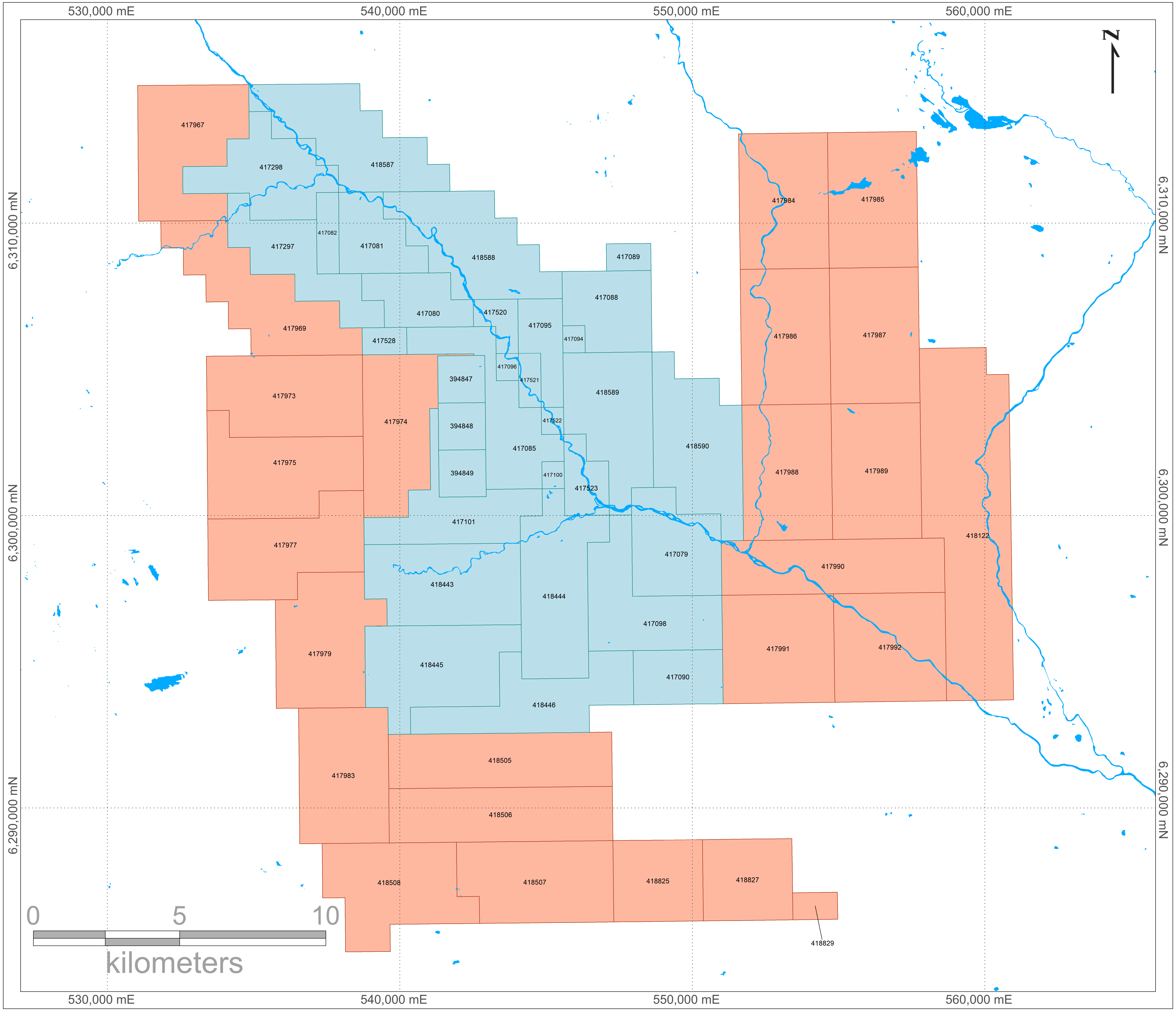
Appendix 2 – Coal Quality Results

Appendix 3 – Cost Summary Report

Exploration Work type	Comment	Days			Totals
Personnel (Name)* / Position	**Field Days (list actual days)**	**Days**	**Rate**	**Subtotal***	
Geology Field Crew			$0.00	$153,575.22	
Engineering Services			$0.00	$68,998.44	
Expeditors and Management			$0.00	$295,876.56	
Geel Enterprises Incorporated			$0.00	$188,000.34	
			$0.00	$0.00	
			$0.00	$0.00	
				$706,450.56	**$706,450.56**
Office Studies	**List Personnel (note - Office only, do not include field days**				
Literature search			$0.00	$0.00	
Database compilation			$0.00	$0.00	
Computer modelling			$0.00	$19,064.77	
Reprocessing of data			$0.00	$0.00	
General research			$0.00	$0.00	
Report preparation			$0.00	$0.00	
Economic Analysis			$0.00	$35,292.19	
				$54,356.96	**$54,356.96**
Airborne Exploration Surveys	**Line Kilometres / Enter total invoiced amount**				
Aeromagnetics			$0.00	$0.00	
Radiometrics			$0.00	$0.00	
Electromagnetics			$0.00	$0.00	
Gravity			$0.00	$0.00	
Digital terrain modelling			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$0.00	**$0.00**
Remote Sensing	**Area in Hectares / Enter total invoiced amount or list personnel**				
Aerial photography			$0.00	$0.00	
LANDSAT			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$0.00	**$0.00**
Ground Exploration Surveys	**Area in Hectares/List Personnel**				
Geological mapping					
Regional		*note: expenditures here*			
Reconnaissance		*should be captured in Personnel*			
Prospect		*field expenditures above*			
Underground	Define by length and width				
Trenches	Define by length and width			$0.00	**$0.00**
Ground geophysics	**Line Kilometres / Enter total amount invoiced list personnel**				
Radiometrics					
Magnetics					
Gravity					
Digital terrain modelling					
Electromagnetics	*note: expenditures for your crew in the field*				
SP/AP/EP	*should be captured above in Personnel*				
IP	*field expenditures above*				
AMT/CSAMT					
Resistivity					
Complex resistivity					
Seismic reflection					
Seismic refraction					
Well logging	Define by total length				
Geophysical interpretation					
Petrophysics					
Other (specify)					

				$0.00	**$0.00**
Geochemical Surveying	**Number of Samples**	**No.**	**Rate**	**Subtotal**	
Drill (cuttings, core, etc.)			$0.00	$10,718.89	
Stream sediment			$0.00	$0.00	
Soil	*note: This is for assays or*		$0.00	$0.00	
Rock	*laboratory costs*		$0.00	$1,315.74	
Water			$0.00	$42,213.85	
Biogeochemistry			$0.00	$0.00	
Whole rock			$0.00	$0.00	
Petrology			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$54,248.48	**$54,248.48**
Drilling	**No. of Holes, Size of Core and Metres**	**No.**	**Rate**	**Subtotal**	
Diamond			$0.00	$0.00	
Reverse circulation (RC)			$0.00	$0.00	
Rotary air blast (RAB)			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
				$0.00	**$0.00**
Other Operations	**Clarify**	**No.**	**Rate**	**Subtotal**	
Bulk Sampling - consultants			$0.00	$92,630.04	
Bulk sampling - environmental studies			$0.00	$11,922.41	
Permitting / Licence Fees			$0.00	$75,147.17	
Public relations / First Nations Training			$0.00	$26,587.30	
Archeological Studies			$0.00	$19,346.74	
Environmental Studies			$0.00	$227,742.84	
Other (specify)			$0.00	$0.00	
				$453,376.50	**$453,376.50**
Reclamation	**Clarify**	**No.**	**Rate**	**Subtotal**	
After drilling			$0.00	$0.00	
Monitoring			$0.00	$0.00	
Other (specify)			$0.00	$0.00	
Transportation		**No.**	**Rate**	**Subtotal**	
Air Support to Site - Tsayata Aviation			$0.00	$72,226.62	
Taxi			$0.00	$378.41	
Helicopter (hours)			$0.00	$12,496.09	
Fuel			$0.00	$15,249.90	
Other - Mobilisation / Demobilisation			$0.00	$22,496.90	
Field transportation costs			$0.00	$160,555.66	
Other - Airport Security			$0.00	$10,629.12	
				$294,032.70	**$294,032.70**
Accommodation & Food	**Rates per day**				
Hotel			$0.00	$20,860.45	
Camp			$0.00	$132,049.10	
Meals	day rate or actual costs-specify		$0.00	$217.40	
				$153,126.95	**$153,126.95**
Miscellaneous					
Telephone			$0.00	$3,130.87	
Training			$0.00	$3,481.11	
Insurance			$0.00	$18,844.33	
IT Consulting and Consumables			$0.00	$2,316.15	
Marketing and Public Relations			$0.00	$12,900.00	
Air Travel (international and interstate)			$0.00	$39,327.72	
				$80,000.18	**$80,000.18**
Equipment Rentals					
Field Gear (Specify)			$0.00	$0.00	
Other (Specify)					
				$0.00	**$0.00**
Freight, rock samples					
			$0.00	$0.00	
			$0.00	$0.00	
				$0.00	**$0.00**
TOTAL Expenditures					**$1,795,592.33**

Appendix 4 - Maps



Atrum Coal

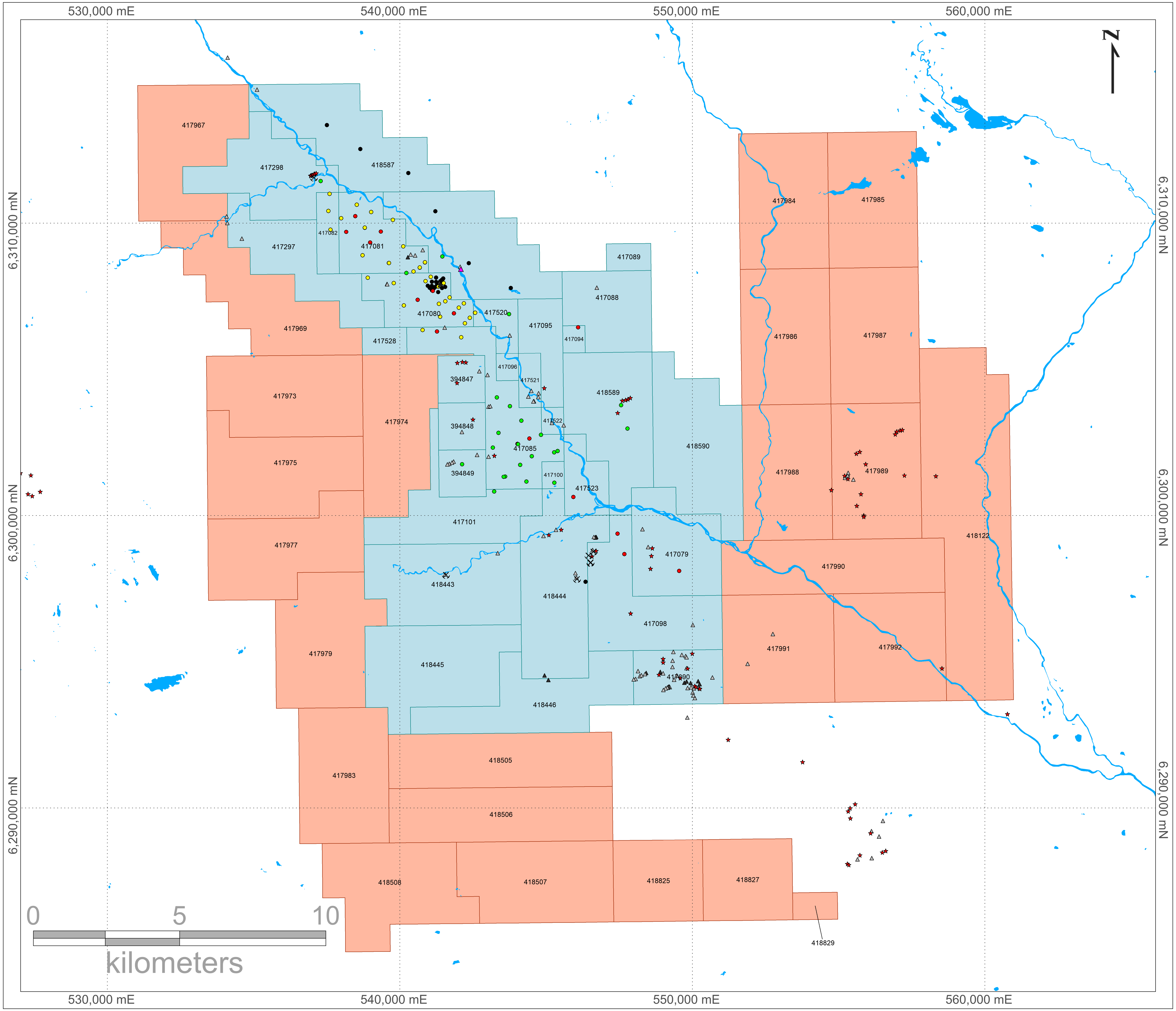
Groundhog Anthracite Project

2015 Tenures

Company:	Atrum Coal Groundhog Inc.	Projection:	UTM NAD 83 Zone 9
Project:	Groundhog Anthracite	Scale:	1:60,000
Date:	25/05/2016	Author:	Daniel Campbell

LEGEND

- Groundhog Coal License
- Groundhog Coal Application



Atrum Coal

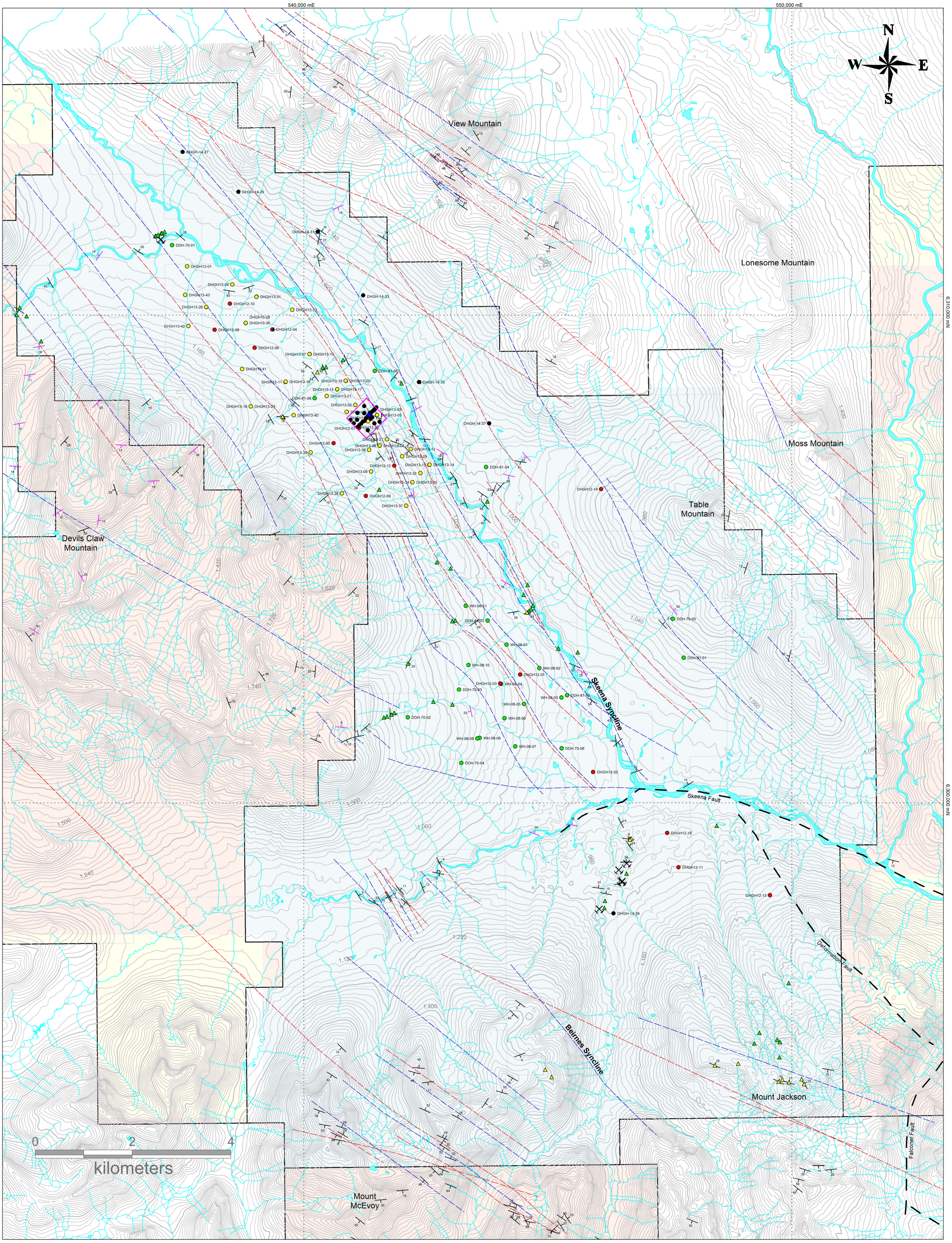
Groundhog Anthracite Project

Groundhog Exploration

Company:	Atrum Coal Groundhog Inc.	Projection:	UTM NAD 83 Zone 9
Project:	Groundhog Anthracite	Scale:	1:60,000
Date:	25/05/2016	Author:	Daniel Campbell

LEGEND

- Adit
- Coal Occurrence
- 2015 Trench
- Pre-2015 Trench
- Historic Drillhole
- 2013 Drillhole
- 2012 Drillhole
- 2014 Drillhole
- Groundhog Coal License
- Groundhog Coal Application



Atrum Coal

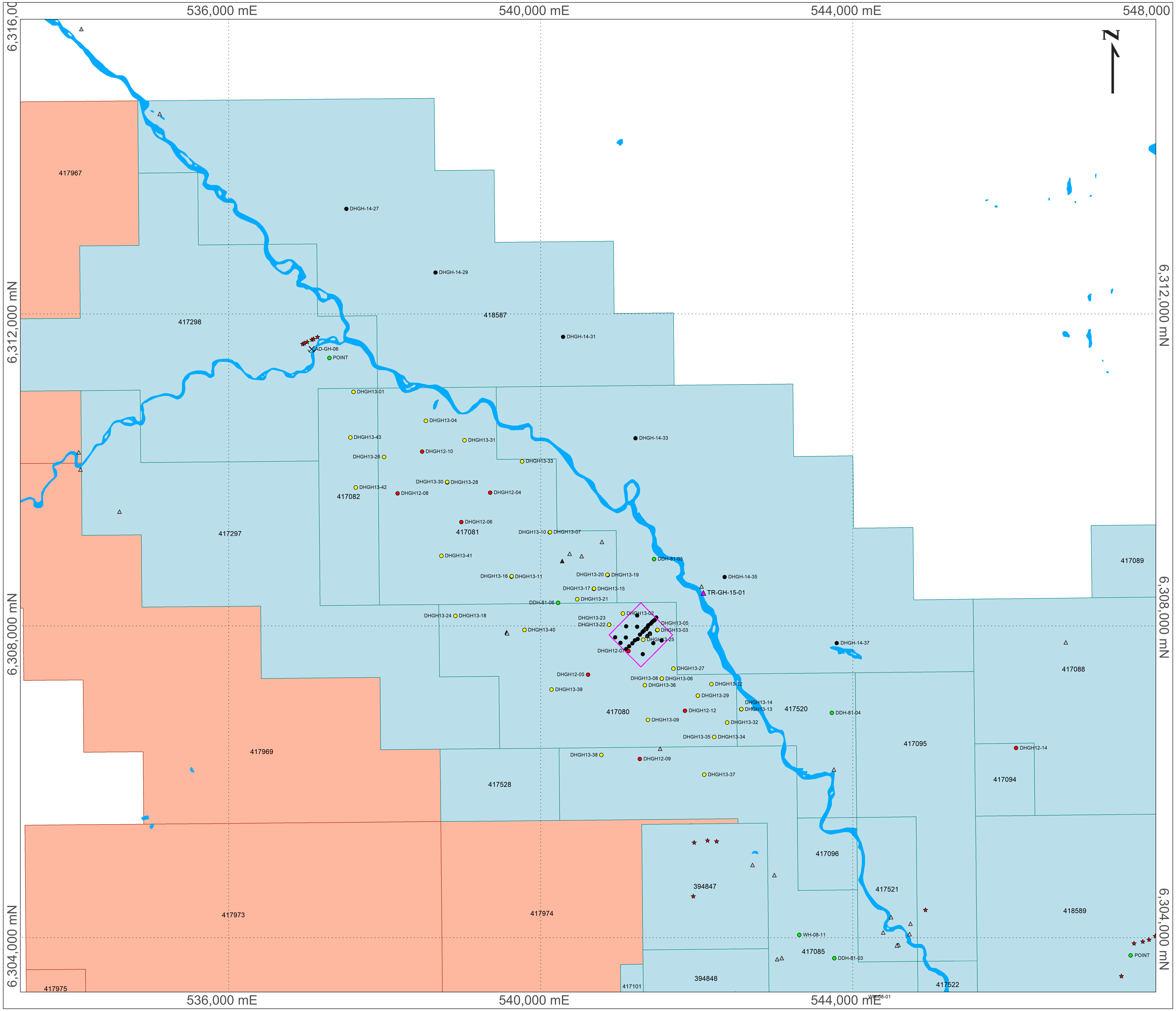
Groundhog Anthracite Project

Property Structure

Company: Atrum Coal Groundhog Inc.	Date: 10/03/2015	Projection: UTM Zone 9 NAD 83
Project: Groundhog Anthracite	Author: Holly Hetherington	Scale: 1:36,000

Legend

- Groundhog License
- Groundhog Application
- Bulk Sample Area
- Historical Addit
- 2014 Drillhole
- 2013 Drillhole
- 2012 Drillhole
- Historic Drillhole
- 2014 Trench
- 2013 Trench
- Historic Trench
- Waterway
- Elevation Contour
- Fault
- Syncline
- Anticline
- Bedding
- Historic Bedding



Atrum Coal

Groundhog Anthracite Project

Groundhog North Exploration Area

Company:	Atrum Coal Groundhog Inc.	Projection:	UTM NAD 83 Zone 9
Project:	Groundhog Anthracite	Scale:	1:20,000
Date:	25/05/2016	Author:	Daniel Campbell

LEGEND

- Adit
- Coal Occurrence
- 2015 Trench
- Pre-2015 Trench
- Historic Drillhole
- 2013 Drillhole
- 2012 Drillhole
- 2014 Drillhole
- Groundhog Coal License
- Groundhog Coal Application
- Bulk Sample Area

Appendix 5 - Archaeology

Appendix 6 – Environmental Studies

Appendix 7 - Infrastructure