



Benga Mining Limited operating as Riversdale Resources

## Grassy Mountain Coal Project Project Description



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## **1.0 GENERAL INFORMATION AND CONTACTS**

### **1.1 Project Overview**

Benga Mining Limited (Benga), a wholly owned subsidiary of Riversdale Resources Limited (Riversdale), is proposing to develop the Grassy Mountain Coal Project (the Project). The Project is located in south-west Alberta near the Crowsnest Pass, approximately 7 km north of the community of Blairmore (Figure 1.1-1). The Project involves a surface coal mine, a coal preparation plant, and associated infrastructure including a coal conveyor system, a rail load-out facility, an access corridor, maintenance shops, and other pertinent facilities. Projected labour requirements involve approximately 700 person-years of construction labour and 400 full time positions during operation.

Riversdale acquired the Grassy Mountain coal lease property from Devon Canada and Consol of Canada (50/50 Joint Venture) in 2013 and since acquiring interest in the property, Riversdale have been conducting pre-feasibility study work, and re-evaluating the historical coal quality data as well as taking fresh samples to update the coal quality evaluation. The current focus of exploration, technical, and environmental work centres on the Grassy Mountain surface mine area, which comprises approximately a 2,800 ha area.

This Project Description has been prepared by Riversdale and is being submitted to the Canadian Environmental Assessment Agency (CEAA) as the designated Project is described in the *Regulations Designating Physical Activities* (CEAA SOR/2012-147). The following document provides the pertinent project information as set out in the *Prescribed Information for the Description of a Designated Project Regulations* (CEAA SOR/2012-148), and follows the Guide to Preparing a Description of a Designated Project Under the *Canadian Environmental Assessment Act, 2012* (CEAA 2014).

### **1.2 Proponent Information**

#### **1.2.1 Name of Designated Project**

Grassy Mountain Coal Project: a proposed metallurgical coal mine in southwest Alberta.

#### **1.2.2 Name of Proponent**

Benga Mining Limited (Benga), a wholly owned subsidiary of Riversdale Resources Limited (Riversdale).

#### **1.2.3 Address of Proponent**

Address: PO Box 660;

12331 – 20<sup>th</sup> Avenue, Blairmore, AB, Canada, T0K 0E0

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#### **1.2.4 Proponent Chief Executive Officer**

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#### **1.2.5 Principal Contact**

David Leslie, Vice President – Technical Services

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Business: 403-563-7600

### **1.3 Consulted Jurisdictions and Parties**

The primary contributors to this Project Description document included Riversdale (proponent), their appointed engineering feasibility team (Golder Associates, CWA Engineering, Sedgman Engineering, and Hatch Mott-Macdonald), as well their appointed environmental assessment team (Millennium EMS Solutions, Hatfield Consultants, SRK Engineering, Nichols Applied Management, aci Acoustical, and Arbutus Consulting).

Aside from the technical engineering and environmental aspects of the Project Description, as part of the documents preparation process, in addition to other preliminary Project related documents (e.g., First Nations consultation plan, proposed terms of reference, field scopes of work, and project plain language documents), Riversdale has had consultation discussions and interactions with Alberta based Treaty 7 Nations (Piikani Nation, Kainai Nation, Siksika Nation, Tsuu T'ina Nation, and Stoney Nations (Bears paw First Nation, Chiniki First Nation and Wesley First Nation).

From a government agency perspective (municipal, provincial, and federal), multiple meetings with the following departments have occurred, and in some cases are on-going. From a municipal perspective, various meetings have occurred with the Municipality of Crowsnest Pass. Provincially, discussions have occurred with Alberta Environment and Sustainable Resource Development's (AESRD) Crowsnest Pass Regional Office, the Lethbridge Office, and, the Calgary Office. In addition to AESRD, other provincial departments that have been engaged on Project related activities have included the Alberta Energy Regulator (AER), the Alberta Consultation Office (ACO), and Alberta Transportation (AT). Federally, there have been preliminary discussions with the Department of Fisheries and Oceans (DFO), the DFO – Species at Risk Office, and the Canadian Environmental Assessment Agency (CEAA).

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#### **1.4 Provincial Regulatory Requirements**

A project description was submitted to the AER on September 29, 2014. A response from the AER was issued November 21, 2014 advising that the Project is a mandatory activity pursuant to Schedule 1 (g) of the *Environmental Assessment (Mandatory and Exempted Activities) Regulation*. Riversdale are required, pursuant to section 44(1)(a) of the *Alberta Environmental Protection and Enhancement Act (EPEA)*, to prepare and submit an environmental impact assessment (EIA) report for the project. The EIA report is required to be prepared in accordance with the provisions of Division 1 of Part 2 of *EPEA*.

In addition to this, Section 3 of the AESRD's, Government of Alberta's Guidelines on Consultation with First Nations on Land and Natural Resource Management, applies to the Project; consequently, Riversdale are required to submit a First Nations Consultation Plan to the ACO. Riversdale have submitted a First Nations Consultation Plan to the ACO for this Project on November 26, 2014, which was subsequently approved by the ACO on November 27, 2014.

#### **1.5 Regional Environmental Studies**

The federal Project Description requires reference to regional studies completed under *CEAA 2012* (as per Sections 73 and 74 of the Act). There have not yet been any regional studies completed under Section 73 and 74 of *CEAA 2012* within southern Alberta; consequently, no further information can be provided.

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## 2.0 PROJECT INFORMATION

### 2.1 Project Overview and Background

#### 2.1.1 General Description

The intention of the Project is to develop a coal mine on Grassy Mountain, to ship high quality metallurgical coal to overseas steel producing markets. The Grassy Mountain coal mine would provide significant economic stimulus to the Municipality of Crowsnest Pass and the Municipality of Ranchlands, as well as to the neighbouring communities to the west (*e.g.*, Sparwood, Elkford, and Fernie).

The Project's overall disturbance layer will consist of an open pit coal mine, waste rock disposal areas, a Coal Handling and Processing Plant (CHPP), and a product coal overland conveyor that will connect the CHPP area to a train load out facility (Figure 2.1-1).

For the mine, rock above the coal will be drilled/blasted, then excavated and hauled to both in-pit and ex-pit waste rock disposal locations (Figure 2.1-1). Coal from the open pit mining operations will be trucked to the run of mine (ROM) raw coal dump station at the CHPP using large scale mining trucks. The overall CHPP will serve to remove excess rock and impurities from the raw coal. This will be accomplished by sizing the raw coal, then feeding it to one of two coal processing plants (CPP), where it will be placed through a series of screening, cleaning, and mechanically dewatering. The reject material from the CPP will be trucked back into the mine for proper disposal.

The final coal product will be sent to the product coal stockpiles, where it will then be conveyed overland (via a covered conveyor) to the load out facility located near the existing Canadian Pacific Railway track located in the Towns of Blairmore and Coleman, Alberta. The coal will then be transported to marine terminal facilities located on British Columbia's west coast. From the terminals the coal will be transferred on to ships destined for customers in the Asian coking coal market (*i.e.*, steel production). Figure 2.1-2 provides a high level overview of the process from dumping of ROM raw coal to final coal product at the rail load-out.

#### 2.1.2 Site History

The Crowsnest Pass, located in south-west Alberta, is an area known for its extensive mining history, dating back to the 19<sup>th</sup> century. In 1878, the geologist George Dawson visited the Crowsnest Pass and reported that there were large quantities of coal in the area; shortly thereafter, the areas first opened in 1900. The underground mines in this part of Alberta were closed through the early part of the 20<sup>th</sup> century, as they were unable to compete with the surface coal mines that opened on the British Columbia side of the Crowsnest Pass.



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Many mines were operated in the region and significant coal tonnages were produced. Several of the key early mines that operated in the area were Figure 2.1-3:

- Mine No. 48 – The Frank Mine was operated by Franco-Canadian Co. from 1900 to 1919. This mine produced 1.5 million tonnes (Mt) of high volatile bituminous coal in that period; all of the other mines in the area also produced coal of the same rank;
- Mine No. 40 – The Hillcrest Mine #1 was operated from 1900 to 1940 by Hillcrest Collieries Ltd. and produced at a rate 2,000 tonnes per day (t/d) by 1911. In that period the mine produced approximately 5.9 Mt of coal;
- Mine No. 1584 – The Adanac Mine #3 was operated from 1942 to 1962 by West Canadian Collieries Ltd. and produced 0.692 Mt of coal;
- Mine No. 1275 – The Byron Creek Mine #3 was operated from 1927 to 1934 by Byron Creek Collieries Ltd. but only produced a small tonnage of coal;
- Mine No. 87 – The Bellevue Mine #3 was operated by West Canadian Collieries Ltd. from 1903 to 1962 and produced approximately 13.6 Mt. At the peak of production the Bellevue Mine employed 500 men and produced 2,500 t/d;
- Mine No. 133 – The Maple Leaf Mine #3 was operated by Maple Leaf Collieries Ltd from 1907 to 1952 and produced approximately 4.0 Mt;
- Mine No. 133 – The Mohawk Mine #3 was operated by Mohawk Bituminous Mines Ltd. Detailed mining records are unavailable;
- Mine No. 126 – The Passburg Mine #3 was operated by Leith Collieries Ltd. from 1906 to 1915 and produced approximately 400,000 Mt;
- Mine No. 153 – The Burmis Mines #3 and #6 (ERCB listed as Davenport Mine) was operated by the East Crowsnest Coal Co. from 1907 to 1943; production figures for this mine are not available; and
- Mine No. 396 – The Greenhill Mine located at the south end of the Grassy Mountain property was operated by Western Canadian Collieries from 1913 to 1958, and produced approximately 8 Mt.

The Grassy Mountain property has had considerable previous surface and underground coal mining activities as well as additional coal exploration by Scurry Rainbow using drilling and trenching from 1970 to 1972. Consol Energy Inc. conducted a drilling program and a bulk sample extraction of 54,000 tonnes from 1973 to 1975. Both coking coal and mid ash thermal products were targeted in this past exploration.

In 2013, Riversdale initiated coal exploration program (CEP), to confirm coal quality and quantity for the Grassy Mountain coal lease. Other objectives of the CEP also included assessment of the coking

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characteristics of the coal to estimate wash plant yields, confirm the preliminary geology model for the Engineering Feasibility Study, collect geotechnical information to support mine design, and to collect representative samples for selenium analysis.

Photographs 2.1 and 2.2 are representative of the drilling rig set up and core samples collected during the CEP.



**Photo 2.1: Exploration Drill Site at the Grassy Mountain Project. March 2014.**



**Photo 2.2: Coal Core Sample from the Grassy Mountain Project. March 2014.**

## **2.2 Designated Physical Activities**

As per the schedule under the *Regulations Designating Physical Activities* the Project falls under section 16(d), which states the Project triggers *CEAA 2012* as the designated Project involves the construction, operation, decommissioning and abandonment of a new coal mine with a coal production capacity of 3,000 t/d or more. Riversdale believes that *CEAA* will require an assessment to be completed for the Project. The intent of this document is to provide sufficient information about the Project to allow this determination to be made. The Project is not a component of a larger project not listed in the *Regulations Designating Physical Activities*. Riversdale also recognize that the rail component of the Project may fall under the *Regulations Designating Physical Activities*; however, its inclusion is pending as details of the rail component are currently in the preliminary planning phase.

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## **2.3 Project Components and Activities**

### **2.3.1 Physical Works**

#### 2.3.1.1 General Infrastructure Overview

The following is a summary list of the physical works associated with the designated project:

##### *Mine Operations*

- Open pit truck and shovel mining operations area;
- Waste rock disposal areas (north and south of the pit area, in addition to in-pit);
- Internal haul roads; and
- Topsoil storage area.

##### *Mine Infrastructure Area*

- Administration office building;
- Washroom and ablution facilities;
- Mine mobile equipment maintenance workshop
- Mobile equipment wash bay
- Mobile equipment fueling station;
- Warehouse and storage; and
- An explosives storage and mixing facility.

##### *Overall Project Site Infrastructure*

- Security building;
- Highway 3 intersection;
- Access road from Highway 3 to the mine infrastructure area (approximately seven kilometres);
- Access road system from the mine infrastructure area to the mine pit operations (currently in the preliminary planning phase );
- Service road system from the mine infrastructure area to the CHPP infrastructure and train loadout are;
- Water management structures including raw water wells for groundwater, CHPP reservoir, storage tanks, distribution pipe network; and
- Site wide drainage civil works.

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### *Coal Handling and Processing Plant (CHPP) Facilities*

- ROM raw coal receivable bin where mine trucks dump the mined coal, which includes a feeder breaker;
- Sizing station;
- ROM raw coal stackers and stockpiles;
- Two CPP feed surge bins;
- Two CPPs;
- Three product coal radial stackers and stockpiles;
- Six product coal stockpile reclaim feeders;
- A product coal surge bin;
- A product coal blending facility may be added if required. This would include a radial stacker, a full face stockpile reclaim system, a reclaim tunnel and conveyor infrastructure;
- Overland conveyor;
- Train loading bin;
- A road system that connects the main infrastructure items of the CHPP including an overland conveyor service road;
- A road system that connects the CHPP to the Mine Infrastructure Area;
- Power, water and control facilities routed between the main CHPP infrastructure;
- CHPP maintenance workshop;
- CPP process flocculant, diesel, MIBC, magnetite and propane storage facilities; and
- CHPP control room and ablution facilities.

### *Train Load-out Facilities*

- Rail track that allows trains to exit the main rail line to a siding loadout area;
- A tie-in system to the main Canadian Pacific Rail track network;
- An operations and controls office including portable sewage waste storage tanks;
- Power supply and transmission to the train loadout area will be provided from the main mine site electrical network, or the local electrical network; and
- Telecommunications provided from main mine site network.



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### 2.3.1.2 Physical Works Overview

#### *Open Pit Mine*

The coal in the open pit mine will be extracted using standard surface mining techniques found in other operating mines located in western Canada. Topsoil and sub-soil materials will be salvaged ahead of drilling and blasting operations using bulldozers to push the topsoil into windrows. An excavator and truck fleet will then follow behind and pick the topsoil up and haul it to designated stockpile areas until a suitable final reclamation placement area can be developed. Drilling and blasting activities will then begin to break up the waste rock ahead of excavation by diesel powered mining shovels and then hauled away in large haul trucks. Initially, the waste rock will be directed to ex-pit disposal areas until locations open up for in-pit backfill. Once the waste rock has been removed the coal is mined and hauled down to the raw coal stockpile area located near the CHPP. Both coal and waste rock haul roads will be developed to allow access from the mining face to the disposal areas. Full details on reclamation areas and haul roads are currently under development by the Project's Engineering Team; however, Figures 2.3-1 to 2.3-3 provide a preliminary mine phasing for the Project.

An explosives storage and mixing facility will be located on site to supply bulk explosives in support of the blasting operations. An ammonium nitrate-fuel oil (ANFO) will likely be the explosive used on site. Typical facilities for an installation like this include an ammonium nitrate prill silo, ammonium nitrate emulsion silo, garage, and office. This facility will be permitted and operated by the blasting contractor, and will need to adhere to all relevant Natural Resources Canada explosives guidelines.

The fine coal wastes will be largely dewatered in the CHPP and will be backhauled in trucks to the waste rock disposal areas. The dewatering equipment will replace the need for a large passive storage pond for the fine coal wastes that are common in the coal mining industry. Water collected in the bottom of the open pit will be directed to surface water impoundments, which will be constructed in strategic locations around the perimeter of the mine disturbance area, prior to release back to the environment. The final Water Management Strategy for the Project is still in development by the Project's Engineering Team.

#### *Coal Handling and Processing Plant*

The CHPP will consist of the raw coal, reject coal, and product coal material handling components and two coal processing plant modules (Figure 2.3-4). The ROM raw coal from the open pit mine will be dumped from the mining trucks into the raw coal ROM bin. The raw coal will then be fed into a feed breaker at the bottom of the ROM bin for initial primary sizing. From there it is then fed onto a conveyor and into a secondary sizing station to ensure a top-size of 50 mm. From the secondary



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sizing station the material is fed to one of two surge bins, each one positioned prior to the respective coal processing plant modules.

Each coal processing plant module will be contained within a housed area complete with bunded concrete floor. HVAC systems will be included inside the shed to keep temperatures above freezing point. Each coal processing plant module will have a 3.5 m wide access way for maintenance vehicles inside. Maintenance will be assisted by an over-head travelling crane along the majority of the coal processing plant module length as well as monorails, which will also be installed above process equipment that require frequent change-outs.

The coal processing plants process water will be supplied from a reservoir from the mine infrastructure areas water raw water system. A pump station will send water from the reservoir and pipe it to the coal processing plant modules for use in the processing as well as other minor maintenance requirements. The coal processing plant process water system will be designed to fully recycle the process water, to minimize the amount of additional make-up water required from the reservoir.

Coal quality test work and process simulation modeling has shown the most efficient coal processing plant module design consists of a single stage dense medium cyclone (DMC) for processing coarse material, reflux classifiers for processing fine material, and two-stage flotation in a cleaner-scavenger cell arrangement for processing ultrafine material. Product coal dewatering will be completed via vibrating and scroll centrifuges for coarse and fine material, respectively, and a hyperbaric disc filter for ultrafine material.

Figure 2.3-5 shows a simplified flow diagram of the proposed coal processing plant module processing circuit. Each coal processing plant module will be capable of processing 535 tonnes per hour for a total of 6800 hours per year giving an annual feed rate of 3.64 Mt. Each CPP will produce 2 Mt of product annually at the expected yield of 55% based on the coal quality data to date.

#### *Overland Conveyor and Train Load-out Facility*

The enclosed overland conveyor will deliver product coal to a 300 tonne surge bin located at a point along the existing Canadian Pacific Railway track located near the Town of Blairmore or Town of Coleman (Figure 2.1-1). From the surge bin, the product coal will be transferred to a train load-out bin feed conveyor via a vibratory feeder. The load-out bin will be housed in a heated structure, and will have a capacity of 350 tonnes. At the bottom of the bin a hydraulic gate will control the flow of product coal into train railcars; an industry standard tackifier will be applied to mitigate dust.

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### *Rail System*

The final route of the overland conveyor to the existing Canadian Pacific Railway track located in the Towns of Blairmore and Coleman is still in development with both municipal and provincial government agencies. It is anticipated that the final design will either be a rail siding (extending east of Blairmore to the west of Coleman) or a loop configuration on a portion of the existing golf course. Regardless of the final design, the construction and operation of the new railway infrastructure will likely require an approval from the Canadian Transport Agency as required by the *Canada Transportation Act*.

### *Road System*

The existing Provincial Highway 3 will provide the access to and from the mine for personnel and supplies. An existing intersection to the east of Blairmore golf course will be upgraded to the applicable standards. From this intersection, a 1-km single-lane road will access the rail load-out facility, if the golf course loop is the final design, and a 6-km two-lane road will access the mine and plant site. The majority of the access roads will be built over existing trails. A maintenance service road will also be constructed along the overland conveyor.

## **2.3.2 Production Capacity**

During phase 1 and phase 2 of the operation, the mine production capacity will be greater than 3,000 t/day of product coal. The Project will achieve a target clean coal production rate of 2 Million tonnes/annually (Mt/a) at the completion of phase 1 and a target production rate of 4 Mt/a at the completion of phase 2. Maximum production capacity will be 4 Mt/a.

To achieve that level of production, an average of 37 million cubic metres of rock will need to be mined per year during phase 2. A full description of the production process is as follows:

- Merchantable timber is harvested inside the mine disturbance area.
- Topsoil inside the mine disturbance area is salvaged and placed in stockpiles for future placement on reclaimed areas.
- Rock (overburden) above the coal seams is drilled and blasted.
- The rock is removed with hydraulic excavators and placed in haul trucks.
- Haul trucks transport the waste rock to designated disposal areas.
- The uncovered coal (raw coal) is mined by hydraulic excavators and hauled down to the raw coal stockpile area which is located near the CPP modules.
- The purpose of the CPP is to remove the impurities (*e.g.* rock, clay) from the raw coal to make it a clean marketable coal product. It is currently estimated that 1.8 t of raw coal will be required to produce 1 t of clean coal.

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- Product coal exits the CPP modules and is placed onto the product coal stockpile area.
- Fine and coarse reject coal that is a by-product from the CPPs is sent to the reject bin. The reject bin then loads reject coal into haul trucks. The haul trucks will back haul the rejects to the waste dump disposal areas for co-disposal with the overburden in the pit mining area.
- Clean coal will be reclaimed from the clean coal storage area and sent down to the rail loadout via the overland conveyor.
- Coal trains will leave the CPR mainline to be loaded in the loop or on a siding.
- Trains will be loaded via a train loadout facility.
- Trains will leave the Project area and make their way to the marine terminals located on the west coast of BC, where they will be loaded onto vessels destined for customers in Asia (e.g., Japan and Korea).

The maximum designed production capacity for phase 2 is 11,000 tonnes per day (tpd) on a clean coal basis and 20,000 tpd on a raw basis.

### 2.3.3 Expansion Details

The Project is not an expansion of any pre-established project; consequently, there is no relevant reference to any thresholds set out in the *Regulations Designating Physical Activities*.

### 2.3.4 Incidental Project Activities

A key incidental activity is the transport of the coal from the Project area, off site to global customers. Canadian Pacific Railway will transport the coal from the Grassy Mountain Coal Project area to the marine terminals on the west coast of British Columbia. These marine terminals will then load the coal on to vessels for shipment to markets. These activities are not within the care and control of the Riversdale. Riversdale will be required to negotiate with Canadian Pacific Railway as they are the sole provider of rail services in the Project area. Riversdale will also negotiate contracts with the marine terminals. Both Canadian Pacific Railway and the various marine terminals are currently providing these services to existing western Canadian coal mines.

An additional incidental activity will include on-going exploration and delineation drilling. This drilling is required to increase the geological certainty of the coal seams prior to detailed mine planning and subsequent mining. This activity may be completed using Riversdale's own equipment and manpower or could be contracted out to a third party. This activity will occur within the Project area and is within the care and control of Riversdale.

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## **2.4 Emissions, Discharges, and Waste Management Plan**

### **2.4.1 Atmospheric Discharge**

#### **2.4.1.1 Fugitive Emissions**

Fugitive dust emissions may be generated from a number of activities. The most probable activities to cause dust are:

- drilling and blasting activities;
- excavation of both waste rock and coal;
- heavy truck haulage of both waste and coal;
- coal dust generated during the feeding of the raw coal into raw coal ROM bin;
- coal dust generated during placement of product coal onto the product coal stockpile area. This dust generation is minimised by the use of luffing stackers which will minimise the drop height of the coal piling onto the stockpile, and will also minimise the drop time. Additionally the product coal will be wet and dust generation will be low as the coal particles will adhere together into lumps that will not easily stay suspended in the air;
- during transfer of coal material in transfer towers. Dust generation is minimised in transfer towers with the use of cladding on the sides of transfer towers where practical; and
- coal dust generated during the loading of the product coal into train railcars from the train loading bin. Dust generation is minimised during this process with full cladding on the sides of the load out structure, and with the discharge chutes of the bin being situated as close as practical to the train railcars.

#### **2.4.1.2 Greenhouse Gas Emissions**

Greenhouse gas emissions will be generated from the following sources:

- combustion emissions generated from diesel powered equipment including excavators, drills, bulldozers, haul trucks, and coal trains;
- propane fueled heaters for the plant, office, and shop facilities; and
- electricity consumption on the Project site that will largely be required to operate the CPP.

An option analysis on outfitting the mine with electrically powered shovels and drilling equipment (instead of diesel) will be completed during the feasibility study.

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## **2.4.2 Liquid Discharges**

### **2.4.2.1 Domestic Wastewater**

As the open pit progresses downward, groundwater in-flows can be expected. Rain and snowfall events will also cause water to collect at the bottom of the open pit. All mine wastewater will be directed to settling ponds located along the perimeter of the disturbance area. From these settling ponds, the suspended solids will be dropped out prior to release back to the environment. Diversion ditches will catch run-off from the haul roads and disposal areas and also direct this run-off to the settling ponds for treatment.

Domestic wastewater from the mine infrastructure area will be treated in a mechanical treatment plant and will be discharged to the natural environment once it meets the treatment requirements. Domestic wastewater from the train load-out ablation facilities will be stored in a tank and a truck will be required to suck the sewage out on a regular basis.

### **2.4.2.2 Water Treatment**

A wastewater management plan will be developed to control pit dewatering and surface run-off from all components of the Project. All water will be treated and released to the natural environment, providing it meets release requirements.

Testing is currently being conducted to determine the presence/absence of selenium in the wastewater. A plan will be developed (or multiple plans) to manage or treat selenium if it is likely to be present as a result of the proposed activities.

## **2.4.3 Solid Waste Management**

Solid waste will be generated and will be stored and managed separately from hazardous wastes. Wastes will be recycled if possible and if not will be disposed of at approved locations.

### **2.4.4 Hazardous Waste Management**

Waste oil and lubricants from the mine maintenance facilities will be separated from water using an oil / water separator unit inside the workshop. The waste will be stored in a tank and will be required to be removed from a portable suction truck on a regular basis.

### **2.4.5 Mine Waste Management**

Waste rock generated in the mine will be directed to dedicated in-pit and ex-pit disposal areas. These waste rock disposal areas will be constructed at their final slope angle, or re-sloped if required, to ensure long term stability and reclamation success.

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The coal processing plant modules will generate a coarse and fine reject coal stream. These streams will be combined in the coal processing plants and directed to the reject bin for loading into mine haul trucks for dry disposal back into the mine. The current mine plan is to co-dispose the reject coal in the waste rock disposal areas of the mining pit operations.

## **2.5 Planned Project Phases and Scheduling**

The Project Application and Environmental Impact Statement (EIS) will be submitted to Provincial and Federal regulatory agencies to apply for approval for the Project. A Mine Permit and Coal Processing Plant Approval will be sought from the Province of Alberta. The detailed applications for Pit and Dump licences, an EPEA Approval, Approvals and Licences under the *Water Act*, and the *Public Lands Act* Dispositions will follow after submission of the Application and EIS. This integrated application is anticipated to be ready for submission at the end of the 2<sup>nd</sup> quarter of 2015.

Riversdale has also engaged the Federal Government, as some level of federal involvement is expected as per the CEAA (2012).

Pending all necessary approvals and permits, the current development schedule for the Grassy Mountain Project is:

- Construction: 2017 - 2018
- Commissioning & Operation: 2018 - 2020
- Full Operations: 2021 – 2042
- Decommissioning: 2043 – 2044
- Reclamation: On-going through life of mine.

### **2.5.1 Construction**

The construction phase of the Project is estimated to take two years. The main steps of the Project have been included below:

- assembly of owner's construction management team;
- selection of contractor(s) to complete the site development work;
- logging of any merchantable timber within the disturbance area;
- settling pond construction and water management control structures;
- plant/office/shop site clearing and grading;
- construction of infrastructure including upgrading of main access road, coal conveyor and powerline;
- assembly of construction camp;



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- construction of explosives facility;
- construction of rail loop or siding and load-out facility including crossing structures for Highway 3;
- construction of coal processing plant modules, mine maintenance shop/dry and office complex; and
- pre-stripping of waste rock inside first phase of mine.

## 2.5.2 Operation

### 2.5.2.1 Main Activities

The site infrastructure will include coal processing plant modules, an access road and coal conveyor, a rail siding and coal loadout facility, administration offices, maintenance shop facilities, and ancillary facilities. Also needed are fresh and process water supply systems, power supply and distribution infrastructure, and process control and instrumentation. Raw coal will be hauled from the mine pits and delivered to the coal processing plant modules for direct dumping into the sizing and plant feed system or to an outside stockpile.

The pit area will be developed in multiple areas to allow waste rock to be removed from the top of the coal in some areas, and allowing the exposed coal to be hauled to the coal processing plant modules from others. The development will be carefully sequenced for the life of the Project to ensure reliable coal supply to the coal processing plant modules and to balance the waste rock disposal between ex-pit and in-pit disposal. All waste rock material is expected to require drilling and if partings are large enough to be blasted, it too will be hauled away with waste rock.

The coal processing plant has been planned to be constructed in two modules. Module 1, which is to be completed during the initial construction phase, will allow for clean coal production of up to 2 Mta. Module 2, which will double the clean coal production capacity, will be constructed during the initial operation period. A summary of the activities during this initial operation phase include:

- hiring and training of site operations manpower;
- mine operations activities such as drilling, blasting, waste/coal excavation and haulage to disposal area/raw coal stockpile, feeding plant, backhauling plant rejects for co-disposal in waste disposal areas and on-going reclamation;
- plant operations such as coal washing, stockpiling of clean coal and loading of trains;
- environmental activities such as environmental monitoring and operation of water management control structures;
- engineering support activities for the mine including exploration drilling;

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- offsite activities such as transportation of coal by rail to marine ports and loading of coal on to vessels at the ports; and
- construction of second processing plant module.

An access road and coal conveyor will be constructed to allow for access to the mine and CHPP from Highway 3 near Blairmore. The coal conveyor is required to transport coal from the CHPP down to the rail loadout and rail track. The final option for these facilities is in the process of being determined. The shop/office and maintenance complex will be constructed near the CHPP facilities to be in close proximity to the mining activities.

#### 2.5.2.2 Schedule and Duration

It is anticipated that the Project construction, commissioning, and production ramp-up phase will take approximately three years (2018-2020) after initial production begins. Operations will continue for an additional 22 years to 2042.

### 2.5.3 Decommissioning and Abandonment

#### 2.5.3.1 Main Activities

The Project as currently designed is for a mine life of from 2019 to 2042. The mine plan allows for progressive reclamation throughout the mine life. A final closure plan will be submitted in the mine permit application. It is expected that decommissioning activities will take a few years upon completion of mining activities to complete. Expected activities may include:

- re-sloping waste disposal areas to a shallower slope as required for long term stability;
- dismantling all site infrastructure;
- re-establishment of vegetation on remaining reclaimed areas; and
- re-establishment of long term surface water drainages.

#### 2.5.3.2 Schedule and Duration

It is anticipated that the Project decommissioning phase will take approximately one to two years (2043-2044).

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### **3.0 PROJECT LOCATION**

#### **3.1 Description of the Project Location**

The Project is located in southwest Alberta, about 150 km south of Calgary in the Crowsnest Pass (Figure 1.1-1). The Grassy Mountain coal lease is predominantly situated to the north of Highway 3, with a small section to the south within the Town of Blairmore. The proposed CHPP will be situated approximately seven (7) km north of Blairmore, and will be accessible via an existing high grade road (Figure 2.1-1).

The majority of the Project's footprint will occur on Riversdale private land, with the remaining portions occurring on either Crown land or other private lands (Figure 2.1-1). The Project's proposed Mine Permit boundary (areas within which all activities will occur) is approximately 6,121 ha in size with the centre of the Project being located at Latitude 49°40'36.4" N and Longitude -114°25'47.1".

##### **3.1.1 Site Plan**

As previously described in Section 2.0 (Project Information), The Project's overall disturbance layer will consist of an open pit coal mine, waste rock disposal areas, a Coal Handling and Processing Plant (CHPP), and a product coal overland conveyor that will connect the CHPP area to a train load out facility (Figure 2.1-1). This current site configuration was chosen to minimize the footprint of the Project as much as possible while maximizing access to the coal resource.

### **3.2 Project Location Relative to Existing Features**

#### **3.2.1 Local Communities and Residences**

Local communities within the Municipality of Crowsnest Pass include the Village of Bellevue, the Town of Blairmore, the Town of Coleman, the Village of Frank, and parts of Improvement Districts No. 5 and 6 (Figure 1.1-1).

The closest communities to the Project are Blairmore and Coleman. The centre of Coleman is located approximately 6.5 km southwest from the centre of the Project; the centre of Blairmore is located approximately 7.5 km south from the centre of the Project. Both towns are situated along provincial Highway 3.

#### **3.2.2 Provincial and International Boundaries**

The provincial border between Alberta and British Columbia is located approximately 17 km west of the Project. The federal border between Alberta and Montana, USA is located approximately 75 km south of the Project (Figure 1.1-1).

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### 3.2.3 Linear and Other Transportation Components

Provincial Highway 3 and a main line of the Canadian Pacific Railroad traverse the Municipality of Crowsnest Pass in an east to west configuration. The southern portion of the Mine Permit Area is accessible by a secondary access road off of Highway 3, while the northern portion of the Mine Permit Area is accessed by an access road via secondary Highway 40 (Forestry Trunk Road) (Figure 2.1-1).

The Canadian Pacific Railway provides direct access for potential coal delivery from coal mines in the Crowsnest Pass to west coast port facilities in British Columbia. The main line of the Canadian Pacific Railway line occurs adjacent to Highway 3, and runs west through the Elk Valley before continuing to the ports on the west coast. A rail load out will extend north to service the Project area. Plans for the route are location of the load-out is currently under discussion between Riversdale, Alberta Transportation, and Canadian Pacific Railway.

### 3.2.4 Existing Land Use

There are a number of existing land uses in the area that include considerable historical mining, oil and gas, recreation (i.e. ATV, hunting, fishing), grazing (Figure 3.2-1), timber harvesting (Figure 3.2-1), trapping, and traditional uses. Riversdale are committed to engaging all the existing users in the discussions regarding the proposed Project. There are no other restrictions that would prevent mining development from occurring.

The area within the Mine Permit Boundary contains seven properties that have existing dwellings, in the form of cabins (Figure 3.2-2 and Table 3.2-1). The Historic Town of Lille and two additional dwellings are located just east of the Mine Permit Boundary. Two trapping cabins are located near the Project (Table 3.2-2), and two trap line dispositions exist within the Mine Permit Boundary under the Alberta Public Lands Act (TPA 1677 and TPA 2426).

<b>Table 3.2-1 Residences within and near the Mine Permit Boundary</b>		
<b>Residence Number</b>	<b>Latitude</b>	<b>Longitude</b>
<b>Within Mine Permit Boundary</b>		
MDRL002	49°39'30.58"N	114°25'7.62"N
MDRL003	49°40'1.20"N	114°25'1.54"N
MDRL004	49°40'13.24"N	114°24'9.40"N
MDRL005	49°40'57.58"N	114°24'25.76"N
MDRL006	49°41'13.44"N	114°24'9.67"N
MDRL007	49°39'48.43"N	114°24'12.24"N

<b>Table 3.2-1 Residences within and near the Mine Permit Boundary</b>		
<b>Residence Number</b>	<b>Latitude</b>	<b>Longitude</b>
<b>Within Mine Permit Boundary</b>		
MDRL008	49°39'32.15"N	114°24'7.26"N
<b>Near and Outside Mine Permit Boundary</b>		
Historic Town of Lille	49°39'6.87"N	114°23'44.32"N
MDRL009	49°39'21.67"N	114°23'33.09"N
MDRL010	49°40'14.05"N	114°23'40.49"N

<b>Table 3.2-2 Trappers Cabins near the Project</b>		
<b>Residence Number</b>	<b>Latitude</b>	<b>Longitude</b>
MDRL011 – Trapper’s Cabin	49°42'54.43"N	114°23'46.89"W
MDRL012 – Trapper’s Cabin	49°45'8.46"N	114°25'53.12"W

Based on some of the preliminary Traditional Knowledge and Use ground-truthing field work conducted by representatives from Piikani Nation, Blood Tribe, Siksika Nation, Tsuu T’ina Nation, and Stoney Nakoda First Nation from June to October 2014, it has been determined that there are seven (7) First Nations (Treaty 7) receptors that exist within the Mine Permit Boundary (Figure 3.2-3). The details of the proposed Project are currently being developed and will be provided to the local, regional, and aboriginal stakeholders once finalized; however, these receptor areas are considered important for current traditional, short-term use.

Historical resources (*i.e.*, archaeological, cultural, geological, historical period, natural, palaeontological) are known to exist within the vicinity of the Project. The Project area has been evaluated for historical resource value using the Alberta Community and Cultural Spirit (ACCS) Listing of Historic Resources, under the *Historical Resources Act*. The Listing of Historic Resources outlines and lists areas that may be of historical significance in Alberta. The Listing assigns a Historical Resource Value (HRV) to various parcels of land, ranging from 1-5, with 1 being the highest protection and 5 the lowest. There is one known historical site with a HRV 1 rating, one known historical sites with a HRV 2 rating, eight known historical sites with a HRV 3 rating, and fifteen historical sites with an HRV 4 classification within the Mining Permit Boundary.

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### 3.2.5 Proximity of Aboriginal Groups

The Project is located within Treaty No 7 territory in southern Alberta. All seven Treaty 7 member Nations have expressed interests in the Project (*i.e.*, Piikani Nation, Blood Tribe, Siksika Nation, Tsuu T'ina Nation, and Bearspaw, Wesley and Chiniki First Nations of the Stoney Nakoda Nation). In addition, Riversdale has contacted the Ktunaxa Nation located in British Columbia to the west of the Grassy Mountain Project area. Riversdale will consult with other Aboriginal groups, including the Métis Nation Alberta Region 3, the Métis Nation British Columbia Region 4, the Samson Cree Nation and the Foothills Ojibway Society, and potentially any additional Aboriginal groups that may assert rights to the Project area throughout the CEAA process.

Several Aboriginal groups are located within a 100 km radius of the Project in both BC and Alberta (Figure 3.2-3). The First Nation reserves in Alberta within 100 km of the Project include the Peigan Timber Limit 147b, Piikani Reserve, Blood 148, Blood Timber Limit 148a, and Eden Valley 216. In BC, First Nation reserves within 100 km include the Bummer's Flat 6, Kootenay 1, St. Mary's 1a, Isidore's Ranch 4, Cassimayooks 5, and Tobacco Plains 2. The closest populated First Nation reserve community to the Project is the Piikani Reserve, approximately 45 km to the east.

Riversdale began engaging Treaty No. 7 First Nations in June 2013, prior to the legal acquisition of the Grassy Mountain coal leases. Through early discussions with First Nations on coal exploration activities and future plans, Riversdale set out to engage each of the Aboriginal groups in Treaty No. 7 and proximate to the Project in a way that is respectful and meaningful. Through these initial discussions, Riversdale began engaging consultation staff, Chief and Council members, Elders, and other key staff members responsible for participation in Project studies, employment and contracting opportunities. Riversdale continues to collaborate with Aboriginal leadership, staff and members to guide ongoing consultation activities. Traditional land and resource use studies were initiated in May of 2014, and field work was conducted from August through September of 2014.

### 3.2.6 Federal and Provincial Land

As noted in Section 3.2.5, the nearest Federal Land to the Project includes the Piikani Reserve (approximately 45 km east) and the Peigan Timber Limit 147B (approximately 30 km east). Also, the townsite of Coleman, which borders the Project on the southwest, is listed as a National Historic Site of Canada (Figure 3.2-3).

Several National Parks and National Historic sites exist within southwest Alberta and southwest BC. The National Parks (NPs) in the area include:

- Waterton Lakes NP (55 km south from the Project);
- Banff NP (100 km northwest from the Project);



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- Kootenay NP (145 km northwest from the Project); and
- Yoho NP (225 km northwest from the Project).

Nearby National Historic Sites in the vicinity of the Project include:

- Coleman (immediately southwest of the Project);
- Head-Smashed in Buffalo Jump (56 km east from the Project);
- Territorial Courthouse (73 km east from the Project);
- Fort McLeod (73 km east from the Project);
- First Oil Well in Western Canada (75 km southeast from the Project);
- Prince of Wales Hotel (79 km southeast from the Project);
- Bar U Ranch (82 km north from the Project);
- Fort Steele Heritage Town (87 km west from the Project);
- Old Woman's Buffalo Jump (100 km from the Project);
- Turner Valley Gas Plant (110 km north from the Project); and
- Turner Valley Oilfield (110 km north from the Project).

No Federal lands exist within the Mine Permit Boundary.

Some land parcels within the Mine Permit Boundary are located on Provincial Crown Land. Section 3.4.3 details surface land ownership associated with the parcels of land on which the Project will be located. Alberta Provincial Parks (Chinook Provincial Park), Provincial Recreation Areas (PRA) (Coleman PRA, Crowsnest Lake PRA, Island Lake PRA, and Lundbreck Falls PRA), Wildland Provincial Parks (WPP) (Livingstone Range WPP, Castle WPP, and High Rock WPP), and a BC Provincial Park (Crowsnest Provincial Park) occur in the vicinity of the Project (*i.e.*, within 20 km from the Project centre). These areas are all considered Provincial Crown Land.

### **3.2.7 Watercourses and Fishing Areas**

Key watercourses in the area include the Crowsnest River, Gold Creek, and Blairmore Creek (Figures 2.1-1 and 3.2-4). The Project is located on the divide between the Gold Creek and Blairmore Creek watersheds, with the majority of the Project falling within the Blairmore Creek watershed. Blairmore Creek originates to the northwest of the proposed mine and flows into the Crowsnest River near the town of Blairmore. The Blairmore Creek drainage landscape influences included forested area and a historic mining area in the upper reaches and the lower reaches through forest and the town of Blairmore, Alberta.

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Gold Creek is located east of the development area with upper tributaries draining from private, residential land down to the Crowsnest River near the Town of Frank. The Project area is located within the upper reaches of several first order tributaries within the Gold Creek drainage.

The Crowsnest River is intensively used as a recreational fishery throughout the Crowsnest Pass, particularly the section of river between Crowsnest Lake and the Lundbreck Falls. Several lakes located within the vicinity of the Project are used for recreational fishing and are stocked (AESRD 2014d). Crowsnest Lake, Phillipps Lake, Island Lake, Allison Lake, Emerald Lake, Coleman Fish and Game Pond, Burmis Lake, and Lees Lake have been stocked with rainbow trout (RNTR), cutthroat trout (CTTR), and/or brook trout (BKTR) between (AESRD 2014d) (Table 3.2-3).

Lake	Location	2010	2011	2012	2013	2014
Crowsnest Lake	08-008-05 W5M	RNTR	RNTR	RNTR	RNTR	RNTR
Phillipps Lake	18-008-05 W5M	CTTR	CTTR	CTTR	---	CTTR
Island Lake	12-008-06 W5M	BKTR	BKTR	---	RNTR	RNTR
Allison Lake	27-008-05 W5M	RNTR	RNTR	RNTR	RNTR	RNTR
Emerald Lake	08-008-08 W5M	CTTR	CTTR	CTTR	---	---
Coleman Fish and Game Pond	24-008-05 W5M	RNTR	RNTR, CTTR	RNTR	RNTR	RNTR
Burmis Lake	14-007-03 W5M	RNTR	RNTR, CTTR	RNTR	RNTR	RNTR
Lees Lake	08-007-02 W5M	RNTR	RNTR	RNTR	RNTR	RNTR, CTTR

Notes: RNTR – Rainbow Trout; CTTR – Cutthroat Trout; BKTR – Brook Trout

### 3.2.8 Environmentally Sensitive Areas

The Project also falls within AESRD's 2014 Environmentally Significant Areas (ESAs) (Figure 3.2-5). In 2014, an update of the areas was provided and it amalgamated both the environmental and aquatic significant areas. The following sensitivity zones are within the vicinity of the Project's Mine Permit Boundary (Figure 3.2-5):

- Grizzly Bear;
- Mountain Goat and Sheep Range;
- Key Wildlife Biodiversity Zones;

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- Environmentally Significant Area #2; and,
- Aquatic Environmentally Significant Areas.

### 3.3 Photographs of Project Location

Representative photographs of the work locations and Project property are provided below.



**Photo 3.1: Aerial view of Grassy Mountain looking north.**



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**Photo 3.2: Coal seams within a bedrock outcrop at the Grassy Mountain Coal Project.**



**Photo 3.3: Historical Surface Mining Activity within the Grassy Mountain Project Area**



**Photo 3.4: North Access Road (off of the Forestry Trunk Road) to the Grassy Mountain Coal Project**

### **3.4 Land Use**

#### **3.4.1 Provincial Government Policies**

The Project falls within the southwest limits of the South Saskatchewan Regional Plan (SSRP) (AESRD 2014e), which came into effect September 2014 and was established to manage the cumulative effects of development on the environment (including air, water, land, and biodiversity) across southern Alberta and to ensure that the long-term quality of the environment in southern Alberta meets provincial objectives. The SSRP encompasses an area of 83,764 km<sup>2</sup> (12.6% of the province), which contains approximately 44% of Alberta's population.

A key objective of the SSRP is the long-term efficient use of land (AESRD 2014e). There are several strategies within this objective, including, but not limited to: minimizing the amount of land required for new developments, using already-disturbed lands, and progressively and timeously reclaiming previously developed lands that are no longer required. Although a large portion of the Grassy Mountain coal lease has been previously disturbed from historical mining activities, Riversdale are committed to minimizing the Project footprint and progressively reclaiming pit and waste rock disposal areas as they become available for reclamation.

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The SSRP contains several conservation areas, recreation and park areas, and priority planning areas to ensure sustainable recreation areas co-exist with healthy ecosystems along the eastern slopes of the Rocky Mountains. The Project overlaps two of these areas (Figure 3.4-1):

- Livingstone Range Wildland Provincial Park (LRWPP) (designated conservation area); and
- Livingstone priority sub-regional planning area.

Restrictions for development and activities are greatest in conservation areas; however, existing activities and leases will be upheld by the legislation (AESRD 2014e). The activities proposed for the Project fall under either the allowable land uses for LRWPP or within the exemptions for freehold minerals and linear infrastructure requirements for freehold minerals activities (AESRD 2014e).

The objectives for the Livingstone priority planning area are recreation management planning and linear footprint management planning (AESRD 2014e), which collectively aim to stabilize or reduce linear development on public land in the sub-region while enhancing recreation opportunities.

#### 3.4.1.1 Integrated Resource Plans

Encompassed within the SSRP, but more specific to the Project, are two Integrated Resource Plan (IRP) areas (Figure 3.4-1):

- Livingstone-Porcupine Hills Sub-Regional Integrated Resource Plan (1987); and
- Crowsnest Corridor Local Integrated Resource Plan (1991).

Within the Livingstone-Porcupine Hills Sub-Regional IRP the majority of lands fall within the Crowsnest Watershed RMA with a small portion to the north falling within the West Livingstone RMA. Most of the area within these RMAs is in Zone 5. Coal exploration and development are a compatible use within Zone 5.

Within the Crowsnest Corridor Local IRP area, land falls within Zone 5 (multiple use) and Zone 8 (facility). There are also areas of freehold lands, for which no zoning is applied. Coal exploration and development are a compatible use within Zone 5 and are not permitted within Zone 8.

The SSRP has recently been approved and the activities contemplated with this development plan are compatible.

#### 3.4.2 Regional and Municipal Zoning

The Mine Permit Boundary falls within two municipal districts (M.D.): the M.D. of Ranchland No. 66 (M.D. Ranchland) and the M.D. of Crowsnest Pass (Figure 3.4-2). Each M.D. has zoning requirements that direct development within the municipalities.



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A portion of the Project area falls within two M.D. districts of the M.D. Ranchlands (Figure 3.4-2):

- Agricultural/White Area – AWA; and
- Forestry Reserve – FR

The purpose of the Agricultural/White Area – AWA district is to conserve agricultural land, including grasslands, while permitting activities associated with agricultural production on privately held lands in the white area. Isolated natural resource extractive industries are a discretionary use within this district.

The purpose of the Forestry Reserve – FR district is to monitor land use proposed within the green area of the M.D. Ranchland, which is subject to prior approval from appropriate government department. Natural resource extractive industries are a discretionary use within this district.

A portion of the Project area also falls within four development areas of the M.D. of Crowsnest Pass:

- Non-Urban Area – NUA-1; and
- Urban Area

The purpose of the Non-Urban Area – NUA-1 is to ensure that these areas, typically on the periphery of existing development, allow only restricted uses and maintain parcels of large sizes to provide maximum flexibility for use and development or when the land is used for urban development. Within this area, exploration and site preparation for oil, gas, and other minerals, resource development activity, and resource processing facilities are discretionary uses.

The Urban Area has been delineated using the M.D. of Crowsnest Pass land use bylaw maps and encompass a number of the M.D.'s development zones that do not have natural resource extraction as a permitted use or special use. This area includes town infrastructure types of developments (local, residential, recreational, and public).

No areas within the Mine Permit Boundary are within the Restricted Development Area (RDA) or the Turtle Mountain Restricted Development (DC-2) of the M.D. of Crowsnest Pass.

### **3.4.3 Surface Land Ownership and Legal Descriptions**

The Project is located in an area that contains both privately owned and Provincial Crown surface rights (Figure 1.1-1). Riversdale commenced exploration drilling in 2013 and to date they have drilled on both crown land (leased by Riversdale) and private land. The privately owned land consists of land titled to Riversdale as well as other private land owners (Figure 1.1-1). The centre of the Project is located at Latitude 49°40'36.4" N and Longitude -114°25'47.1" (685425E, 5505866N, UTM Zone 11N), and the proposed project falls within the following legal land locations (township and range):



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- Township 008- Range 03- West of the 5th Meridian
- Township 008- Range 04- West of the 5th Meridian
- Township 009- Range 03- West of the 5th Meridian
- Township 009- Range 04- West of the 5th Meridian

The legal descriptions for surveyed Crown Land parcels that overlap with the project footprint are provided in Table 3.4-3.

<b>Table 3.4-3 Legal Descriptions of Provincial Crown Land Parcels within the Mine Permit Boundary</b>	
<b>Title Number</b>	<b>Legal Description</b>
162X174	NW-19-007-03 W5M
891 051 606B	SW-14-008-04 W5M
901 155 112	SW-02-008-04 W5M
881 052 951	NE-03-008-04 W5M
871 205 556A	NE-03-008-04 W5M
147R226	NE-16-008-04 W5M
122575A	NE-11-008-05 W5M SE-11-008-05 W5M
127Z108	NW-14-008-05 W5M SW-14-008-05 W5M
133G111	SW-14-008-05 W5M

#### **3.4.4 Subsurface Ownership**

Riversdale holds the subsurface mineral agreements for the coal leases within the Mine Permit Boundary. The Mine Permit Boundary area also has two petroleum and natural gas (PNG) leases, one natural gas lease, five 5 year Foothills PNG licences, one metallurgic and industrial minerals permit, and one coal lease application, held by various owners (Table 3.4-4).

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<b>Table 3.4-4 Active Crown Mineral Agreements within the Mine Permit Boundary</b>			
<b>Agreement Number</b>	<b>Agreement Type</b>	<b>Expiry Date</b>	<b>Agreement Holder(s)/Percentage</b>
(AB)001 127718	Petroleum and Natural Gas Lease	Dec 31, 9999	Direct Energy Marketing Ltd./ 10.25% Devon Canada Corp./ 89.75%
(AB)001 127718A	Petroleum and Natural Gas Lease	Dec 31, 9999	Direct Energy Marketing Ltd./ 10.25% Devon Canada Corp./ 89.75%
(AB)002 1417	Natural Gas Lease	Dec 31, 9999	Direct Energy Marketing Ltd./ 10.25% Devon Canada Corp./ 89.75%
(AB)131301120013	Coal Lease	Dec 20, 2016	Benga Mining Ltd./100%
(AB)0131302040120	Coal Lease	Apr 10, 2017	Benga Mining Ltd./100%
(AB)0131304020413	Coal Lease	Feb 20, 2019	Benga Mining Ltd./100%
(AB)0131306120436	Coal Lease	Dec 6, 2021	Benga Mining Ltd./100%
(AB)0131306120437	Coal Lease	Dec 9, 2021	Benga Mining Ltd./100%
(AB)0131307030946	Coal Lease	Mar 8, 2022	Benga Mining Ltd./100%
(AB)0131307030965	Coal Lease	Mar 22, 2022	Benga Mining Ltd./100%
(AB)0131307080678	Coal Lease	Aug 31, 2022	Benga Mining Ltd./100%
(AB)0131308050906	Coal Lease	May 10, 2023	Benga Mining Ltd./100%
(AB)0131308050907	Coal Lease	May 10, 2023	Benga Mining Ltd./100%
(AB)0131308050908	Coal Lease	May 10, 2023	Benga Mining Ltd./100%
(AB)0131308050909	Coal Lease	May 10, 2023	Benga Mining Ltd./100%
(AB)0131308070802	Coal Lease	Jul 2, 2023	Benga Mining Ltd./100%
(AB)0131309090457	Coal Lease	Sep 16, 2024	Benga Mining Ltd./100%
(AB)0131309110258	Coal Lease	Nov 1, 2024	Benga Mining Ltd./100%
(AB)0131312060346	Coal Lease	Jun 11, 2027	Benga Mining Ltd./100%
(AB)0131314010343	Coal Lease	Jan 20, 2029	Benga Mining Ltd./100%
(AB)0131314010344	Coal Lease	Jan 20, 2029	Benga Mining Ltd./100%
(AB)0131314010355	Coal Lease	Jan 31, 2029	Benga Mining Ltd./100%
(AB)0555505060975	5 Year Foothills Petroleum and Natural Gas Licence	Jun 30, 2015	Devon NEC Corp./ 100%
(AB)0555505060976	5 Year Foothills Petroleum and Natural Gas Licence	Jun 30, 2015	Devon NEC Corp./ 50% Legacy Oil + Gas Inc./ 50%

**Table 3.4-4 Active Crown Mineral Agreements within the Mine Permit Boundary**

Agreement Number	Agreement Type	Expiry Date	Agreement Holder(s)/Percentage
(AB)0555505060977	5 Year Foothills Petroleum and Natural Gas Licence	Jun 30, 2015	Devon NEC Corp./ 100%
(AB)0555505060978	5 Year Foothills Petroleum and Natural Gas Licence	Jun 30, 2015	Devon NEC Corp./ 100%
(AB)0555596010065	5 Year Foothills Petroleum and Natural Gas Licence	Dec 31, 9999	Shell Canada Ltd./ 33.3% Legacy Oil + Gas Inc./ 66.7%
(AB)0939302020061	Metallic and Industrial Minerals Permit	Feb 11, 2016	Micrex Development Corp./ 100%
(AB)A1 120211507	Appl-Coal Lease	Jan 1, 1753	Peace River Coal Inc./ 100%

### 3.5 Water Use

#### 3.5.1 Water Requirements for the Project

The volume of water required for the Project is estimated to be 850,000 m<sup>3</sup>/year, which is based on 100 litres per raw tonne of coal with a clean coal yield of 55%. Additional discussion is required to fully understand the volume of water that will be consumed, lost, and returned.

The Project is located in the South Saskatchewan River Basin (SSRB), particularly within the Oldman River sub-basin of the SSRB, which is currently under surface water allocation restrictions. Since August 2006, the SSRB have been closed to new water licence applications except for First Nations, the Water Conservation Objective, and water storage projects. Approximately 15% of the water use requirements can be obtained from new surface water allocations, the remainder will need to come from other sources.

Riversdale is currently exploring for groundwater sources to provide the majority of the water supply for the Project. Groundwater sources are available in the SSRB. Other possibilities include acquiring surface water or groundwater allocations from other licenced users in the region. An example of this is Riversdale is in the process of purchasing approximately 15% of the Project's water needs from another user in the Crowsnest Pass region.

#### 3.5.2 Existing Surface Water Allocations

A search of the AESRD Licence Viewer revealed that 73 surface water diversion licences exist within the Crowsnest River Watershed, which equates to 8,417,093 m<sup>3</sup>/year of surface water that has been allocated. A summary review of the licences within the watershed indicates that:

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- The majority of water allocated is for commercial use (68%), followed by municipal (16%), irrigation (12%), agricultural (2%), and other uses (2%);
- AESRD holds a of surface water diversion licence (approval number 00032258-00-00) of 5,083,170 m<sup>3</sup>/year from Allison Creek (SE-27-008-05 W5M) for use at the Allison Creek Fish hatchery. Only 0.4% of the diversion volume is estimated for consumption and loss, whereas 99.6 % is estimated to return to Allison Creek;
- The Municipality of Crowsnest Pass holds six surface water licences (approval numbers 00045622-00-00, 00045625-00-00, 00045980-00-00, 00045849-00-00, 00035850-00-00, and 00045849-00-00) for municipal use, for a total of 1,255,700 m<sup>3</sup>/year;
- Devon Canada Corp. (Devon) has been allocated 123,350 m<sup>3</sup>/year of water and diversion rate of 0.017 m<sup>3</sup>/s from the Crowsnest River (NE-02-008-05 W5M) for commercial use (approval number 00039493-00-00);
- Two surface water diversion licences (approval numbers 00038115-00-00 and 00269922-00-00) are held by 706979 Alberta Ltd. for commercial use (aggregate washing). The total volume allocated from Allison Creek is 277,540 m<sup>3</sup>/year, with 93 % estimated to be returned to Allison Creek;

### 3.5.3 Existing Groundwater Allocations

A surface water moratorium that was put in place within the SSRB also applies to water diversion licences from groundwater sources that naturally flow to and from the rivers and tributaries. Due to these restrictions, Riversdale is investigating some possible options to meet the Project's water requirements, using groundwater as a source. These groundwater allocation options are outlined in the following sections.

#### 3.5.3.1 Existing Groundwater Diversion Licences

A search of the AESRD Licence Viewer revealed that 25 groundwater diversion licences exist within the Crowsnest River Watershed, which equates to 5,761,062 m<sup>3</sup>/year of groundwater that has been allocated. A summary review of the licences within the watershed indicates that:

- The majority of water allocated is for municipal use (83.8%), followed by management of fish (14.4%), agricultural (1.7%), and other uses (<0.1%);
- AESRD holds a of surface water diversion licence (approval number 00030473-00-00) for the diversion of 829,640 m<sup>3</sup>/year from two wells located at 08-22-008-05 W5M for use at the Allison Creek Fish hatchery. 10% of the diversion volume is estimated for consumption and loss, whereas 90% is estimated to return to Allison Creek at SE-22-008-05 W5M;

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- The Municipality of Crowsnest Pass holds ten groundwater licences (approval numbers 00029000-00-00, 00029001-00-00, 00029756-00-00, 00029757-00-00, 00034273-00-00, 00034274-00-00, 00034620-00-00, 00034621-00-00, 00034622-00-00, and 00140020-00-00) for municipal use, for a total of 4,765,274 m<sup>3</sup>/year;

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## 4.0 GOVERNMENT FINANCIAL SUPPORT, LANDS, AND LEGISLATIVE REQUIREMENTS

### 4.1 Financial Support

There is no proposed or anticipated federal or provincial financial support to Riversdale to carry out the Project. There is the potential that some federal support to Aboriginal Groups may be required.

### 4.2 Lands

There are no federal lands that will be used for the purpose of carrying out the Project. With the exception of federal Aboriginal Groups reserve land (*i.e.*, the Peigan Timber Limit 147B and the Piikani Reserve), there are no federal lands within 50 km of the proposed Project. Furthermore, no federal lands are expected to be affected by the Project directly, indirectly, or through cumulative effects.

### 4.3 Legislative Requirements

The following federal *Acts* may apply to the design, construction, and operation of the Project:

- *Canadian Environmental Assessment Act;*
- *Fisheries Act;*
- *Species at Risk Act;*
- *Canada Wildlife Act;*
- *Migratory Birds Convention Act;*
- *Explosives Act;*
- *Canada Transportation Act;*
- *Transportation of Dangerous Goods Act;*
- *Radio Communications Act;*
- *Canada Shipping Act;* and
- *Railway Safety Act*

Below is a list of the anticipated provincial *Acts*, which may apply for the design, construction, and operation of the Project:

- *Coal Conservation Act;*
- *Coal Sales Act;*
- *Environmental Protection and Enhancement Act;*
- *Forest and Prairie Protection Act;*
- *Forests Act;*

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- *Historical Resources Act;*
- *Mines and Minerals Act;*
- *Law and Property Act;*
- *Municipal Government Act;*
- *Occupational Health and Safety Act;*
- *Public Highways Development Act;*
- *Public Lands Act;*
- *Special Areas Act;*
- *Surface Rights Act; and*
- *Water Act*



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## 5.0 ENVIRONMENTAL SETTING AND POTENTIAL EFFECTS

### 5.1 Environmental Setting

#### 5.1.1 General Environmental Overview

Topography of the Grassy Mountain area consists of high rounded hills with <math>20^{\circ}</math> slopes at lower elevations to moderate grade ( $\sim 30^{\circ}$ ) to steep ( $>45^{\circ}$ ) slopes at higher elevations. The elevation at the Town of Blairmore at Highway 3 is 1,290 metres above sea level (masl). Elevation in the Grassy Mountain surface mine area ranges from 1,460 to 2,100 masl. The general setting is characterized as foothills with complex geology, underlain by structurally deformed sandstone, siltstone, mudstone, and coal.

Blairmore Creek drains the valley west of the proposed Project and Gold Creek drains the valley to the east, with both draining into the Crowsnest River. Other water features on Grassy Mountain are associated as ponded areas in form of open pit excavations from historical surface mine activities.

Seasonal variations in temperature can be significant, where in the winter; temperatures can rise rapidly by  $30^{\circ}\text{C}$  during periods of warm Chinook winds. Snow can cover the ground from late September to the end of May at higher elevations. Warm to hot temperatures can extend from June through late September. Based on 20 year climate records collected from the Environment Canada climate station, Crowsnest (ID 3051R4R), the coldest month is December and the warmest month is July. Average monthly temperatures during these months are  $-6.4^{\circ}\text{C}$  and  $15.4^{\circ}\text{C}$ , respectively.

Precipitation is variable between years and seasons with the annual mean annual recorded at the Crowsnest Climate Station (recorded years of 1994 to 2013) as 361 mm, with rainfall contributing nearly three quarters of this ( $\sim 270$  mm) and snowfall one quarter ( $\sim 90$  mm). During spring and summer seasons, the greatest amount of rainfall occurs in June, with precipitation also recorded to occur in May, September, August and July (in decreasing order).

The Project lies within the Subalpine and Montane natural subregions of Alberta. Major soil types are Luvisols & Brunisols, with dominant tree species in the subalpine zone recorded as aspen, lodgepole pine, Douglas fir, subalpine fir, and Engelmann spruce. Grasslands are also present and Eutric Brunisols are commonly found. Agriculture is also prominent in the region and livestock grazing occurs over much of the private and crown lands adjacent to the Project area.

Environmental baseline studies for the Project were initiated in the fall 2013, and will continue to winter 2015. The studies have included data collection related to air quality, noise, hydrogeology, geochemistry, hydrology, water quality, fish and fish habitat, wetlands and vegetation, wildlife, soils

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and terrain, historical resources, traditional use and traditional ecological knowledge, as well as human health assessment (e.g., as part of vegetation and wildlife surveys).

### 5.1.2 Geology and Soils

The Project is located within the Rocky Mountain Natural Region. Approximately 58% of the local study area is located within the Subalpine Natural Subregion, while the remainder lies within the Montane Subregion (Natural Regions Committee, 2006). The Subalpine Natural Subregion occurs at high elevations on rolling to inclined landscapes. The Montane Subregion occurs on lower slopes and valley bottoms, and its upper boundary is the lower limit of the Subalpine Natural Subregion. The Project is also located in the Rocky Mountain Foreland Thrust and Fold Belt, within a succession of generally west-dipping thrust faults and associated folds with predominantly west-dipping axial surfaces. The Project lies between two major thrust faults, in an area of somewhat lesser disturbance. The coal deposits of the Project area are typical of those for Inner Foothills and Rocky Mountain areas which have been subjected to a relatively high tectonic formation. Fault offsets are common but fault-bounded plates generally retain normal stratigraphic thicknesses. Figure 5.1-1 shows the regional geology of the area and Figure 5.1-2 summarizes the regional stratigraphy of the area.

The coal seams of the Project are medium volatile bituminous in rank and found within the Mist Mountain Formation of the Kootenay Group, which is Jurassic to Lower Cretaceous in age. The coal sequences in the Mist Mountain Formation consist of a cyclic succession of carbonaceous sandstone, mudstone, siltstone, coal, and some conglomerate. The main coal zones identified within the Mist Mountain Formation in this area, from top to bottom, are Zones 1, 2 and 4 (Figure 5.1-2). Coal Resources and Coal Reserves estimates take into account the two thickest seams from Zones 1 and 4 and the single thickest seam from Zone 2. Zone 2 contains the thickest single seam.

Grassy Mountain coal in the Mist Mountain Formation outcrop occurs in a general north-south direction for a strike length of approximately seven (7) km. The Mist Mountain Formation consists of 66 to 194 vertical metres of strata and is overlain by prominent, weather-resistant Blairmore conglomerate. The strata have been strongly folded and faulted, resulting in sediments and coal zones repeated in parallel bands. Coal deposits of this type are characterized by tight folds, some with steeply inclined or overturned limbs. Fault offsets are common but fault-bounded plates generally retain normal stratigraphic thicknesses. These characteristics suggest that the Grassy Mountain coal deposits should be categorized as “Complex” to “Severe” Geology Types. Figures 5.1-3 to 5.1-7 illustrate plan view and cross sections of the Project.

Continuity of the coal seams along strike and the proximity of the coal to surface facilitate the use of surface mining methods to economically extract the coal. The density of drilling and supplemental

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information database allowed for 140,256 thousand tonnes (kt) of coal resources to be classified as “measured” and “indicated”.

### 5.1.3 Air Quality

For the Crowsnest Pass area of Alberta, the annual precipitation averages 58 cm; the majority of which is snow and seen in the months of October to April. Daily average temperatures range from -6°C in January, to 15°C in July, with temperature extremes ranging from -40°C to 35°C in January and July, respectively.

The closest long-term Environment Canada meteorological station to the Project is Coleman (Station ID: 3051720) located approximately six (6) km southwest of the Project in the Crowsnest River Valley. The climate normal for Coleman are presented in Table 5.1.1 and Figure 5.1-8 showing the location of the station relative to the Project.

<b>Table 5.1-1 Climate Normal for Coleman (Station ID: 3051720), 1981 to 2010 (Environment Canada, 2014)</b>													
<b>Month</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Year</b>
Daily Average Temperature	-6.4	-5	-0.8	3.6	7.9	11.8	14.3	14.3	9.5	4.6	-2.7	-7.4	3.6
Daily Maximum Temperature	-1.6	0.1	4.6	9.5	14.4	18.7	22.1	22.8	17	10.2	1.4	-3	9.7
Daily Minimum Temperature	-11.3	-10.1	-6.2	-2.4	1.3	4.9	6.5	5.7	2	-1.1	-6.8	-11.9	-2.4
Rainfall (mm)	12.7	10.8	13	23	60.8	70.2	62.6	43.2	44.3	32.8	22.4	9.2	404.8
Snowfall (cm)	22.1	26.4	25.6	16.7	8.8	0	0	0.5	1.7	13.6	33.9	28.1	177.3
Precipitation (mm)	34.8	37.1	38.6	39.8	69.6	70.2	62.6	43.7	45.9	46.4	56.2	37.3	582.1

To assist in the environmental assessment, two Project specific meteorological stations were established to collect short-term, site-specific climate data within the Project boundary (Figure 5.1-8). The stations operated from the mid-June 2014 to the mid-November 2014 collecting information on air temperature, solar radiation, precipitation, average wind speed, wind direction, relative humidity

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and barometric pressure. These representative stations will provide background meteorological data and will be supported by data from regional measurement stations. Baseline modelling will be conducted using emissions from sources in the study area, including those from industry, communities, and Highway 3.

#### **5.1.4 Hydrogeology**

Groundwater flow is eastward and westward away from the topographic high of Grassy Mountain. Flow in the upper portion of these systems is rapid based on baseflow chemistry analysis from the upper headwater tributaries of Blairmore Creek or Gold Creek. As a result of this rapid flow, dissolved constituents in the groundwater are expected to be relatively low.

At the south end of the Project the hydrogeological regime is influenced by the presence of historical underground mines. Groundwater levels in this area of the mountain are anticipated to be lowered (compared to the northern portions of the mountain) by the draining effect of the underground workings, as there is evidence of flow at abandoned underground mine portals.

Based on the geology, groundwater flow is anticipated to be focussed on structural features such as joints and faults rather than on primary features such as intergranular voids. The coal seams may contain relatively more structural features than the overlying or underlying strata and therefore may focus groundwater flow.

The steep topography of the Project area is likely to result in rapid runoff of precipitation; consequently, there is relatively low potential for groundwater recharge compared to areas with lesser slopes. This, combined with the structural-based hydraulic conductivity, will likely result in substantial variability in groundwater levels under the higher portions of the Project. It is anticipated that groundwater levels will decline substantially during fall and winter when there is little recharge, rise in the spring and vary noticeably as a result of summer storm events.

The relative lack of surficial alluvium, including the valleys of Blairmore Creek and Gold Creek, suggests that these watercourses will receive baseflow controlled by the secondary hydraulic conductivity of the structural features. It is anticipated that baseflow in these watercourses will be low.

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## 5.1.5 Hydrology

### 5.1.5.1 Watershed Description

The Project is located on the divide of two watersheds: Blairmore Creek and Gold Creek, with the majority of the Project falling within the Blairmore Creek watershed. Figure 5.1-9 illustrates the Projects location within the Blairmore Creek and Gold Creek watersheds and their proximity in relation to the Crowsnest River and Oldman River watersheds.

Blairmore Creek and Gold Creek collect runoff from an upstream area of 50 km<sup>2</sup> and 60 km<sup>2</sup>, respectively, with both discharging to Crowsnest River. These two subwatersheds are part of the Oldman River watershed, which is part of the South Saskatchewan River Basin, which is a major contributor to the Saskatchewan River, which ultimately discharges into Lake Winnipeg.

The Blairmore Creek watershed is relatively steep, with an average slope of 22°, and elevations ranging between 2300 and 1300 masl. Blairmore Creek originates to the northwest of the proposed mine and flows into the Crowsnest River near the town of Blairmore. The Blairmore Creek drainage landscape influences included forested area and a historic mining area in the upper reaches and the lower reaches through forest and the town of Blairmore, Alberta. There are several tributaries along the east side of Blairmore Creek that may be affected by Project activities.

Gold Creek has similar geomorphological characteristics to Blairmore Creek with an average slope of 19° and elevations ranging from 2500 to 1300 masl. Gold Creek is located east of the development area with upper tributaries draining from private, residential land down to the Crowsnest River near the Town of Frank. The Project area is located within the upper reaches of several first order tributaries (mapped at the 1:50,000 scale) within the Gold Creek drainage. Winter work will be undertaken to determine the seasonal flow in these tributaries.

### 5.1.5.2 Hydrological Regime

The Crowsnest Pass area is located in a region described to have humid continental weather with mild to warm summers and is characterized as having at least four months with average temperatures greater than 10°C. To understand local orographic effects to the hydrology, a total of 18 regional meteorological stations were reviewed. These stations have an average length of record of 60 years with daily information from 1876 to 2014. In addition, a total of 12 regional gauging stations with a natural hydrologic regimen were obtained to evaluate long-term runoff trends for the Project.

A record length of 50 years with daily flow data from 1908 to 2013 was obtained. This regional hydrologic data was also complemented with stream data from seven local gauging stations located in the vicinity of the site. Figure 5.1-10 illustrates the local and regional stations used to evaluate baseline and long-term hydrologic conditions at the project site. In order to evaluate evaporation,

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additional meteorological parameters such as solar radiation and dew point temperature are required. As this type of data was not available from the regional stations located near the project site, additional stations located at a greater distance (up to 400 km away) had to be investigated, as shown in Figure 5.1-10.

Based on available stream data from the local hydrometric stations, it was found that the regional Crowsnest River at Frank station (05AA008) best represented local hydrologic conditions. This station has continuous daily information from 1911 to 1919 and from 1965 to 2011, where data post-2011 was not publically available at the time that this report was prepared.

Figure 5.1-11 presents the monthly average runoff and precipitation expected at Grassy Mountain. The mean annual precipitation and mean annual runoff were determined to be 630 millimetres/year (mm/yr) and 385 mm/yr, respectively. Site lake evaporation was estimated from Environment Canada climate normals from 1981 and 2010, and Figure 5.1-11 displays the average monthly lake evaporation from the existing open pits, where the average annual lake evaporation is estimated to be 740 mm/yr.

The results of the baseline hydrologic analysis for the Project are listed as follows:

- Mean annual precipitation: 630 mm/yr;
- Mean annual runoff: 385 mm/year; and,
- Mean annual evaporation: 740 mm/yr.

The hydrologic analysis will be used to evaluate baseline hydrology for the project and assist in the evaluation of potential impacts to water quantity, quality and aquatic habitat during operations and post-closure.

### **5.1.6 Surface Water Quality**

To assist in the characterization of water quality within the Blairmore Creek and Gold Creek watersheds, a project specific sampling program was established in the spring of 2013 (carried out until winter 2015), which involved the establishment of five (5) locations to capture data upstream and downstream of the proposed mine (Figure 5.1-12). Preliminary results from the sampling are summarized in the following subsections.

#### **5.1.6.1 Blairmore Creek**

Two water quality sampling sites are located on Blairmore Creek; one upstream and one downstream of the proposed mine site (Figure 5.1-12). Guideline exceedances were observed for true colour, sulphide, copper (total), and aluminum at the upstream monitoring site, and for true colour, copper (total and/or dissolved), and aluminum at the downstream site during the spring freshet. These

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exceedances are likely attributed to natural variations experienced during the spring freshet's elevated flows. Aluminum (dissolved) was variable between sampling seasons with two guideline exceedances occurring in spring (May) and fall (September) 2013.

At the downstream sampling site (BLC-W01), high water levels attributable to spring melt and the flood event in June 2013 likely explain the exceedance in the true colour results in spring and during the 2013 high water sampling period (early July). Similar to the upstream site, copper (total) exceeded guidelines in spring 2013, copper (dissolved) exceeded guidelines in spring and summer 2013. Aluminum exceeded guidelines in spring 2013 and summer (August) 2014. Samples were not collected in winter (April) 2014 due to freezing and unsuitability of sample water for analyses.

Peaks in turbidity during spring and following the June 2013 flood may have led to high metal levels and other parameters due to the suspended sediment caused by increased runoff and erosion from higher flows. Aluminum in particular is associated with suspended sediment and can be naturally found in high concentrations in Alberta streams (AESRD, 2014b).

#### 5.1.6.2 Unnamed Tributary to Blairmore Creek

For the Blairmore Creek watershed, a water quality sampling site was also established on an unnamed tributary to Blairmore Creek (Figure 5.1-12). Similar to the mainstem of Blairmore Creek, exceedances in true colour were detected in April and July (high water and summer sampling) in 2013. Other exceedances included mercury (total) and copper (total and dissolved) and were also detected in spring and other high water sampling periods in the summer. Aluminum (dissolved) exceeded guidelines occurred across each sampling period with the exception of spring 2014.

#### 5.1.6.3 Gold Creek

The sampling site on Gold Creek (located in the town of Frank, immediately upstream of the Crowsnest River confluence) (Figure 5.1-12) was not added until July 2013; subsequently, no results for spring or post-flood conditions are available for that year. There were reports of selenium levels exceeding guidelines in fall 2013 (total selenium), and spring (April) 2014 (dissolved selenium). *In-situ* water quality parameters including dissolved oxygen (mg/L), temperature (°C), pH, and conductivity (µs/cm) were variable across monitoring periods, reflective of changes in seasonal conditions.

#### 5.1.6.4 Crowsnest River

For the Crowsnest River, the project specific sampling locations were established upstream and downstream of the confluence with Blairmore Creek (CRR-W02) (Figure 5.1-12). For the upstream location the Crowsnest River exceeded guidelines for sulphide in fall 2013, and selenium (total and dissolved) across each sampling period. The sampling station located downstream of the Blairmore



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Creek confluence (CRR-W01) (Figure 5.1-12) showed exceedances in aluminum in spring 2014, as well as ammonia and sulphide in summer (August) 2014. Selenium (total and dissolved) was observed to exceed guidelines across each sampling period, similar to the upstream monitoring site.

## 5.1.7 Fish and Aquatic Habitat

### 5.1.7.1 Blairmore Creek

Prior to the sampling being conducted for the Project, the most recent fish community sampling in Blairmore Creek was in 2010 as part of a provincial government program to assess the distribution of pure strain (100%) westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) to aid in the recovery plan for the species (AESRD 2014c). The recovery plan identified a small portion of an unnamed headwater tributary to Blairmore Creek as containing pure strain westslope cutthroat trout (AWCTRT 2013). Prior to this provincial sampling program, there are some reports of additional sampling in 2002 and 2006, as well as anecdotal records from oil and gas projects conducted in 1980s; however, these sampling occurrences do not appear to have followed rigorous or repeatable sampling program protocols.

Due to provincial restrictions on instream sampling techniques (in place to protect the species), sampling conducted for the Project was limited to August 2014. Fish and fish habitat surveys were conducted at 19 locations within the Blairmore Creek drainage and covered all of the mapped tributaries present on a 1:50 000 scale NTS map (Figure 5.1-13). Of the 19 sites, nine (9) were assessed for habitat only, as there was insufficient water depths to carry out electrofishing; all of these sites were shallow (<0.3 m) first order tributaries of Blairmore Creek.

Electrofishing was conducted at 10 locations within the upper portion of the drainage where existing information is sparse. All sites electrofished were above a permanent barrier (natural falls; local name Blairmore Falls), the only previously identified natural barrier on Blairmore Creek (Figure 5.1-13). Of the 10 sites that were sampled, fish were captured at eight. All fish captured were cutthroat trout. Genetic samples were taken at five of the locations due to the larger than expected numbers of fish captured, and submitted to AESRD for genetic testing. Results of the testing were not available at the time of this document.

Fish habitat potential throughout the Blairmore Creek drainage was found to be suitable for salmonid (trout) species from the confluence with the Crowsnest River to its upper reaches. Instream and overhead cover was found to occur throughout the watershed, providing suitable habitat for fish, which was reflected in fish being captured throughout the drainage as far up as the forestry trunk road. Some tributaries however, did have impassable, natural barriers at or near their mouth; subsequently, fish were not captured in these areas.

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#### 5.1.7.2 Gold Creek

There are reports of Gold Creek being sampled in 2000, 2003 and 2006. Although brook trout were recorded in 2000, the creek is considered to contain only pure strain (100%) westslope cutthroat trout and is identified on the westslope cutthroat trout recovery plan (AWCTRT 2013) as critical habitat for the species. An impassable, natural barrier (falls) is present in Gold Creek; consequently, it prevents upstream migration of introduced species and therefore maintains the genetic purity of the system.

Project specific fish sampling was not conducted within the Gold Creek watershed due to the special permits required to handle a Species at Risk Act listed species. The approach taken for the Project was, rather than apply for and create potential short term sensory disturbance to the existing fish population, Riversdale will utilize the well-established data set that exists for Gold Creek.

#### 5.1.8 Vegetation and Wetlands

The Project is located in the Rocky Mountain Natural Region with portions of the vegetation study area falling within the Montane and Subalpine Natural Subregions. The vegetation study area was determined by the mine permit boundary, with surveys focused around the proposed Project footprint (Figure 5.1-14).

Based on data available from Alberta Conservation Information Management System (ACIMS) (ACIMS 2014), 30 rare plant species were deemed likely to occur within the LSA. Field surveys confirmed a total of 21 provincially-listed rare plant species within the Project mine permit boundary (Figure 5.1-15). Of these 21 species, two are considered “At Risk” in Alberta – whitebark pine (*Pinus albicaulis*) and limber pine (*Pinus flexilis*) (Figure 5.1-16). An additional eight (8) species are listed as “Sensitive”, six (6) species are listed as “May Be At Risk”, and three (3) species have an “Undetermined” status provincially according to AESRD (2010). According to ACIMS (2014), six (6) of the 21 species are considered critically vulnerable to extirpation (S1), ten are considered vulnerable to extirpation (S2), and five (5) are somewhat vulnerable (S3), provincially. One species, whitebark pine, is also listed as a Schedule 1 “Endangered” species by the *Species at Risk Act* (SARA).

Dominant ecosite phases observed during Project vegetation surveys include:

Montane Natural Subregion:

- b1 – bearberry / lodgepole pine
- c1 – Canada buffalo-berry / hairy wild rye / Douglas fir
- c2 – Canada buffalo-berry / hairy wild rye / lodgepole pine
- d2 – creeping mahonia – white meadowsweet / lodgepole pine
- e1 – thimbleberry / pine grass / lodgepole pine

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#### Subalpine Natural Subregion:

- b1 – bearberry / hairy wild-rye / lodgepole pine
- e1 – false azalea - grouse-berry / lodgepole pine
- e3 - false azalea - grouse-berry / Engelmann spruce
- e4 – false azalea - grouse-berry / subalpine fir
- h1 – horsetail / Engelmann spruce

Several additional ecosite phases are present within the study area, but less dominant on the landscape. Ecosite verification and mapping is on-going. Detailed area summaries and finalized maps will be provided in the Environmental Impact Statement.

##### 5.1.8.1 Areas of Special Concern

AESRD has identified fescue grassland communities as an area of special concern for the Project. During Project specific vegetation field assessments, conducted in 2014, several fescue grassland communities were identified on Grassy Mountain. Plant community composition and soils data indicate that these communities are characteristic of the climax state for this community type. These communities will be delineated as a component of the Environmental Impact Statement. In additions, seven (7) grassland community sites were targeted for Range Health Assessments during July 2014 field surveys. All communities assessed were found to be “healthy with problems” to “healthy.” A single site was deemed unhealthy due to presence of invasive species.

##### 5.1.8.2 Rare Plant Species and Communities

Whitebark pine was identified in 19 locations on Grassy Mountain (Figure 5.1-16). Populations were of varying size/age classes and occurred along the tops of topographical features such as ridgelines. Limber pine was also identified in four (4) locations and found to occur in similar habitat to whitebark pine (Figure 5.1-16). No other rare plant communities have been observed.

##### 5.1.8.3 Wetlands

Three (3) wetlands were identified during 2014 vegetation field surveys (Figure 5.1-15). Two wetlands were determined to be open graminoid fens, and the wetland was determined to be a coniferous swamp as per the Alberta Wetland Inventory Classification System (Halsey *et al.* 2003).

##### 5.1.8.4 Invasive Plant Species

A total of six (6) regulated noxious weed species were recorded during 2014 field surveys. Invasive plants were identified during vegetation inventories and noted when encountered in transit between

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survey plots. Noxious weed species were most abundant adjacent to areas of pre-existing disturbance (e.g., existing roads). Regulated noxious weed species identified on-site include:

- Ox-eye daisy (*Chrysanthemum leucanthemum*)
- Creeping thistle (*Cirsium arvense*)
- Hound's tongue (*Cynoglossum officinale*)
- Dalmation toadflax (*Linaria dalmatica*)
- Tall buttercup (*Ranunculus acris*)
- Common mullein (*Verbascum thapsus*)

### 5.1.9 Wildlife and Wildlife Habitat

A total of 60 wildlife species at risk may potentially occur on or near Grassy Mountain: four amphibian species, two reptile species, 11 mammal species, and 42 bird species. Only three of these species are classified as "May Be At Risk", four species are "At Risk", and one is "Threatened", while the remaining 52 species are classified as "Sensitive" at the provincial level. At the federal level, eight of these 60 wildlife species are classified as "Special Concern", five are "Threatened", and one is "Endangered".

The Project occurs within key grizzly bear (provincially "Threatened" and federally a species of "Special Concern") range (Figure 5.1-17) and important game species habitats including mountain goat, bighorn sheep, moose, white-tailed deer, mule deer, and elk. Game species such as moose and elk are important for traditional users and recreational hunters in the region.

#### 5.1.9.1 Amphibians

Thirty-nine locations were surveyed for amphibians (Figure 5.1-18). A total of four amphibian species were identified, including two of the four at-risk species identified in the desktop review as potentially occurring. Boreal chorus frogs (*Pseudacris maculata*) were detected at one location, wood frogs (*Lithobates sylvaticus*) were detected at seven locations, Columbia spotted frogs (*Rana luteiventris*) were detected at one location, and three western toads (*Anaxyrus boreas*) were visually confirmed at two locations.

The identification of the Columbia spotted frogs was also confirmed visually with a sighting of six frogs in a single breeding pond. The boreal chorus frog and Columbia spotted frog groups had one to few individuals calling, while the wood frog groups varied from one or few calling individuals to full continuous choruses of calls. Western toads and Columbia spotted frogs have a general provincial status of "Sensitive", while wood frogs and boreal chorus frogs are considered "Secure". Western toads are listed as a Schedule 1 "Special Concern" species under the *Species at Risk Act* (SARA).

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Young salamander (*Ambystoma* sp.) larvae were observed in one pond, although it was unclear whether they were tiger ("Secure" in Alberta) or long-toed salamanders ("Sensitive" in Alberta).

#### 5.1.9.2 Breeding (Migratory) Birds

To determine presence and relative abundance of breeding bird species protected under the *Migratory Birds Convention Act* and SARA, a song / breeding bird survey was conducted within each habitat type across the entire LSA (Figure 5.1-19). Particular emphasis was placed on detecting rare or sensitive species such as forest-dwelling warblers. A total of 54 stations were surveyed and 36 bird species were detected. At-risk species heard and/or observed included five olive-sided flycatchers (*Contopus cooperi*) and three common nighthawks (*Chordeiles minor*), both of which have SARA Schedule 1 "Threatened" status (SARPR 2014a, b). Additionally, two bald eagles (*Haliaeetus leucocephalus*), one western wood-pewee (*Contopus sordidulus*), and one sora (*Porzana carolina*) were detected, and these species have a provincial status of "Sensitive" (AESRD 2010). All other species detected have a general provincial status of "Secure" or "Undetermined". From the desktop review, a total of 42 at-risk bird species may potentially occur in the Project Area; the Species of Concern Section provides a list of all at-risk birds observed during the wildlife surveys to date.

#### 5.1.9.3 Bats

The bat surveys were conducted to determine species occurrence and relative abundances of bat species in the area (Figure 5.1-18). Based on range distribution maps, six bat species are likely to occur on Grassy Mountain: big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), little brown myotis (*Myotis lucifugus*), long-legged myotis (*Myotis volans*), and long-eared myotis (*Myotis evotis*). Silver-haired and hoary bats are considered "Sensitive" in Alberta (AESRD 2010) and the little brown myotis is federally designated as "Endangered" (SARPR 2014c).

Five bat species were identified through acoustic monitoring: little brown myotis, long-eared myotis, hoary bat, little brown/long-legged myotis, and big brown/silver-haired bat. Three bats were captured (all little brown myotis); all were visually in good condition with no obvious signs of white nose syndrome. All of the at-risk species determined to be potentially occurring during the desktop review are included in these observed species or species groups.

#### 5.1.9.4 Wildlife Observations

As part of the Project's wildlife camera program to determine presence and distribution of medium- to large-sized mammal species, twenty-two wildlife cameras were set up throughout Grassy Mountain (Figure 5.1-18). Ten of the wildlife cameras recorded data from late September 2013 through to early November 2014 (an average of 408 days), and another four cameras recorded data for 217, 273, 348, and 372 days. There were a total of 5290 camera-days of data collected and analyzed at

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the time of reporting. The remaining eleven cameras were set up in early November 2014; however, no data was available from these cameras at the time of reporting.

Preliminary results indicate a total of 17 species of ungulates, carnivores, rodents, lagomorphs, and various species of birds were identified. These 17 species include two of six medium- to large- sized at-risk mammals that were reported to potentially occur in the wildlife LSA and RSA: grizzly bear (*Ursus arctos*), and Canada lynx (*Lynx canadensis*).

Four ungulate species were detected in the LSA; mule deer (*Odocoileus hemionus*) (most common occurrences), white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), and elk (*Cervus elaphus*). All four species have a general provincial status of "Secure", although they are all species of management concern as they are valued by recreational hunters and for traditional use. Although the Project lies within the range of bighorn sheep and mountain goats, neither species has been detected by the wildlife cameras, despite several cameras being located in preferred habitat for these species. The absence of detection does not mean that these species are not present on Grassy Mountain, but rather if they are present they are not using the habitat in the vicinity of the cameras.

Coyotes (*Canis latrans*), gray wolves (*Canis lupus*), and black bears (*Ursus americanus*) were the most common carnivores detected by the cameras, followed by cougars (*Puma concolor*), Canada lynx, red fox (*Vulpes vulpes*), grizzly bears, and American marten (*Martes americana*). The Canada lynx has a general provincial status of "Sensitive" and grizzly bears have a general provincial status of "At Risk". COSEWIC designated the grizzly bear a species of "Special Concern" in 2012, but the species is not on a SARA Schedule at this time (SARPR 2014d).

Other species detected by the cameras included Columbian ground squirrels (*Urocyon columbianus*), snowshoe hares (*Lepus americanus*), a common raven (*Corvus corax*) and wild turkeys (*Meleagris gallopavo*). Wild turkeys have a provincial status of "Exotic", but have recreational value.

#### 5.1.9.5 Species of Concern

##### *Species of Concern Summary*

From preliminary wildlife analysis and incidental species observations, wildlife species of federal and provincial concern have been observed (Figure 5.1-20). Four of these species have SARA Schedule 1 designations; one is recognized by COSEWIC but not yet listed by SARA; and another 10 are considered provincially "Sensitive". These species are:

- SARA-listed bird species – olive-sided flycatchers (n=5 during breeding bird point count surveys, n=2 incidental observations outside of the LSA) and common nighthawks (n=3 incidental observations), both of which have SARA Schedule 1 "Threatened" status. Olive-



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sided flycatchers are listed as “May Be at Risk” in Alberta, while the common nighthawk is listed as “Sensitive” provincially.

- SARA-listed mammal species – little brown myotis is designated “Endangered” under SARA Schedule 1. A total of three individuals of this species was caught at two netting locations, and likely detected (calls could not be differentiated from another myotis species) through acoustic monitoring at all six acoustic detection locations. Little brown myotis are listed as “Secure” in Alberta.
- SARA-listed amphibian species – western toad is designated as “Special Concern” under SARA Schedule 1. A total of three individuals were visually confirmed at two locations during the amphibian survey. Western toads are listed as “Sensitive” in Alberta.
- COSEWIC-recognized species – grizzly bears COSEWIC designation of “Special Concern”, and also provincially “At Risk.
- Provincially-listed as “Sensitive” – Columbia spotted frogs; bald eagles, western wood-pewee, sora, golden eagle, and great gray owl; hoary bats; and Canada lynx and bobcat.

#### 5.1.10 Socio-Economics

For the purpose of the Project Description the socio-economics for the following region is considered:

- The Municipal District of Ranchland No. 66 (M.D. of Ranchland); and
- The Specialized Municipality (S.M.) of Crowsnest Pass.

The S.M. of Crowsnest Pass was formed in 1979 as a result of the amalgamation of the following municipalities:

- the Town of Coleman;
- the Town of Blairmore;
- the Village of Bellevue;
- the Village of Frank;
- Improvement District No. 5; and,
- Improvement District No. 6.

Due to the amalgamation, census and other socio-economic data for individual communities are limited. Baseline conditions are therefore presented as a whole (referred to as the region) unless community-specific data are available.



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#### 5.1.10.1 Population

The region is a sparsely populated area (Table 5.1-2). In 2011, the region was home to approximately 5,645 people, the majority of which were distributed throughout the S.M. of Crowsnest Pass in the communities of Coleman (1,065), Blairmore (2,088), Bellevue (803), and Frank (263). Population growth in the region during the 2001 to 2011 period was negative, as the population declined at an average annual rate of 1.18%.

Geography	2001	2011	10 Year Change	Average Annual Growth Rate
M.D. of Ranchland	95	80	-15	-1.70
S.M. of Crowsnest Pass	6,260	5,565	-695	-1.17
Blairmore <sup>1</sup>	n/a	2,088	n/a	n/a
Coleman <sup>1</sup>	n/a	1,065	n/a	n/a
Bellevue <sup>1</sup>	n/a	803	n/a	n/a
Frank <sup>1</sup>	n/a	263	n/a	n/a
<b>Total RSA</b>	<b>6,355</b>	<b>5,645</b>	<b>-710</b>	<b>-1.18</b>

Source: 2001, 2011 Federal Census of Canada. Statistics Canada.

<sup>1</sup>2009 Alberta Official Population List. Alberta Municipal Affairs. Specific community data not available for other years.

There are no Aboriginal Groups (*i.e.*, First Nation reserves or Métis settlements) within the region; however, approximately 3% (180 people) of the total regions population identify themselves as Aboriginal (Statistics Canada, 2011; Environics, 2014). Of the 180 people identifying as Aboriginal, approximately three quarters identify as Métis and the balance as First Nations (Statistics Canada, 2011; Environics, 2014).

#### 5.1.10.2 Local Economy and Labour Force

The local wage economy of the region is driven primarily by mining, quarrying, and oil and gas extraction industry, which accounts for approximately 22% of all jobs in the region, which is well above the provincial average of 7% (Statistics Canada, 2011; Environics, 2014). Other key industries in the region include health care and social assistance, retail trade, and public administration, which, when taken together with the mining industry, account for slightly more than half of all employment in the region (Statistics Canada, 2011; Environics, 2014).

The labour force participation rate in the region is 60.6%, well below the provincial average of 73.2% (Statistics Canada, 2011; Environics, 2014). This suggests that a sizeable portion of the population has

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elected not to pursue paid employment, when compared with the provincial labour force overall. The unemployment rate for the region is identical to the provincial rate of 5.8% (Statistics Canada, 2011; Environics, 2014).

#### 5.1.10.3 Housing

The number of total dwelling units in the region has declined from 2,710 units in 2002 to 2,620 in 2011, reflective of the steady decline in the regional population (Statistics Canada, 2001, 2011; Environics, 2014). In 2011, the regional housing stock was comprised primarily of single detached homes (85%), low-rise apartment units (5%), and mobile homes (7%) (Statistics Canada, 2011; Environics, 2014). Of the 2,620 units, approximately 81% were owned and 19% were rented (Statistics Canada, 2011; Environics, 2014).

#### 5.1.10.4 Social Infrastructure and Services

##### *Policing*

Police services in the region are provided by the RCMP from a detachment located in Blairmore. The detachment is home to nine fulltime RCMP officers who serve and patrol both the S.M. of Crowsnest Pass and the M.D. of Ranchland (R. Philipuzzi, pers. comm.). In addition to the RCMP officers, the S.M. of Crowsnest Pass also employs two fulltime Peace Officers to help police the area (Crowsnest Pass Municipality Website, 2014).

##### *Health and Emergency Services*

Fire services in the region are provided by a combination of paid and volunteer firefighters based throughout the region. The S.M. of Crowsnest Pass has a fulltime fire chief and deputy and 53 on-call, paid firefighters working out of fire stations located in Blairmore, Coleman, and Bellevue. These fire stations service the S.M. of Crowsnest Pass as well as a portion of the M.D. of Ranchland. The remainder of the M.D. of Ranchland is serviced under contract with the M.D. of Foothills by firefighters based in stations in Turner Valley and Claresholm (J. Wilkinson, pers. comm.).

The main health facility in the region is the Crowsnest Pass Health Centre, which offers acute, continuing care, 24-hour emergency, obstetrical, palliative, and surgical services. In addition, there are three medical clinics in Blairmore, Coleman, and Bellevue offering primary care services (Alberta Health Services, 2014).

##### *Social Services*

Social services are provided by the Government of Alberta (GoA) and through the Family Community Support Services (FCSS) office located in Blairmore. The GoA provides child, family, and other social services while FCSS delivers social programs that are preventive in nature to promote

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and enhance the well-being of individuals, families, and communities (Crowsnest Pass Municipal Website, 2014).

#### 5.1.10.5 Municipal Infrastructure and Services

Potable water in the S.M. of Crowsnest Pass is recovered from nine ground wells and treated at four treatment plants located in Coleman, Blairmore, Bellevue, and Hillcrest. It is then stored in one of four concrete reservoirs and piped throughout the community (Crowsnest Pass Municipality Website, 2014). The M.D. of Ranchland has no central water wells or treatment plants as property owners have their own water wells (S. Christianson, pers. comm.).

Wastewater within the S.M. of Crowsnest Pass is treated at two treatment facilities: one located in Frank and one between Bellevue and Hillcrest (Crowsnest Pass Municipality Website, 2014). In the M.D. of Ranchland, wastewater is stored in septic tanks on individual properties and hauled out as needed (S. Christianson, pers. comm.).

Solid waste from the S.M. of Crowsnest Pass is disposed of in the Pincher Creek Sanitary Landfill while waste from the M.D. of Ranchland is trucked out to the landfill in Okotoks (Crowsnest Pass Municipality Website 2014; Christianson, 2014).

#### *Transportation*

The road network in the region consists of a number of primary and secondary highways, including:

- Highway 3, the main highway near the southernmost boundary of the proposed mine. This highway runs east to Fort MacLeod and then on to Lethbridge and west into British Columbia, near the U.S. border. The proposed mine access road would intersect Highway 3 near Blairmore.
- Highway 40, which runs north-south to Coleman, approximately 2 km from the western boundary of the proposed mine permit area.
- Secondary Highway 22, which is located approximately 10 km to the east of the eastern boundary of the proposed mine permit area and runs north towards Calgary. Most of the population of the M.D. of Ranchland lives along Highway 22 (S. Christianson, pers. comm.).

#### **5.1.11 Historical Resources**

The two primary historical resource elements of interest and concern regarding the proposed Grassy Mountain Coal Mine are archaeological sites and remains, including both Precontact (Prehistoric in the definition above) and Postcontact resources (historic in the definition above) and palaeontological locales and remains. These elements are discussed separately below.

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#### 5.1.11.1 Archaeology

Archaeological research in southwestern Alberta and more specifically in the Crowsnest Pass region indicates the area has been occupied by humans since at least the end of the last glaciation more than 10,000 years ago (Driver, 1978). The environment of the Crowsnest Pass and southwestern Alberta has changed considerably in the last 10,000 years, but the human cultures that have occupied the region in that time have practiced a generally mobile hunting and gathering economy. There is evidence of occupation of the area, including the Grassy Mountain project area during all seasons.

Approximately 75% of the proposed Grassy Mountain Coal mine area as defined by the Proposed Mine Permit Boundary has been subject to previous historical resources assessments, but the intensity and goals of previous assessments have been variable. Nevertheless significant portions of the area have been the subject of previous research. The vast majority of Precontact sites have been classified as “camp sites”. That is, habitation sites that are generally small, mostly less than 100 m x 100 m, but from which has come a variety of archaeological materials including stone tools, bones, and remains of living units. Most of these sites were probably occupied once, but there is evidence that some were occupied many times over centuries or millennia. Other recorded Precontact sites within the mine boundary include sites where animals were killed and/or butchered, quarries for obtaining material to produce stone tools and small agglomerations of artifacts without any evidence of exact site function. Precontact sites in the larger area also include those classified as ceremonial or religious where recovered or observed remains suggest those sites were used in a generally non-utilitarian manner. A typical example would be a rock art site, where past people used natural exposures of rock to render images or symbols, a common practice in all cultures, modern and ancient.

As a result of late 18th and early 19th development, there are numerous and widespread Postcontact historical resources in the region including within the Grassy Mountain Mine area. Most of these Postcontact sites are related to coal mining and include remains of the Greenhill Mine in the southeast corner of the mine’s proposed permit boundary. Other Euro-Canadian sites within the mine boundary area include remains from the former Boisjoli Mine and homesteads.

There are 61 recorded archaeological sites within the Grassy Mountain Proposed Mine Permit Boundary, including both Precontact and Postcontact sites. Approximately 75% of these sites are concentrated along the project’s southern and southeastern boundary and most, including the highly significant Greenhill Mine Site remains are in areas where little or no development related to mining operations will occur or is planned.

Of the 61 currently recorded sites, 35 are considered significant and warrant protection and preservation or will require mitigation if mine related impacts will occur within the site area. The remainder are classified as having no further historical resource value either because they have been

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destroyed, fully mitigated or, as in the case of isolated finds of single artifacts, the material has been removed from the site area and for all intents and purposes, the site no longer exists.

#### 5.1.11.2 Palaeontology

Grassy Mountain contains portions of three significant palaeontological locales. Two of these are in near the south and southeastern boundary areas and are unlikely to be impacted by mine development. The third is located in an area that has been significantly disturbed by previous mining activity and is located partly in an area that has provisionally been identified as a waste rock disposal area.

## 5.2 Potential Environmental Effects

### 5.2.1 Soils & Terrain

Project related activities that may have a potential impact on the existing soil resources and associated terrain include (but are not limited to):

- soil stockpiling – stockpiling of salvaged soil materials during the construction of the Project, both short term and long term, results in potential for soil erosion issues and effects to soil productivity;
- development of Project infrastructure – includes creation of roads, and all related Project infrastructure, will require soil removal and alteration of existing terrain;
- progressive reclamation – activities related to re-contouring of reclaimed landscapes and soil handling and replacement, may result in effects to the reclaimed soil profiles and terrain. Inappropriate re-contouring and/or soil replacement activities may result in impacts to the reclaimed soil profile and a decrease in land capability for the desired end land uses or delay in achieving land capability.

### 5.2.2 Air Quality

A detailed air quality impact assessment will be completed for the EIS, which will include modeling conducted in accordance with Alberta's most recent Air Quality Model Guideline (Government of Alberta 2013a). Emissions from mining activities will be included in a dispersion modelling assessment. The emission sources will include mining, handling, and hauling activities, operations at the wash plant, conveying, and loading at the rail head. Windblown dust emissions will also be included. Potential impacts to be examined in the assessment include impacts on air quality at residences and sensitive environmental receptors near operations, with emphasis on particulate matter, effect of acid and nitrogen deposition on vegetation and lakes from mine fleet exhaust, and determination of dust deposition rates to nearby receptors.

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For the impact assessment it is anticipated that the potential impacts that would be associated with the Project will include (but not limited to):

- impacts on air quality at residences and sensitive environmental receptors near operations, (with emphasis on particulate matter);
- effects of acid and nitrogen deposition on vegetation and lakes from mine fleet exhaust; and,
- effects of dust deposition rates for nearby receptors.

Riversdale committed to applying the appropriate mitigation plans to ensure the Project meets or exceeds standards in the Alberta Ambient Air Quality Objectives (Government of Alberta 2013b), and Canadian Ambient Air Quality Standards (CCME 2014).

### 5.2.3 Noise

A noise impact assessment compliant with AER's Directive 038 will be completed for the EIS.

Potential noise impacts of the Project include, but are not limited to:

- noise predicted at residences and communities adjacent to or in the vicinity of the mine and its associated infrastructure.
- noise impacts to wildlife – sensory disturbances may lead to changes in habitat use, health and body condition, reproductive behaviour and breeding success, and longevity.
- noise issues related to the health and safety of Project staff. Occupational health and safety guidelines will be followed to ensure potential health and safety issue arising from noise are appropriately mitigated.

If the noise impact assessment concludes that noise mitigation is required, Riversdale will investigate mitigation options to determine the most effective means of mitigation and to ensure the Project will be compliant with AER Directive 038.

### 5.2.4 Hydrogeology

A full hydrogeology impact assessment will be provided in the EIS; however, it is anticipated that the following potential impacts to groundwater may be associated with the Project. These include (but are not limited to):

- potential impacts of groundwater extraction and/ or dewatering on groundwater quality, including surface water- groundwater interactions;
- potential impacts of mine spoil on groundwater quality; and,
- potential impacts of mine operations on shallow groundwater quality.



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### 5.2.5 Hydrology

A detailed hydrology impact assessment will be completed for the EIS; however, it is anticipated that the following potential impacts are associated with surface flows:

- changes to surface runoff based on location of proposed pit, waste rock disposal areas, and other mining related infrastructure; and,
- potential impacts to neighbouring watercourse from dewatering or mine drainage plans.

### 5.2.6 Surface Water Quality

A detailed water quality impact assessment will be completed for the EIS. It is anticipated that the following potential impacts are associated with surface water quality:

- potential release of deleterious substances (*e.g.*, TSS and turbidity); and
- potential impacts to neighbouring watercourse from mine waste such as selenium or other metals.

### 5.2.7 Fisheries and Aquatic Habitat

The Project's mining activities may have the potential to directly and indirectly effect fish and fish habitat, as some of the unnamed tributaries to Blairmore Creek will be modified to accommodate mining and waste rock disposal areas. While these tributaries do not support fish habitat directly, water quantity and quality does contribute to downstream areas. Water will be diverted around mining activities, but a loss of flow and therefore potential loss of downstream fish habitat is possible. In addition, there are known occurrences of a sensitive fish species (westslope cutthroat trout) in both Blairmore Creek and Gold Creek.

A detailed impact assessment on fish and aquatic habitat will be completed for the EIS. It is anticipated that following potential impacts are associated with fisheries and aquatic habitat:

- Loss of stream habitat from Project activities (pits, waste dumps and processing facilities) in the vicinity of watercourses;
- Potential changes to fish habitat from potential changes in hydrology as a result of earth moving mining activities; and,
- Potential changes in water quality from mining related activities.

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### 5.2.8 Vegetation and Wetlands

Project related activities that may have a potential impact on the existing vegetation and wetlands include (but are not limited to):

- loss of vegetation prior to slope re-contouring, road construction, borrow pit and mine pit excavation, and construction of site facilities.
- loss of existing vegetation from the placement of waste rock dumps and overburden storage piles;
- potential indirect disturbance to vegetation from changes in surface topography and microhabitat conditions, deposition of dust on foliage, changes in hydrology and road development; and,
- potential introduction of invasive species and expansion of invasive species populations with increased bare mineral soil.

### 5.2.9 Wildlife

The key regulatory issue with respect to wildlife is related to the potential occurrence of and potential effects to species at risk, species of management concern, and specific bird species protected under the *Migratory Birds Convention Act* (1994) reported to occur in the vicinity of the Project.

Potential Project impacts on wildlife will fall into four broad categories:

- a direct loss of habitat as a result of vegetation clearing;
- an indirect loss of habitat due to increased noise, human activity, and artificial lighting;
- habitat fragmentation and the disruption of natural movement patterns of wildlife; and,
- increases in wildlife mortality.

They will be discussed in full detail in the Environmental Impact Statement, along with recommended mitigation strategies to minimize the effect of the Project on wildlife in the area.

### 5.3 Federal Lands and Transboundary Effects

The Project is not expected to have any environmental effects to federal lands or to areas of British Columbia. The nearest federal crown land to the Project is the Piikani Reserve (approximately 45 km east) and the Peigan Timber Limit 147B (approximately 30 km east).

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## 5.4 Social Environment Effects

### 5.4.1 Socio-Economics

The Project's construction capital expenditures are estimated to be approximately \$580 million. These expenditures include wage and salaries paid to construction workers, engineering and environmental services, and the direct purchase of goods and services, such as equipment modules and structural elements. Construction capital expenditures will accrue locally, provincially, nationally, and internationally.

Once fully constructed, the annual operations and sustaining capital expenditure of the Project will average \$225 million per year. Operations and sustaining capital expenditures include wages and salaries to contractors and employees, and the purchase of key inputs such as fuel, utilities, and equipment.

Construction of the Project is expected to require approximately 465 person-years of labour during the 2017 to 2018 period. The number of workers on site during the construction period is expected to average approximately 100.

Once fully operational, the Project is expected to directly employ an annual average of approximately 365 full-time individuals. To the extent possible and subject to cost and quality considerations, the Project will hire permanent operations-related employees from the local labour force.

The Project will also contribute to the revenue of various levels of government during operations. For example, in an average year of operations:

- \$25 and \$35 million in corporate income taxes will be paid to the provincial and federal governments respectively ; and
- \$32 million royalties in will be paid to the Government of Alberta.

### 5.4.2 Human Health

A detailed human health risk assessment (HHRA) will be conducted for the EIA and will be compliant with relevant EIA guidance and HHRA methodology as provided by Alberta Health and Wellness (AHW 2011), Health Canada (HC 2010, 2012), and the United States Environmental Protection Agency (US EPA 2005). Completion of the HHRA will require the results of baseline report as well as of the impact assessments from a number of the EIA disciplines (*e.g.*, Air Quality, Socio-Economics, Traditional Land Use and Traditional Ecological Knowledge). Based on evaluation of the currently available project information and professional experience, the potential impacts of the Project on human health may include, but not be limited to:

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- Emissions to air – Project activities including blasting, diesel engine emissions (*e.g.*, trucks, trains and excavation equipment) and train loading activities can contribute to chemical and dust emissions into air. Emissions into air have the potential to impact human health directly via inhalation. Potential indirect exposure can also occur due to deposition of chemicals from air onto soil, surface water, and vegetation and subsequent uptake into vegetation, fish, and wild game. Potential indirect impacts to human health can occur via ingestion of environmental media and local country foods and wild game.
- Discharges into surface or groundwater – Potential discharge of project water associated with project activities (*e.g.*, outdoor coal storage, coal processing, surface water run off) has the potential to impact human health directly via ingestion and dermal exposure to surface and groundwater. Indirect exposure due uptake of impacted surface and groundwater by local vegetation, fish or wildlife has the potential to impact human health via ingestion of water, local country foods, fish and wild game.
- Project related noise – Project related noise due to blasting, truck and train traffic, coal processing activities, and train loading and unloading activities have the potential to impact human health.

### 5.4.3 Traditional Land Use

Potential effects of the proposed Project on Aboriginal groups will be assessed through consultation and studies conducted for the Environmental Impact Assessment (EIA), and the full report will be included in the full Environmental Impact Statement (EIS).

Aboriginal groups may be impacted by the construction and operation of the Project, including direct or indirect impacts on current use of lands and resources for traditional purposes, physical and cultural heritage, or archaeological resources. Project-related effects that may impact current use of lands and resources for traditional purposes include removal of vegetation, changes in wildlife behaviour, and water quality impacts on local watercourses.

Socio-economic effects are anticipated to be generally positive in the areas of employment and business opportunities and community investments made possible by the operation of the proposed Project. Potential effects on direct and indirect Aboriginal community health and well-being are not yet known, but will be identified in the studies and consultation for the EIA and reported in the EIS.

Riversdale does not currently anticipate the Project having potential effects on the Samson Cree, the Foothills Ojibway, the Métis Nation Region 3 Alberta, the Métis Nation Region 4 British Columbia or the Ktunaxa Nation. Continued EIA studies and consultation with these groups will identify any potential effects on these Aboriginal groups.

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## 6.0 RIVERSDALE'S ENGAGEMENT AND CONSULTATION WITH ABORIGINAL GROUPS

### 6.1 Aboriginal Groups Potentially Interested in the Project

Riversdale initiated Aboriginal consultation in June 2013 with the following First Nations, prior to the formal acquisition of the Grassy Mountain coal lease:

- Treaty 7 Nations
  - Piikani Nation;
  - Kainaiwa Nation (Blood Tribe);
  - Siksika Nation;
  - Tsuu T'ina Nation: and,
  - Stoney Nations (Bears paw First Nation, Chiniki First Nation and Wesley First Nation).

As part of the EIS process, Riversdale plans to consult with the following Aboriginal Groups:

- Treaty 6 Nation
  - Indent bullet* Samson Cree Nation
- Ktunaxa Nation
- Métis
  - Métis Nation Alberta, Southern Alberta Region 3
  - Métis Nation British Columbia, Kootenay Region 4
- Other Aboriginal Groups
  - Foothills Ojibway Society

Riversdale will also consult with any other Aboriginal groups that may be identified throughout the EIS process.

#### 6.1.1 Contact Information of Aboriginal Groups Consulted To Date

To date, the majority of the Aboriginal Consultation has been with Treaty 7 First Nations. The following lists the contact information for each Treaty 7 First Nation representative to whom Riversdale have been in contact with.

##### **Piikani Nation**

Dustin Wolfe, Consultation Manager  
Email: d.wolfe@piikanation.com

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Lisa Old Crow, Consultation Coordinator  
Email: [piikanicc@gmail.com](mailto:piikanicc@gmail.com)

PO Box 3318  
1590 – 15<sup>th</sup> Avenue  
Brocket, AB T0K 0H0

### **Kainaiwa Nation**

Mike Oka  
Consultation Coordinator  
Tribal Government & External Affairs  
PO Box 60, Standoff, AB T0I 1Y0

Office: 403-737-8236  
Fax: 403-737-2336  
Email: [mike.oka@bloodtribe.org](mailto:mike.oka@bloodtribe.org)

### **Siksika Nation**

Richard Right Hand  
Consultation Manager  
Cell: (587) 727-1957  
Siksika Office (403)-324-3240

Email: [rrh.siksika@gmail.com](mailto:rrh.siksika@gmail.com)

Siksika Nation  
PO Box 1100  
Siksika, AB T0J 3W0

### **Tsuu T'ina Nation**

Tonya Crowchild  
Consultation Director  
Tsuu T'ina Nation  
9911 Chiila Blvd.  
Tsuu T'ina, AB T2W 6H6

Office: 403-281-4455  
Cell: 403-408-9979  
Fax: 403-251-5871  
Email: [ttnconsultation@gmail.com](mailto:ttnconsultation@gmail.com)



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## **Stoney Nakoda Nation**

William (Bill) Snow  
Stoney Tribal Administration  
PO Box 120  
Morley, AB T0L 1N0

Office: 403-881-4760  
Cell: 587-580-6212  
Fax: 403-881-4250  
Email: bills@stoney-nation.com

## **6.2 Aboriginal Consultation To Date**

### **6.2.1 Treaty 7 First Nations Consultation**

Riversdale have been meeting on a regularly with the Treaty 7 First Nations to share Project information and updates, seek views and input on the Project, and to develop work plans for consultation, EIA-related studies, and communication activities. Information shared and discussed in the meetings have typically included, but not limited to the following:

- project updates;
- employment, training, and contracting opportunities;
- information on the provincial and federal EA processes; and
- information on the mining sector and development processes.

Riversdale have implemented an information management system (StakeTracker) to organize and ensure the team addresses any comments or concerns raised by First Nations. Table 6.2-1 summarizes the consultation activities completed to date.

<b>Consultation Period (To Date)</b>	<b>Groups Contacted</b>	<b>Method of Contact/ Activity</b>
June 17, 2013 – January 8, 2015	Piikani Nation	In-person/ Annual General Assembly Meeting/Site Visits/Workshops/Email/Phone
June 17, 2013 – January 18, 2015	Kainaiwa Nation	In-person/Site Visits/Email/Phone
June 14, 2013 – January 21, 2015	Siksika Nation	In-person/Site Tour/Email/Phone
June 3, 2013 – December 19, 2014	Stoney Nakoda Nation	In-person/Site Visits/Email/Phone
October 8, 2013 – February 23, 2015	Tsuu T’ina Nation	In-person/Site Tour/Email/Phone

## 6.2.2 Information Provided During Consultation Meetings

Riversdale began engaging the Treaty No. 7 First Nations in June 2013, prior to acquiring the Grassy Mountain coal lease. Through early discussions with First Nations on coal exploration activities and future plans, Riversdale set out to engage each group in the Project in a way that is respectful and meaningful. The following summarizes the consultation activities and initiatives have been conducted with First Nations to date (further detail will be provided in the EIS).

### 6.2.2.1 Provision of Project Information and Update

Riversdale sends detailed information about its planned activities, including permit applications, to First Nations designated consultation representatives via email followed by email and telephone requests for meetings to discuss the information provided. During in-person meetings, Riversdale provides relevant scale maps and hard copies of documents provided earlier by email. In email, telephone, and in-person discussions, Riversdale requests input on known or potential concerns and issues from First Nations.

### 6.2.2.2 Traditional Land Use Studies

Riversdale is providing support to all five Treaty 7 First Nations for their traditional use studies. Initial site assessments were conducted by all five Nations, ground truthing has been conducted by Piikani, Kainaiwa, Siksikawa and Tsuu T’ina Nations, and plans are being developed for the next phase of the studies. This will help inform the assessment of the potential effects associated with the

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Project and provide insight into how potential effects can be avoided, mitigated, or managed, and, if necessary, accommodated.

#### 6.2.2.3 Archaeological Assessment

Riversdale has initiated archaeological and other heritage assessments for the Project. Riversdale began conducting HRIAs for coal exploration permit applications since the summer of 2013, and is working with the Treaty 7 First Nations to plan their participation in the assessment and report to ensure appropriate engagement.

#### 6.2.2.4 Socio-economic Initiatives

Riversdale has initiated discussion about potential socio-economic benefits available to Aboriginal and local groups, including employment, participation in studies, business development, and sponsorships.

#### 6.2.2.5 Collaboration on Consultation Schedule/Work Plans

Riversdale is currently working with each of the five Treaty 7 First Nations on developing Nation-specific work plans for the EIA and consultation process.

### 6.2.3 Summary of Treaty 7 First Nations Site Visits

In 2014, Riversdale worked closely with the Treaty 7 First Nations groups to discuss field assessment methods, issues, themes, traditional knowledge and traditional land uses as it related to the Project. Traditional Knowledge and Traditional Use (TK/TU) between each First Nation and Riversdale's Aboriginal Consultation Team were shared during a preliminary site tour of the proposed Grassy Mountain Project in June 2014, in addition to ground-truthing efforts in September and October 2014. Workshops followed each field activity to discuss and interpret the field observations and add more of the stories of the area. These were led by the First Nations and funded by Riversdale.

Tables 6.2-2 to 6.2-5 summarize these site visits, with the exception of Kainaiwa Nation.

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<b>Table 6.2-2 Summary of Piikani TK/TU Data Collection Dates, Attendees, and Sites</b>					
<b>Phase</b>	<b>Type of Visit</b>	<b>Date(s) (2014)</b>	<b># of Days</b>	<b># of Attendees</b>	<b># of Sites Recorded</b>
Phase 1	Preliminary Site Tour	June 9	1	4	8
Phase 1	Workshop	June 10	1	11	N/A
Phase 1	Ceremony	June 11	1	20	N/A
Phase 2	Ground-truthing	September 2, 4, and 5	3	6	28
Phase 2	Workshop	September 8 and 9	2	13	N/A
Phase 2	Ground-truthing	October 30	1	4	16
Phase 2	Workshop	October 31	1	10	N/A
		<b>TOTAL</b>	<b>10</b>	<b>68</b>	<b>52</b>

<b>Table 6.2-3 Summary of Siksika TK/TU Data Collection Dates, Attendees, and Sites</b>					
<b>Phase</b>	<b>Type of Visit</b>	<b>Date(s) (2014)</b>	<b># of Days</b>	<b># of Attendees</b>	<b># of Sites Recorded</b>
Phase 1	Preliminary Site Tour	June 24	1	4	14
Phase 2	Ground-truthing	October 6 to 10	5	6	32
		<b>TOTAL</b>	<b>6</b>	<b>10</b>	<b>46</b>

**Table 6.2-4 Summary of Stoney Nakoda TK/TU Data Collection Dates, Attendees, and Sites**

Phase	Type of Visit	Date(s) (2014)	# of Days	# of Attendees	# of Sites Recorded
Phase 1	Preliminary Site Tour	June 25	1	3	17
		TOTAL	1	3	17

**Table 6.2-5 Summary of Tsuu T'ina TK/TU Data Collection Dates, Attendees, and Sites**

Phase	Type of Visit	Date(s) (2014)	# of Days	# of Attendees	# of Sites Recorded
Phase 1	Preliminary Site Tour	July 11	1	2	7
Phase 2	Ground-truthing	August 12 to 13	2	4	22
Phase 2	Ground-truthing	October 27 and 28	2	6	32
		TOTAL	5	12	61

### 6.3 Key Comments and Concerns to Date

The EIA studies and consultation process are expected to enable all Aboriginal Groups to identify any specific comments and concerns related to the Project. Initial comments from the consultation discussion with all of the Treaty 7 First Nations groups (to-date) have made reference to potential adverse effects to:

- wildlife: potential impacts to species that are culturally, spiritually, and nutritionally important such as elk, deer, moose, bear, cougar, coyotes, squirrels, rabbit, frogs, hawks, woodpecker, snowbird, and owls;
- heritage, archaeological and cultural resources: potential impacts to travel routes, sacred areas (e.g., buffalo rock and vision quest sites), as well as cultural practices and customs;
- vegetation: potential impacts to plant species used for ceremonial, medicinal and subsistence;
- water quality: potential impacts to water quality from springs that may be connected to underground waterbodies; and,
- spiritual/sacred sites: potential impacts to spiritual sites as pointed out by Elders.

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In addition, all of the Treaty 7 First Nations engaged to-date commented they wish to benefit from employment, business, and other development opportunities that would be available from the Project.

#### **6.4 Aboriginal Consultation Approach/Plan**

Through early discussions on coal exploration activities and future plans, Riversdale set out to engage each Aboriginal Group in proximity to the Project in a way that is respectful and meaningful. Through these initial discussions, Riversdale began engaging with Chief and Council, consultation staff, and other key staff members responsible for participation in Project studies, employment and contracting opportunities. Riversdale has continued to collaborate with Aboriginal leadership and staff to guide ongoing consultation and is collaborating with Aboriginal groups on Traditional Land Use studies in the project area.

While Riversdale understands that the Crown, or government, is ultimately responsible for ensuring that the duty to consult with Aboriginal groups is fulfilled, certain procedural aspects of consultation will be delegated to Riversdale. Mitigation measures proposed by Riversdale in consultation with Aboriginal groups, or mutually agreed outcomes arising out of consultation with Aboriginal groups, may be viewed by the Crown as acceptable forms of accommodation.

Throughout the Project, Riversdale will continue to share Project information and seek input from Aboriginal groups to develop a greater understanding of, potential impacts to Aboriginal and Treaty rights and traditional uses. This input will be considered and incorporated, as appropriate, into the Application and other regulatory documents.

Riversdale recognizes consultation must respect Aboriginal knowledge, culture, processes, and views. Riversdale will continue to demonstrate respect for these principles and seek positive relationships with Aboriginal groups potentially affected by the Project.

During engagement with Aboriginal groups, Riversdale plans to:

- Provide for effective two-way communication and ensure meaningful engagement between Riversdale and affected Aboriginal groups;
- Provide Aboriginal groups with timely and credible information on the Project and ensure meaningful discussions occur;
- Seek input of Aboriginal groups on Project design and environmental studies;
- Ensure Aboriginal groups' rights, Treaty rights, traditional uses, other interests (socio-economic, community well-being) and issues relevant to the Project and assessment are identified through available sources, which may include information provided by Aboriginal groups, research, commissioned studies and Aboriginal traditional studies, so they may be



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appropriately addressed. Confidential information will be managed according to agreed protocols with Aboriginal groups.

- Ensure that Aboriginal groups' input and concerns about potential effects are gathered, understood and integrated into the proposed Project design, the EA, and monitoring programs related to the construction and operation of the mine;
- Provide opportunities for dialogue on measures that could be used in the Project design, operation or closure to avoid, reduce, mitigate or accommodate potential adverse effects; and
- Work collaboratively with the Aboriginal groups on options to enhance positive effects and benefits of the proposed Project.

Specific consultation approaches may vary depending on the preferences, interests, or concerns expressed by the Aboriginal groups, or as directed by CEAA.

#### **6.4.1 Consultation Methods during Pre-Application and Application Phases**

In addition to the initial engagement activities, key consultation activities for the pre-Application/EIS phases will include:

Riversdale will provide notice to Aboriginal groups of upcoming EIS milestones throughout the Pre-Application and the Application phases including:

- Information such as project information/updates, environmental baseline studies, technical reports, effects assessments and results of integration of traditional use information will be made available to Aboriginal groups as appropriate throughout the EA process. Information will be provided by email and/or post, and followed up by telephone and in-person with the designated consultation representatives;
- Community information sessions will be offered for each affected Aboriginal group with the intent of increasing awareness and knowledge of the various Project components, timelines and the EIA process. This will also provide an opportunity for community members to speak with Riversdale representatives about Project-related questions, and for Riversdale to obtain comments, issues and concerns regarding potential effects of the Project;
- Riversdale will work with Aboriginal groups' designated contacts to determine the most appropriate ongoing processes for consultation activities, schedules, and Project timelines, including regulatory process timeframes for comment. Consultation activities may include community meetings, workshops, Elder and youth meetings, and focused communication on traditional uses of the Project area; and
- Riversdale will work with the affected Aboriginal groups to integrate available traditional and local knowledge with biophysical and human environment assessments, the Project's

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Historical Resources Impact Assessment and on-going Historical Resource management and site preservation plans, and to consider approaches to avoid, mitigate, or manage potential impacts to Treaty and Aboriginal rights and traditional uses.

## **7.0 CONSULTATION WITH THE PUBLIC AND OTHER PARTIES**

### **7.1 Potentially Interested Stakeholder Groups**

A range of non-Aboriginal stakeholders may be interested in the Project, including local communities, regulatory agencies, and environmental non-governmental organizations (ENGOs). Riversdale have and continue to record public inquiries and communication from various stakeholder groups that may have an interest in the proposed Project into their engagement tracking software (StakeTracker). Potential interested stakeholders may change as the Project progresses.

### **7.2 Overview of Activities that Have Occurred**

Timely and effective engagement with the public is a key aspect of the Project. Riversdale has held three Public Forums and one Open House in the Crowsnest Pass to inform the public about the Project. Numerous meetings have also been held with the regional municipalities, local stakeholders, local residents and land owners, special interest groups, provincial and federal government agencies, senior cabinet ministers and specific individuals with concerns.

In addition to the Public Forums and Open House, Riversdale has attended a local trade show in Blairmore and held numerous meetings with the municipalities in the region, particularly the Specialized Municipality of Crowsnest Pass and the Municipal District of Ranchland.

#### **7.2.1 Stakeholders' Comments and Concerns**

##### **7.2.1.1 September 30<sup>th</sup> and October 1<sup>st</sup>, 2014, Open House**

Overall, the majority of the community is accepting of the proposed Project, but they did voice several potential areas of concerns (Table 7.2-1). All of their concerns fall into the disciplines that will be covered in the Environmental Impact Statement.

<b>Table 7.2-1 Potential Areas of Public Concern Related to the Project</b>	
<b>Potential Areas of Concern</b>	<b>% Indicating Concern<sup>1</sup></b>
Groundwater quality	74%
Residential property effects	65%
Human health	59%
Groundwater quantity	59%
Surface water quantity	56%
Surface water quality	55%
Wildlife and fisheries	55%
Reclamation	54%
Recreation access to public land	49%
Public safety	47%
Public engagement	43%
Industrial and mine related traffic volumes	43%
Protection of historical resources	39%

<sup>1</sup> Based on 96 completed surveys at the Open House held Sept 30<sup>th</sup> and Oct 1<sup>st</sup>, 2014.

### **7.2.2 Future Public Engagement Plans**

Riversdale expects to be holding additional focussed meetings with individuals and agencies in 2015. The Provincial Proposed Terms of Reference for the EIA were publicly filed and public comments were sought through a 45 day public notice period. Additional newsletters will also be produced and distributed.

In addition to these activities, Riversdale maintains an “open door” policy at their Blairmore office, whereby individuals can stop by at their convenience to discuss the Project. Riversdale will continue to operate its community office and employ a Community Relations representative. This will ensure the people have a physical location to go to ask questions and to obtain Project information.

These efforts will ensure that all interested individuals and agencies have an opportunity to become familiar with the Project, and that all pertinent environmental and social concerns have been

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identified and methods for mitigating these concerns have been investigated. Riversdale will continue the public engagement program throughout the Project's life.

Copies of the provincial (AER) Proposed Terms of Reference, Summary Table, Project Description, or other documents were made available on the company website or by contacting the company contacts noted in this document.

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United States Environmental Protection Agency (US EPA). 2005. Human Health Risk Assessment Protocol (HEAP) for Hazardous Waste Combustion Facilities, Final. Office of Solid Waste, US EPA. Available online at: <http://www.epa.gov/osw/hazard/tsd/td/combust/risk.htm#hhrad>

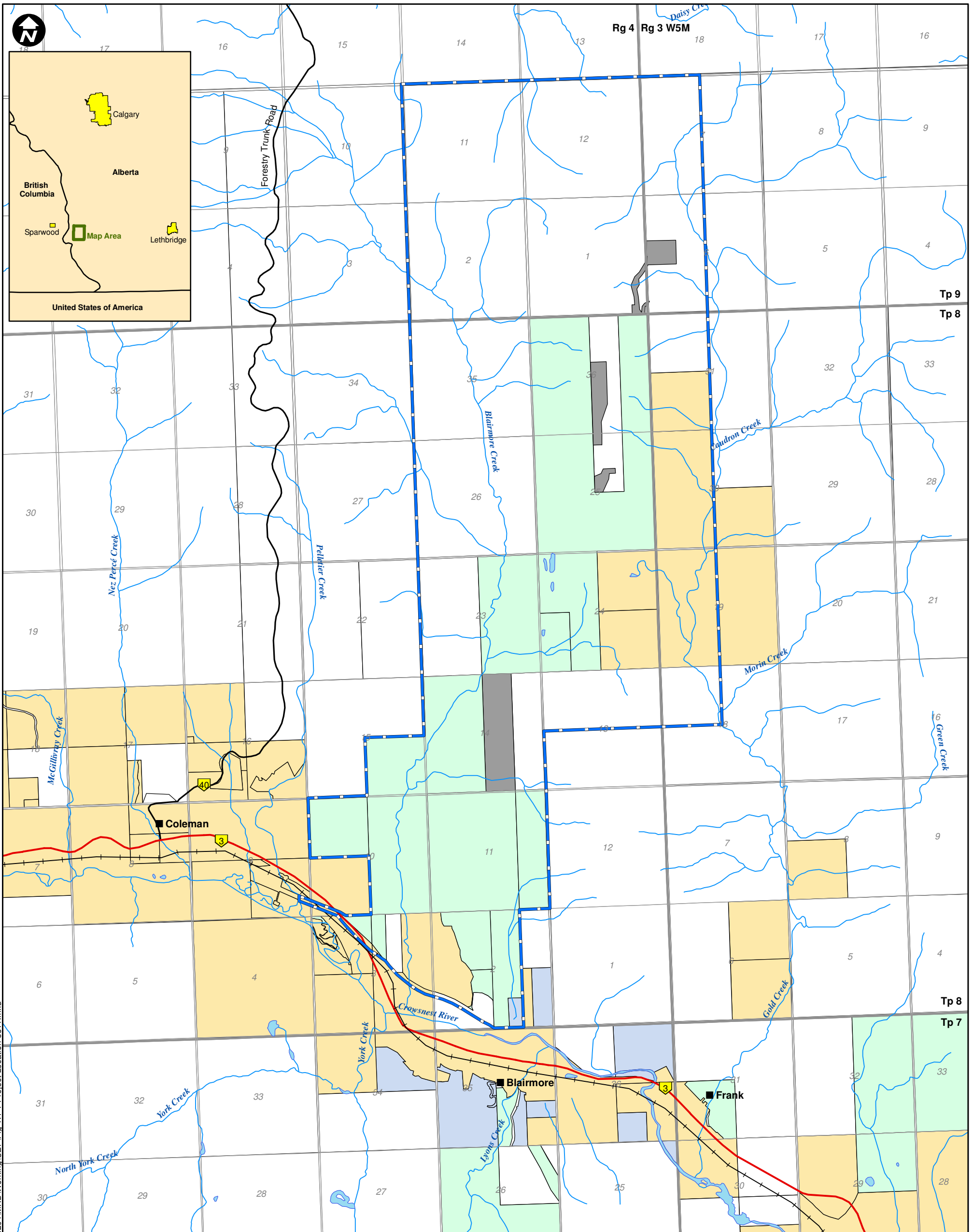


Benga Mining Limited operating as Riversdale Resources

Riversdale Resources Limited  
Grassy Mountain Coal Project  
March 2015

---

**FIGURES**



Document Path: K:\Active Projects 2014\AP\_14-00201\14-00201\MXD\Working\CEP\Fig 1.1-1-1 Project Location 8311.mxd

**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Private (Riversdale)
- Crown (Leased by Riversdale)
- Crown
- Municipal
- Private (Other)

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**PROJECT LOCATION**

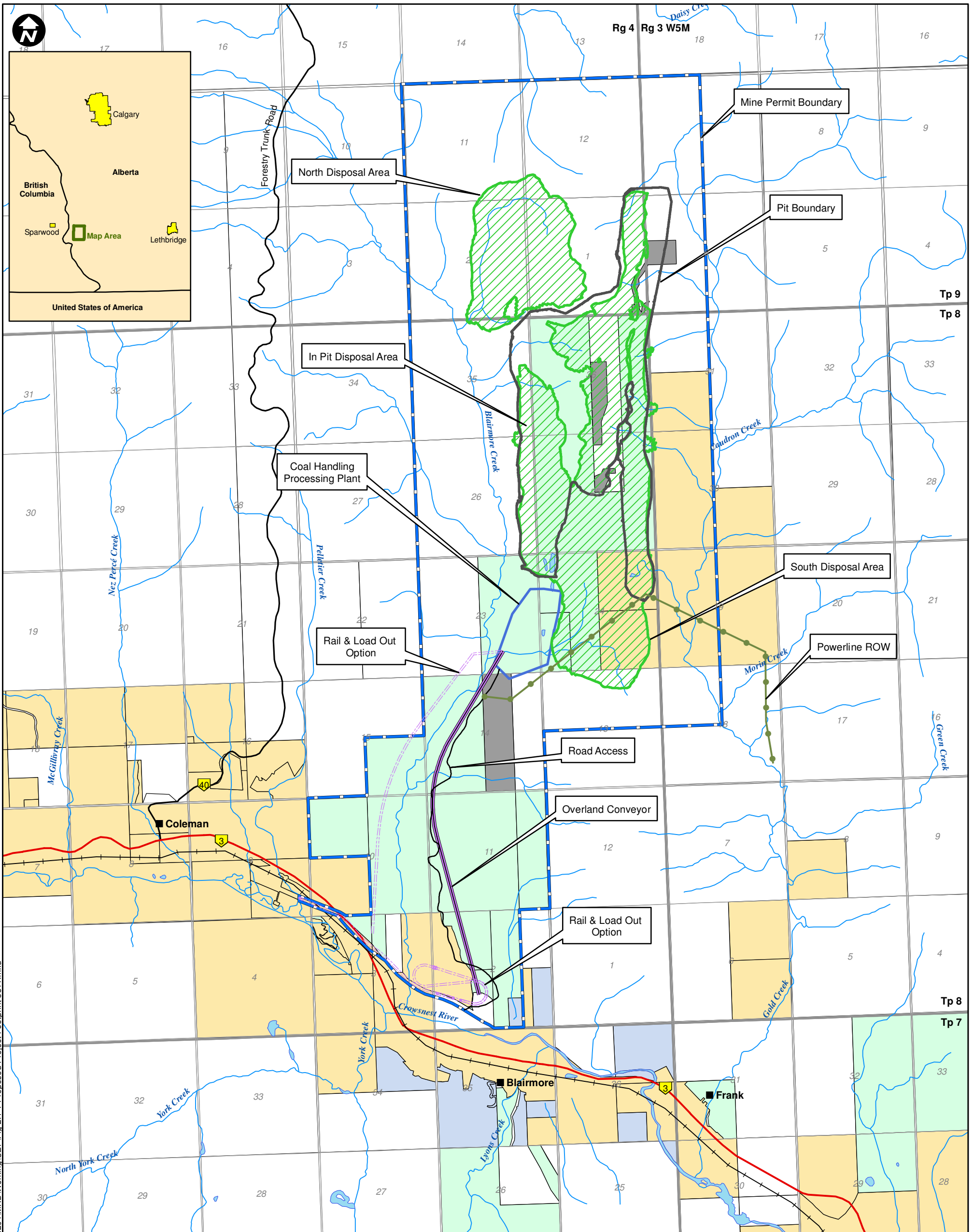
**NOTES**

AltaLIS, 2015; NRCAN, 2015; Riversdale, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015

**FIGURE**  
**1.1-1**





Document Path: K:\Active Projects\2014\AP\_14-00201\14-00201\MXD\Working\CEP\Fig 2.1-1\_Proposed Project Footprint 8311.mxd

**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Access Road
- Overland Conveyor
- Powerline ROW
- Rail Loadout Option
- Mine Permit Boundary
- Pit Boundary
- Disposal Area
- Coal Handling Processing Plant Area
- Private (Riversdale)
- Crown (Leased by Riversdale)
- Crown
- Municipal
- Private (Other)

**PROJECT**



**TITLE**

**PROPOSED PROJECT FOOTPRINT**

**NOTES**

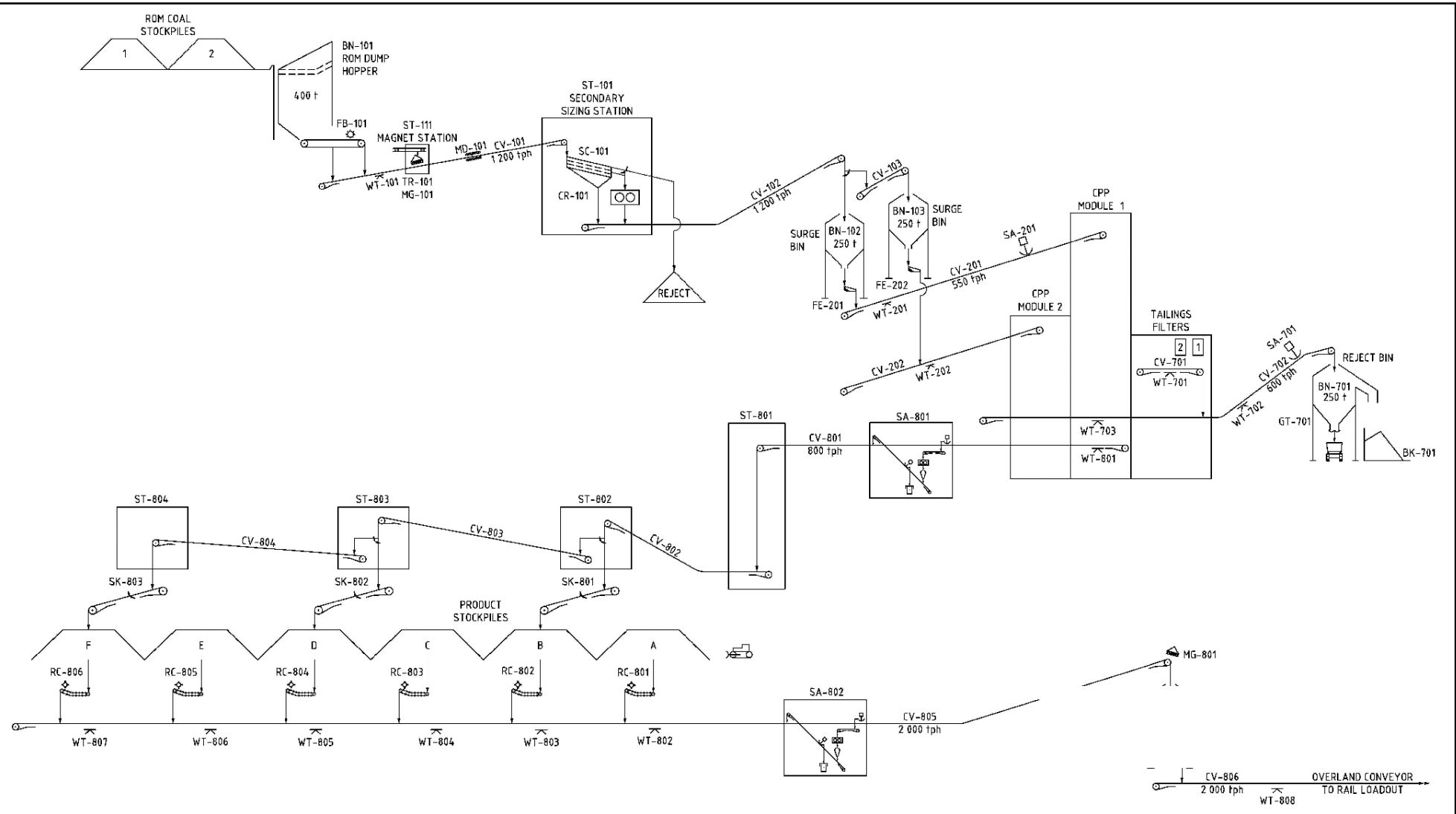
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PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015



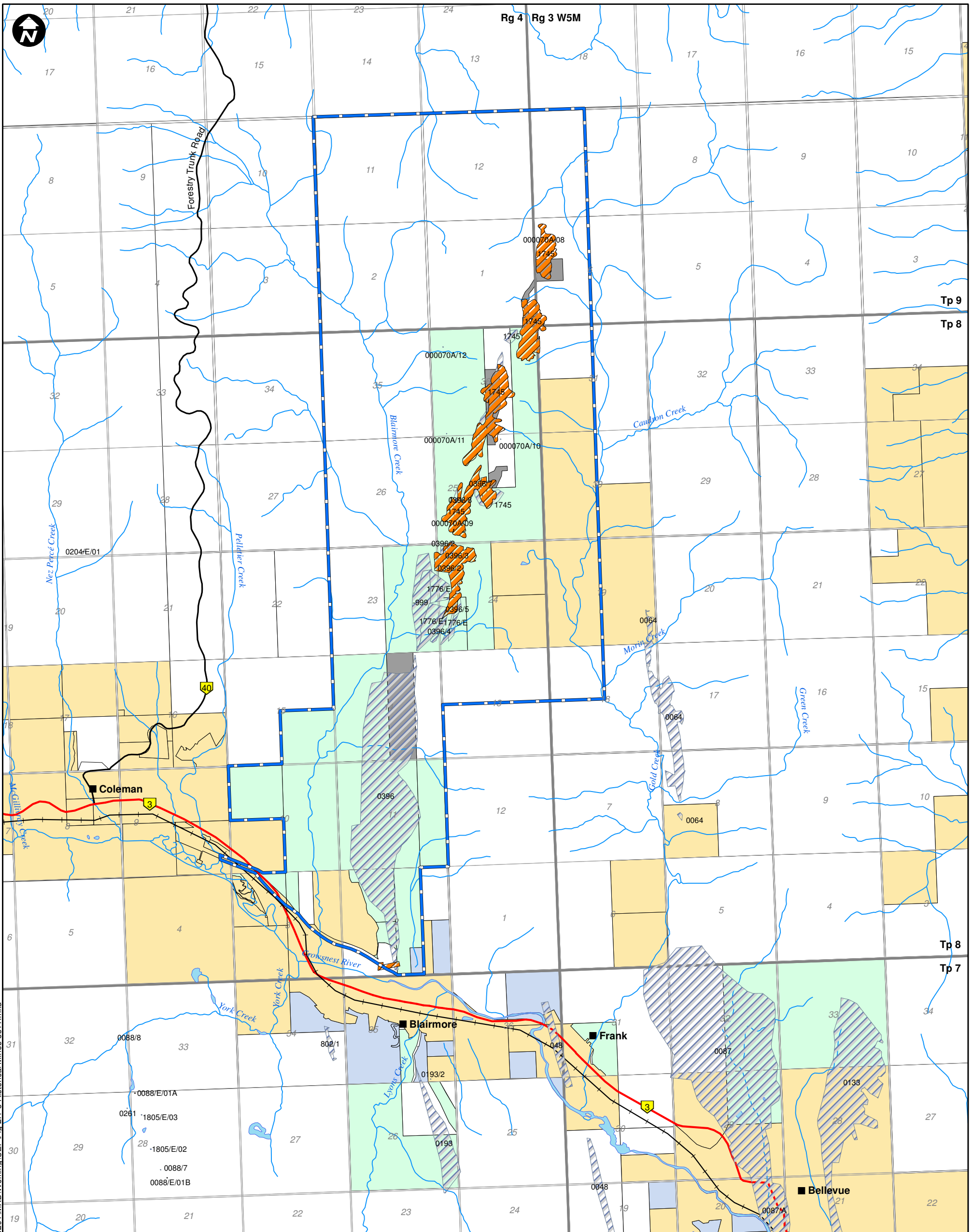
**FIGURE**  
**2.1-1**

Document Path: K:\Active Projects\2014\AP\_14-00201 to 14-00250\14-00201\MXD\Working\CEP\Fig 2.1-2 Process Overview.mxd



<p><b>PROJECT</b></p>  <p><b>RIVERSDALE</b> GRASSY MOUNTAIN RESOURCES COAL PROJECT</p>  <p><b>MILLENNIUM</b> EMS Solutions Ltd.</p>	
<p><b>TITLE</b></p> <p><b>PROCESS OVERVIEW</b></p>	
<p><b>NOTES</b></p> <p>Riversdale Resources, 2015</p>	<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: JDC</p> <p>CHECKED BY: MB</p> <p>DATE: MARCH 19, 2015</p>
<p><b>FIGURE</b></p> <p><b>2.1-2</b></p>	
<p>NOT TO SCALE</p>	





**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Surface Mine
- Underground Mine
- Private (Riversdale)
- Crown (Leased by Riversdale)
- Crown
- Municipal
- Private (Other)

**PROJECT**

**RIVERSDALE** RESOURCES **GRASSY MOUNTAIN COAL PROJECT**



**TITLE**

**HISTORICAL MINES**

**NOTES**

AltaLIS, 2015; ERCB, 2015; NRCAN, 2015; Riversdale, 2015  
Datum/Projection: UTM NAD 83 Zone 11

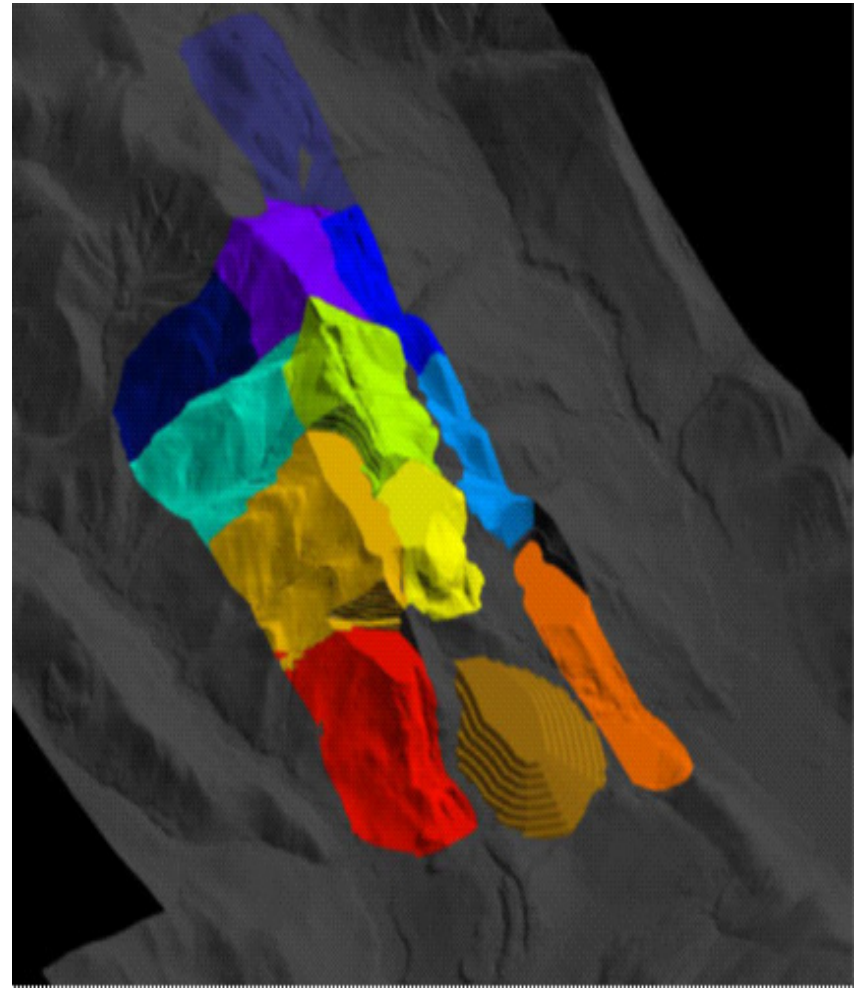
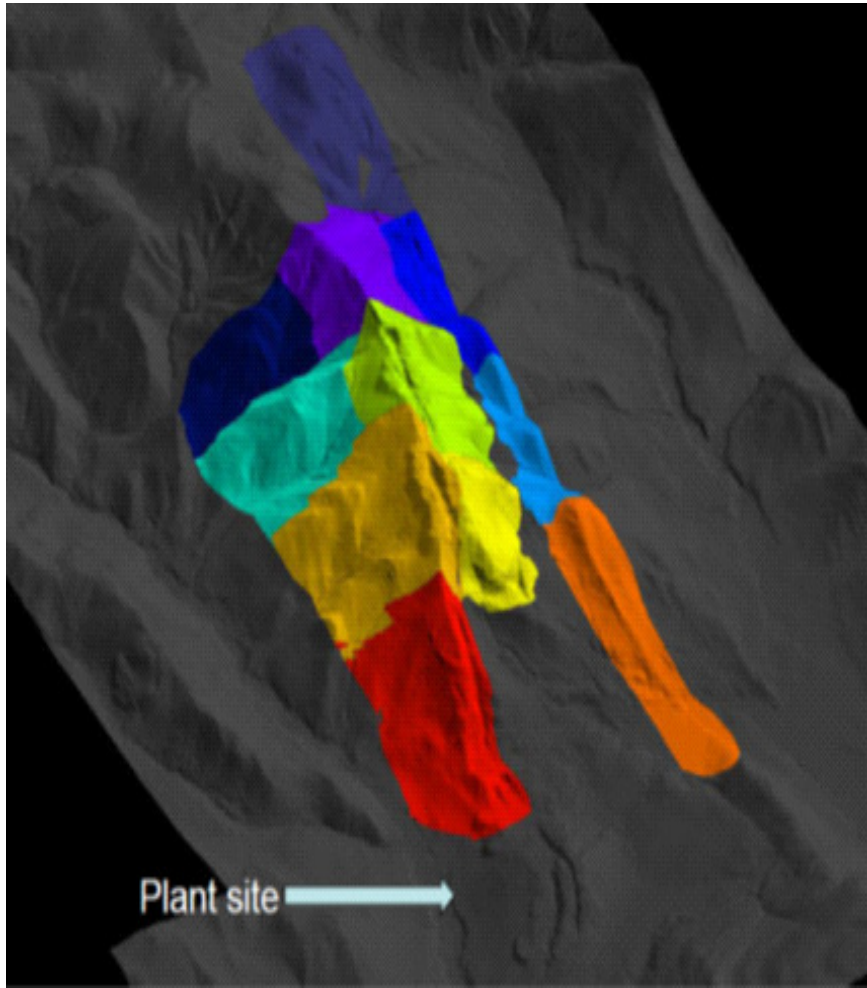
PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015



**FIGURE**  
**2.1-3**

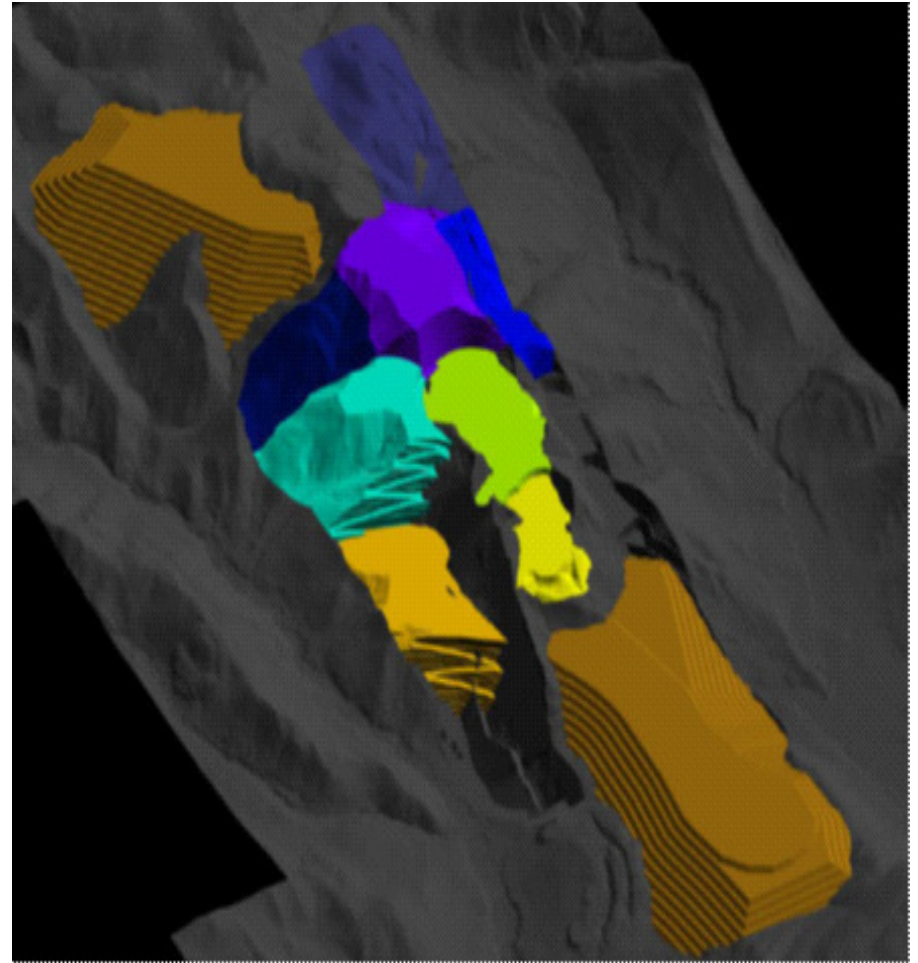
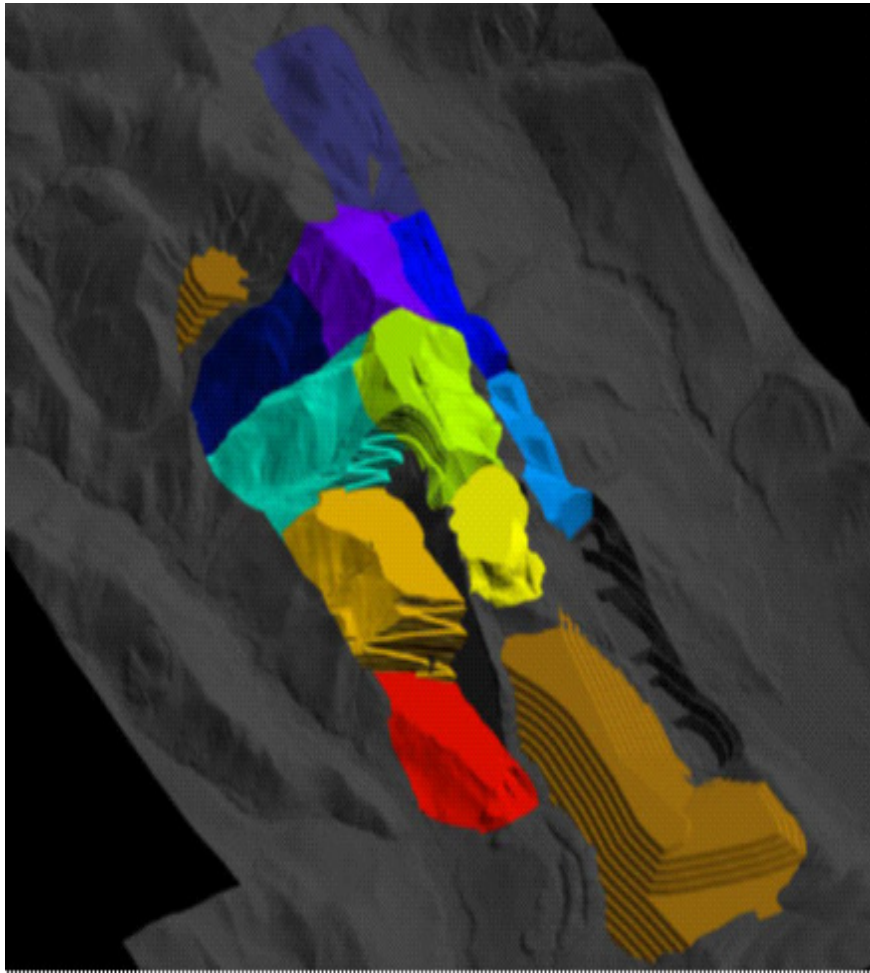




Document Path: K:\Active Projects\2014\AP\_14-00201\MXD\Working\CEP\Fig 2.1-3 Historical Mines 8311.mxd



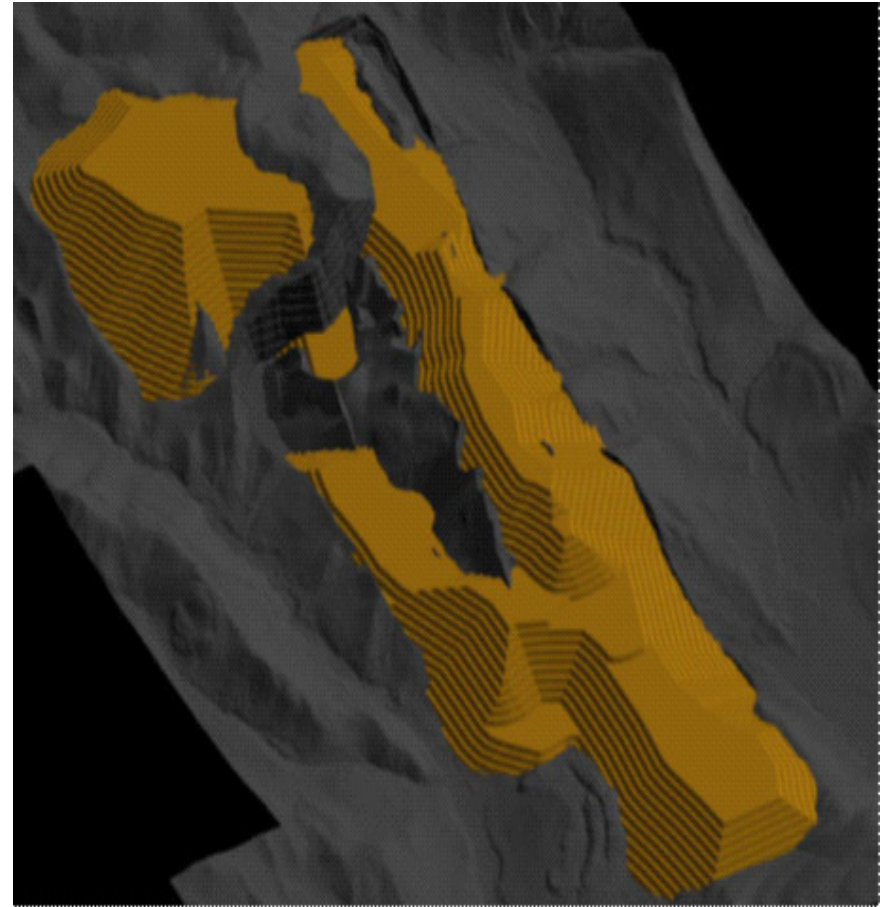
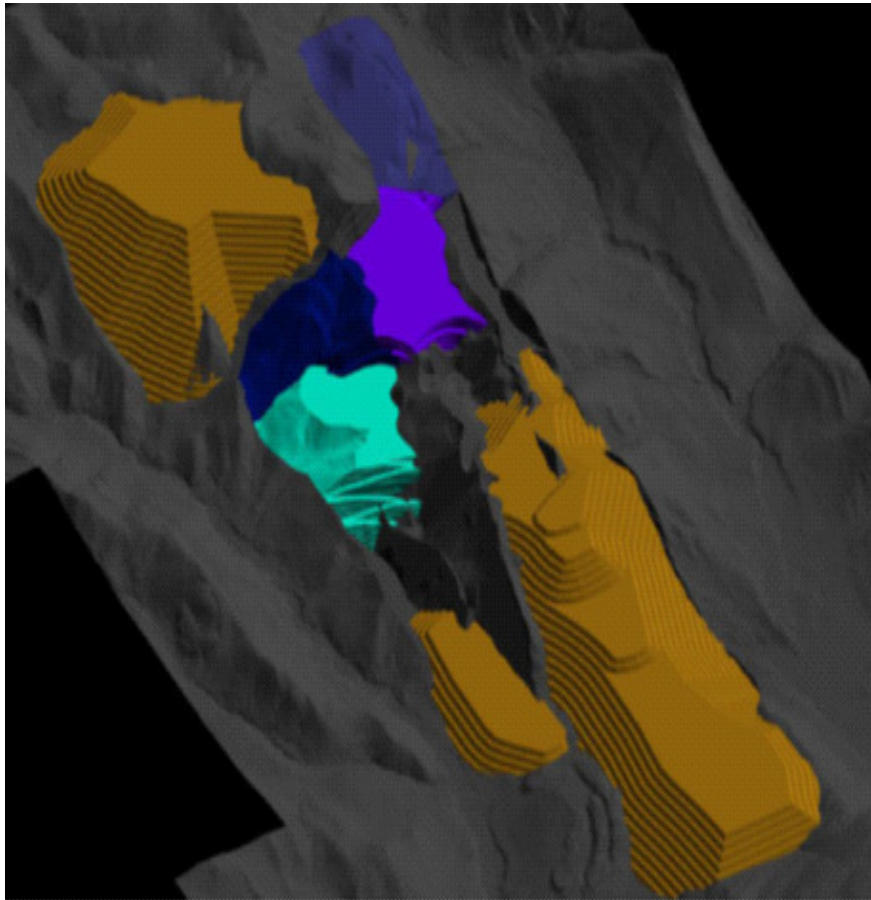


<p><b>PROJECT</b></p>  <b>RIVERSDALE</b> RESOURCES  <b>MILLENNIUM</b> EMS Solutions Ltd.	
<p><b>TITLE</b></p> <p><b>GRASSY MOUNTAIN COAL PROJECT</b></p> <p><b>PRELIMINARY MINE PHASING (YEAR 0 TO YEAR 2)</b></p>	
<p><b>NOTES</b></p> <p>SRK Consulting (Canada) Inc., 2015</p>	<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: JDC</p> <p>CHECKED BY: MB</p> <p>DATE: MARCH 2, 2015</p>
<p><b>FIGURE</b></p> <p>NOT TO SCALE</p> <p><b>2.3-1</b></p>	



<p><b>PROJECT</b></p>  <p><b>RIVERSDALE</b> GRASSY MOUNTAIN RESOURCES COAL PROJECT</p>		 <p><b>MILLENNIUM</b> EMS Solutions Ltd.</p>
<p><b>TITLE</b></p> <p><b>PRELIMINARY MINE PHASING (YEAR 5 TO YEAR 10)</b></p>		
<p><b>NOTES</b></p> <p>SRK Consulting (Canada) Inc., 2015</p>		<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: JDC</p> <p>CHECKED BY: MB</p> <p>DATE: MARCH 02, 2015</p>
<p>NOT TO SCALE</p>		<p><b>FIGURE</b></p> <p><b>2.3-2</b></p>





**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**PRELIMINARY MINE PHASING (YEAR 15 TO YEAR 22)**

**NOTES**

SRK Consulting (Canada) Inc., 2015

PROJECT: 14-00201-01

DRAWN BY: JDC

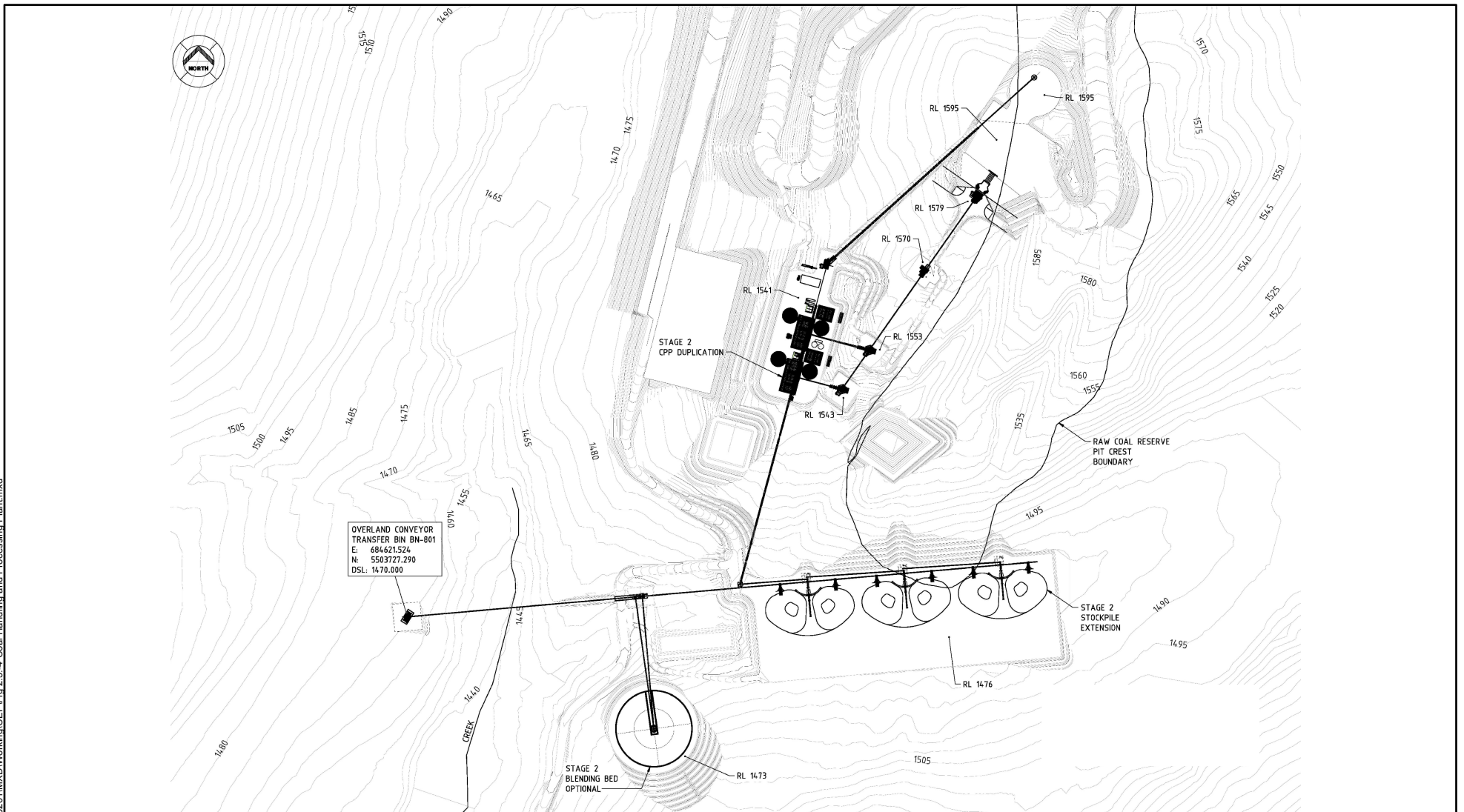
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DATE: MARCH 2, 2015

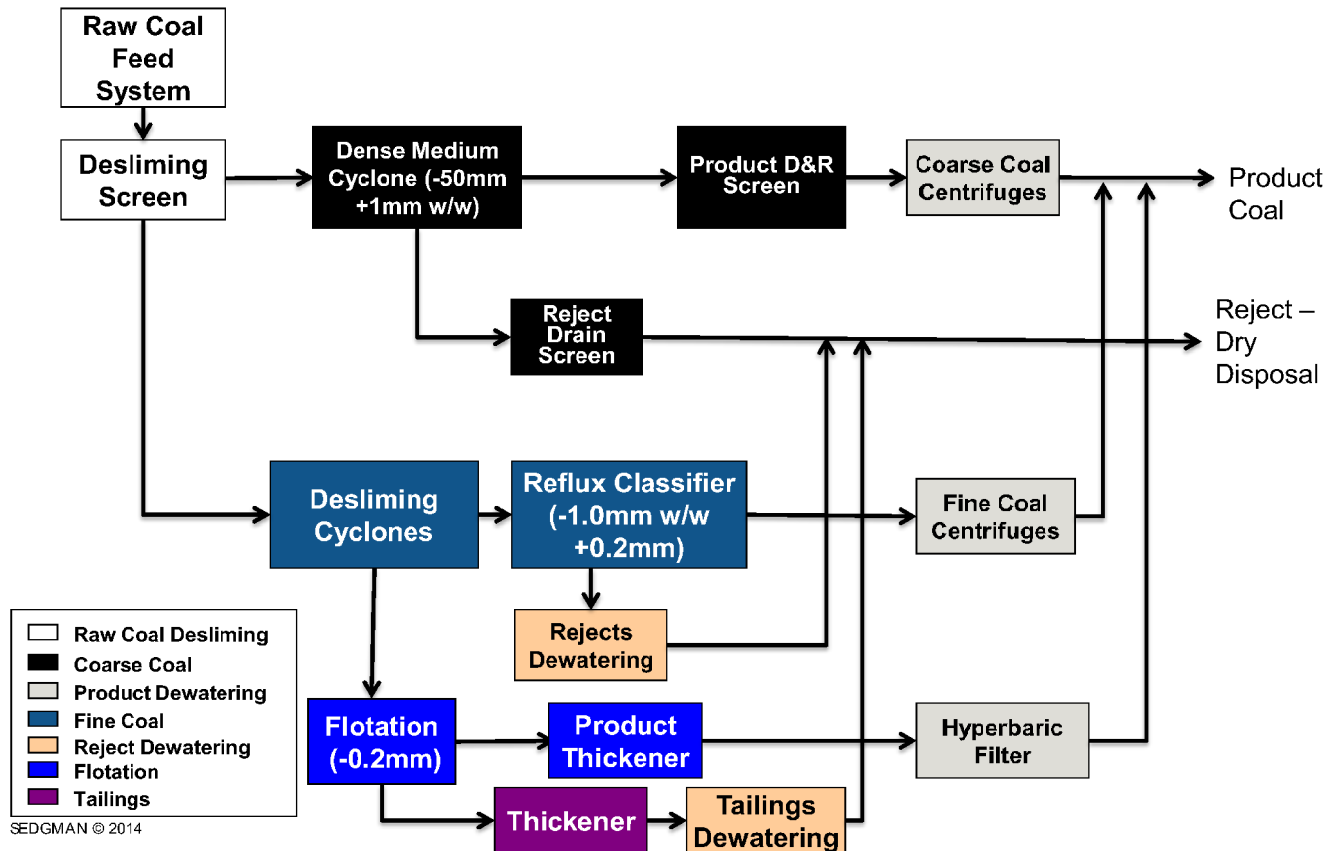
**FIGURE**

**2.3-3**

NOT TO SCALE



<p><b>PROJECT</b></p>  <p><b>RIVERSDALE GRASSY MOUNTAIN COAL PROJECT</b></p>		
<p><b>TITLE</b></p> <p><b>COAL HANDLING AND PROCESSING PLANT - GENERAL ARRANGEMENT</b></p>		
<p><b>NOTES</b></p> <p>Riversdale Resource, 2015</p>		<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: JDC</p> <p>CHECKED BY: MB</p> <p>DATE: MARCH 19, 2015</p>
<p>NOT TO SCALE</p>		<p><b>FIGURE</b></p> <p><b>2.3-4</b></p>



PROJECT



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



TITLE

**FLOW DIAGRAM OF COAL PROCESSING PLANT**

NOTES

SRK Consulting (Canada) Inc., 2015

PROJECT: 14-00201-01

DRAWN BY: JDC

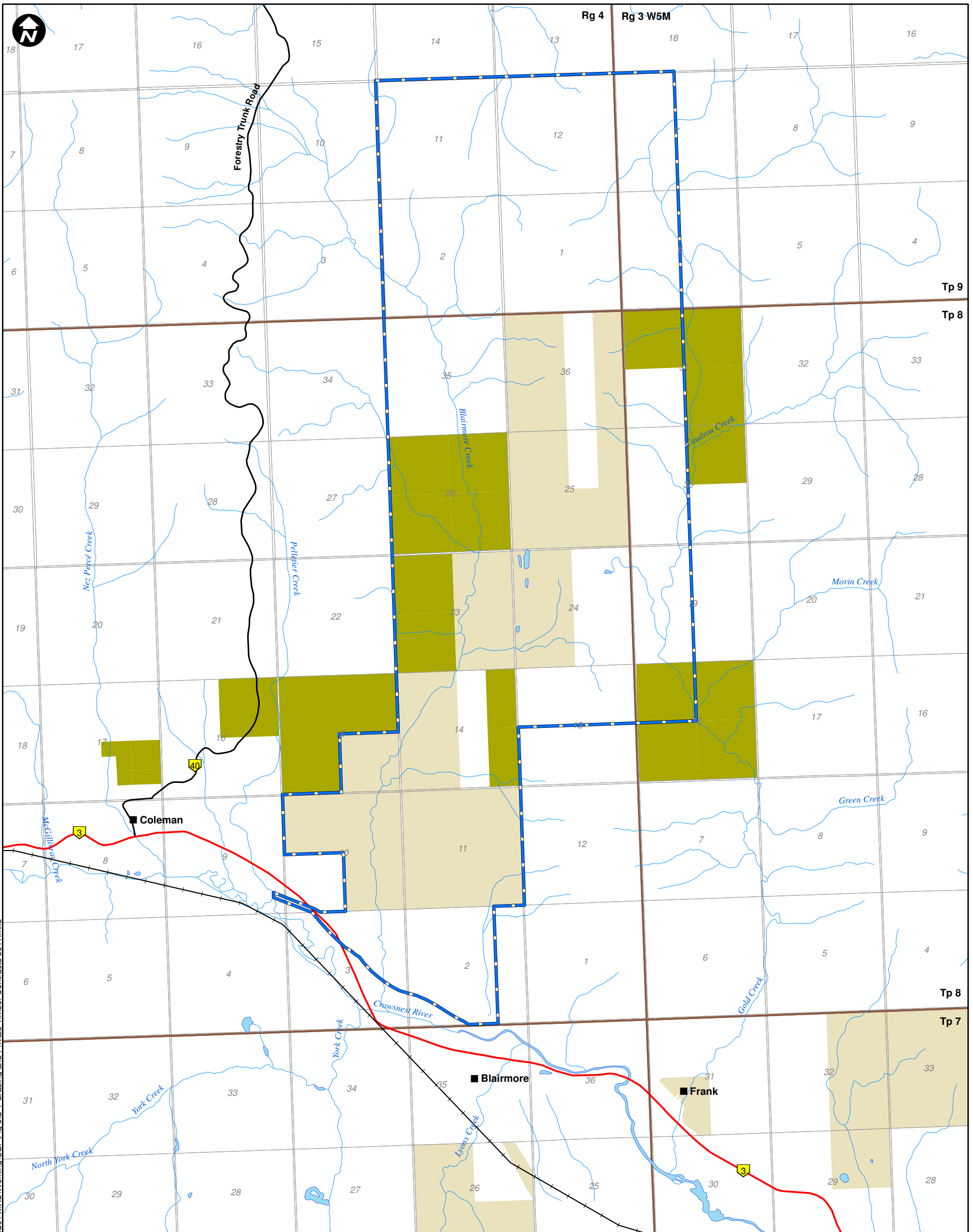
CHECKED BY: MB

DATE: MARCH 2, 2015

FIGURE

**2.3-5**

NOT TO SCALE



Document Path: K:\Active Projects 2014\AP 14-00250\14-00201\MXD\Working\CEP\Fig 3.2-1 Grazing and Private Timber Contracts 8311.mxd

**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Private Timber Contracts
- Grazing Leases
- Mine Permit Boundary

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

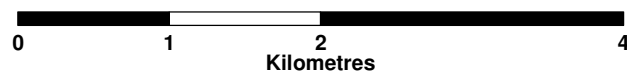
**GRAZING LEASES & PRIVATE TIMBER CONTRACTS**

**NOTES**

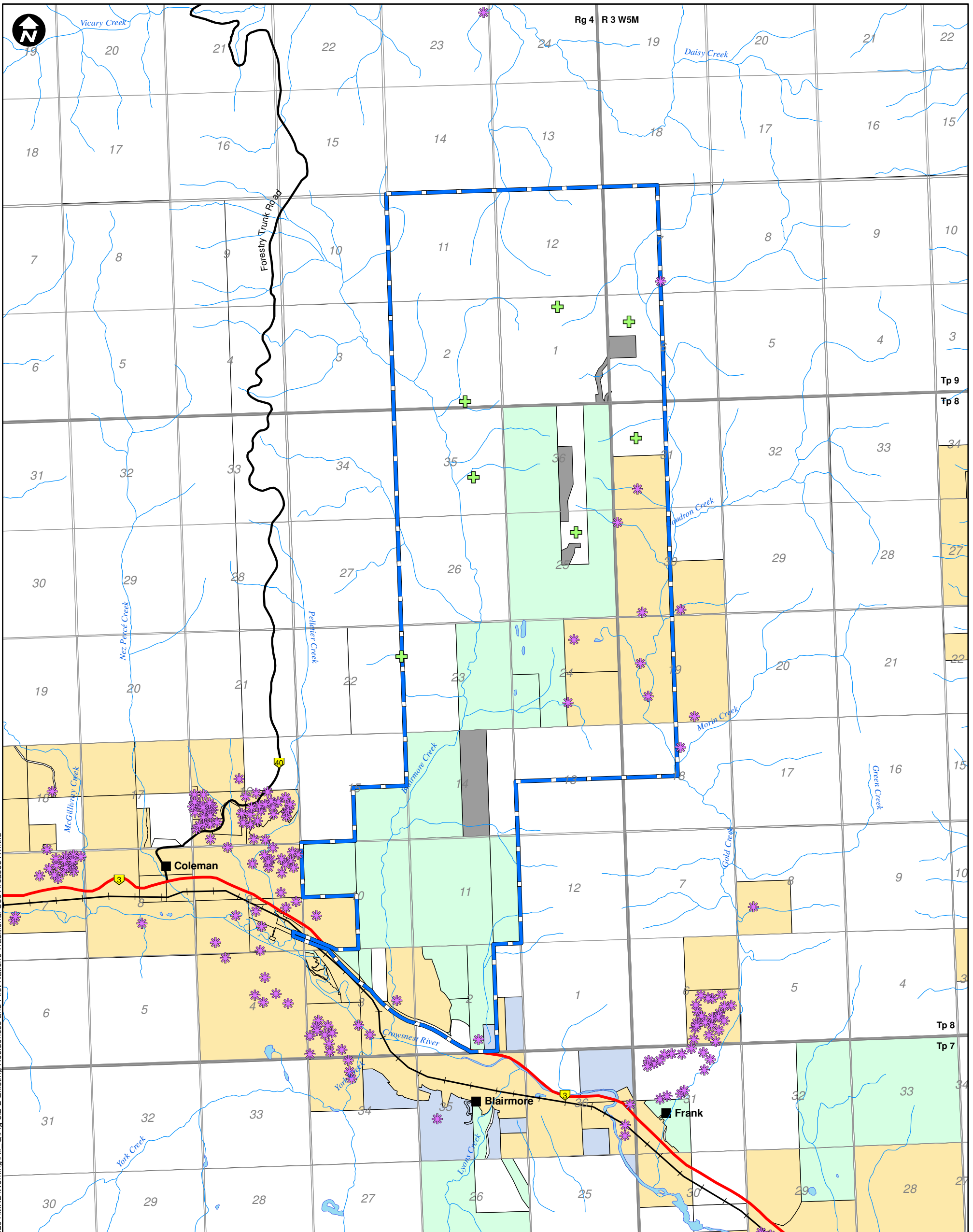
AltaLIS, 2015; NRCAN, 2015; Riversdale, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015

**FIGURE**  
**3.2-1**







Document Path: K:\Active Projects 2014\AP\_14-00201 to 14-00250\14-00201\MXD\Working\Air\_Q\Fig 3.2-2 Existing Residences and First Nations Traditional Use Areas8311.mxd

**LEGEND**

- + First Nations Traditional Use Areas
- \* Residences
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Private (Riversdale)
- Crown (Leased by Riversdale)
- Crown
- Municipal
- Private (Other)

**PROJECT**

**RIVERSDALE RESOURCES** **GRASSY MOUNTAIN COAL PROJECT**



**TITLE**  
**EXISTING RESIDENCES & FIRST NATIONS TRADITIONAL USE AREAS**

**NOTES**

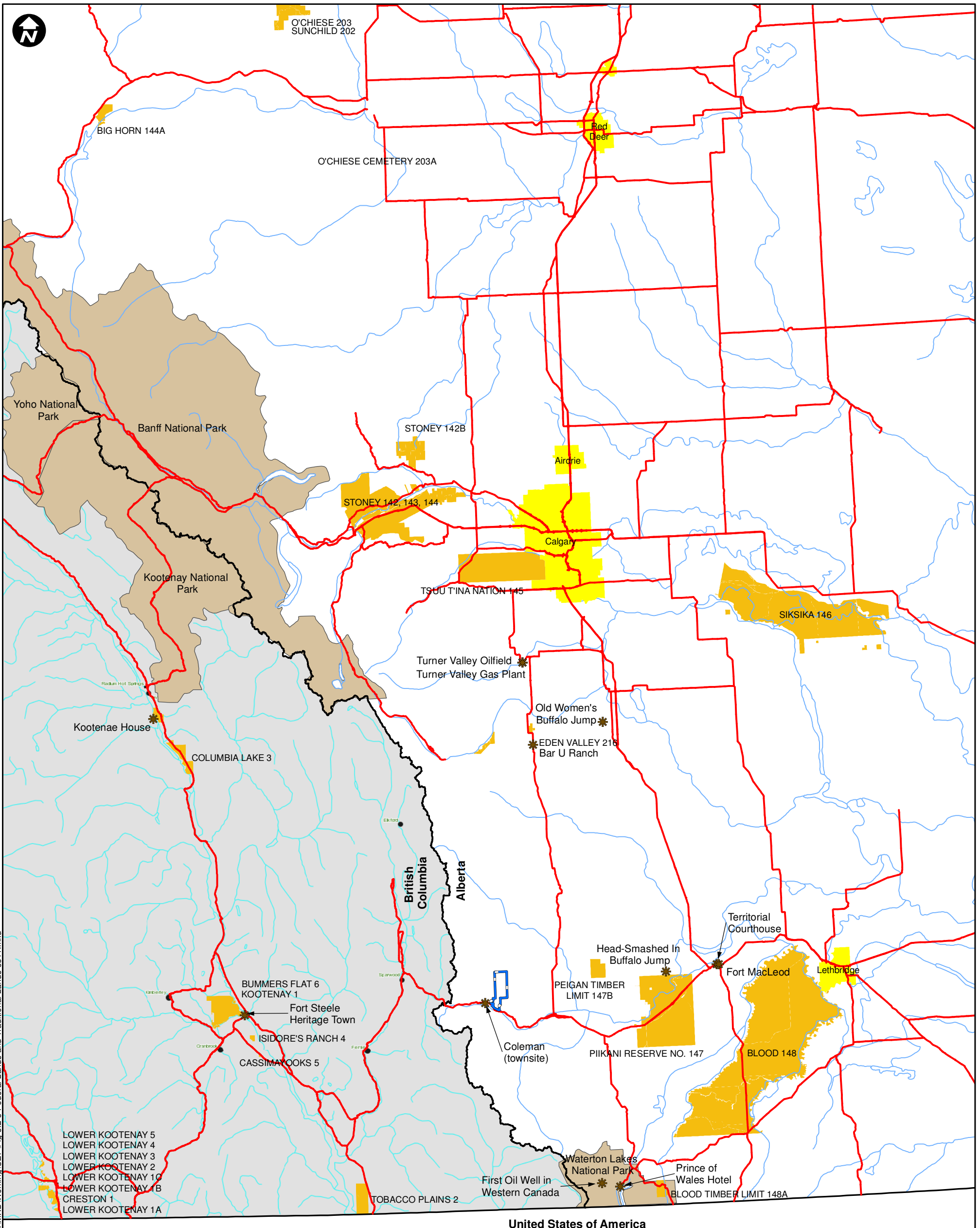
AltaLIS; 2015; DialecticResearch, 2015; GeoBase, 2011; MEMS, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015



**FIGURE**  
**3.2-2**





Document Path: K:\Active Projects\2014\AP\_14-00250\14-00201\MXD\Working\CEP\Fig\_3.2-3\_Federal Lands and Traditional Lands\_8311.mxd

**LEGEND**

- National Historic Site
- Primary Highway
- First Nation Reserve Land
- National Parks
- Ktunaxa Kinbasket Treaty Council SOI Area
- Mine Permit Boundary
- BC/Alberta/United States Border

**PROJECT**



**GRASSY MOUNTAIN COAL PROJECT**



**TITLE**

**FEDERAL LANDS & TRADITIONAL TERRITORIES**

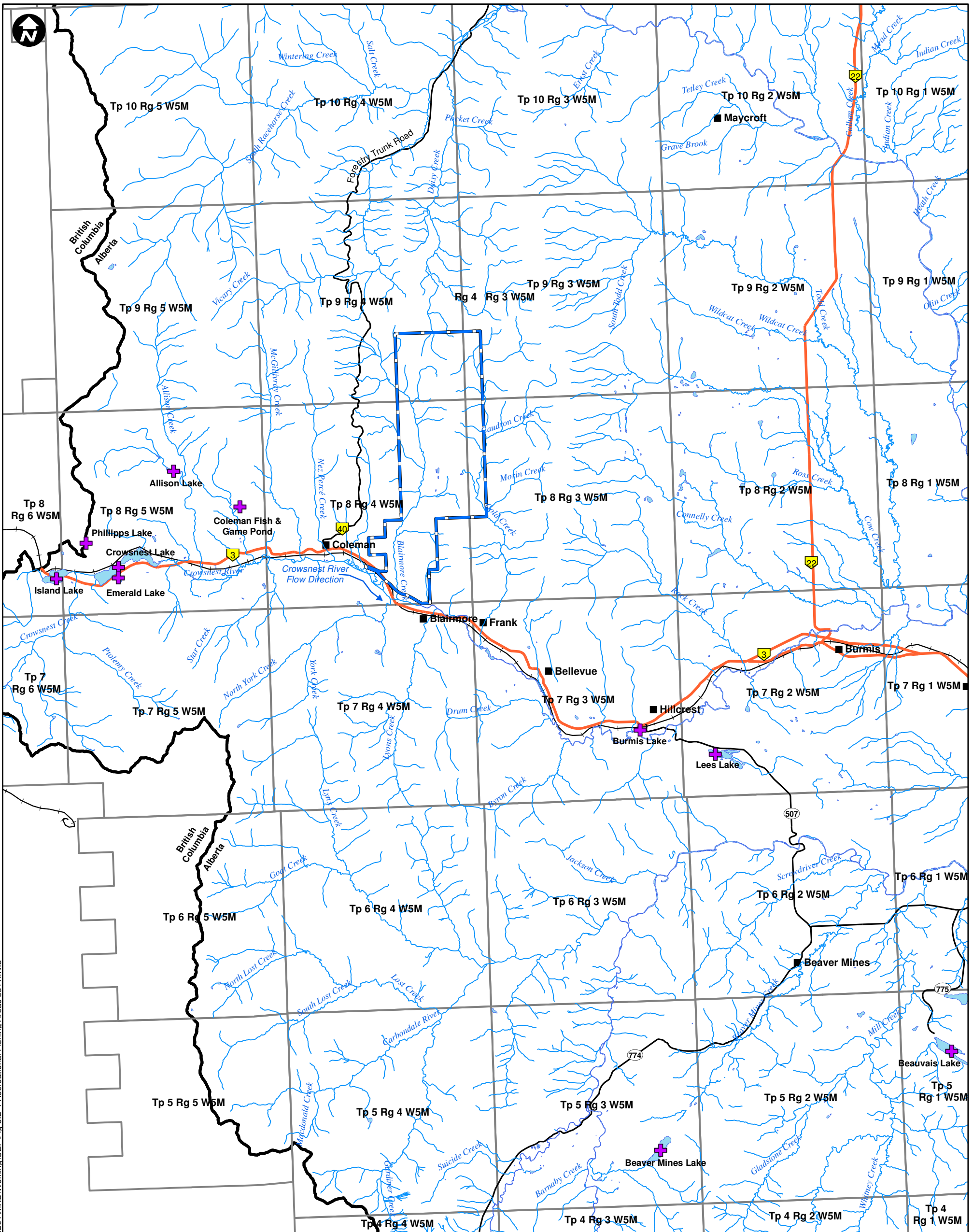
**NOTES**

AltaLIS, 2015; BCTrim II, 2015; NRCAN, 2105  
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PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: MB  
DATE: FEBRUARY 27, 2015



**FIGURE**  
**3.2-3**



Document Path: K:\Active Projects 2014\AP\_14-00201 to 14-00250\14-00201\MXD\Working\CEP\Fig\_3.2-4\_Recreational Fishing Areas 8311.mxd

**LEGEND**

- + Fish Stocked Lake
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Provincial Border

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**RECREATIONAL FISHING AREAS**

**NOTES**

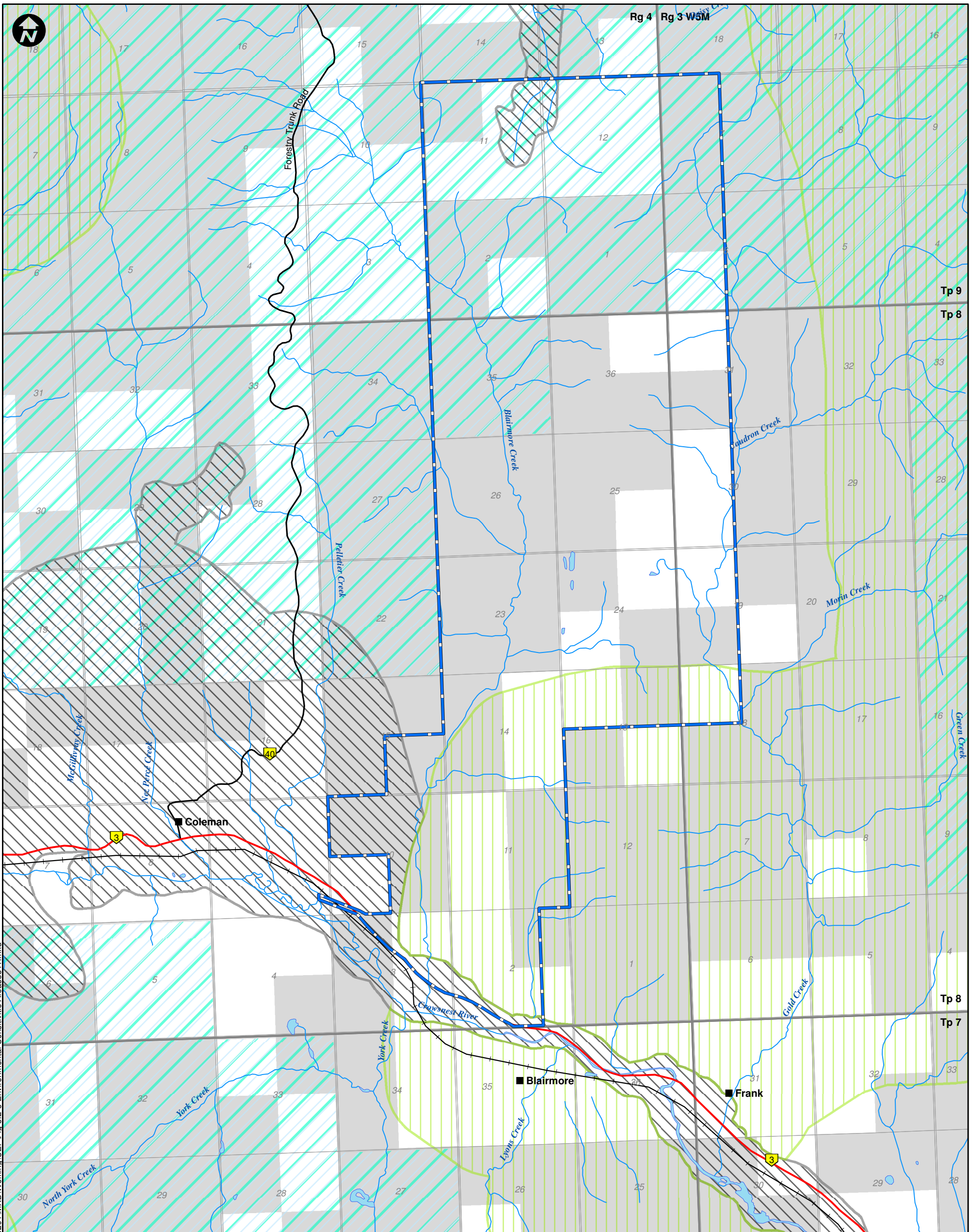
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Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: CP  
DATE: FEBRUARY 26, 2015



**FIGURE**  
**3.2-4**





Document Path: K:\Active Projects 2014\AP\_14-00201 to 14-00250\14-00201\MXD\Working\CEP\Fig\_3.2-5 Environmental Sensitivity Areas8311.mxd

**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Mountain Goat and Sheep Range
- Key Wildlife and Biodiversity Zone
- Grizzly Bear Zone
- Environmentally Sensitive Area (2014)

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**ENVIRONMENTALLY SENSITIVE AREAS**

**NOTES**

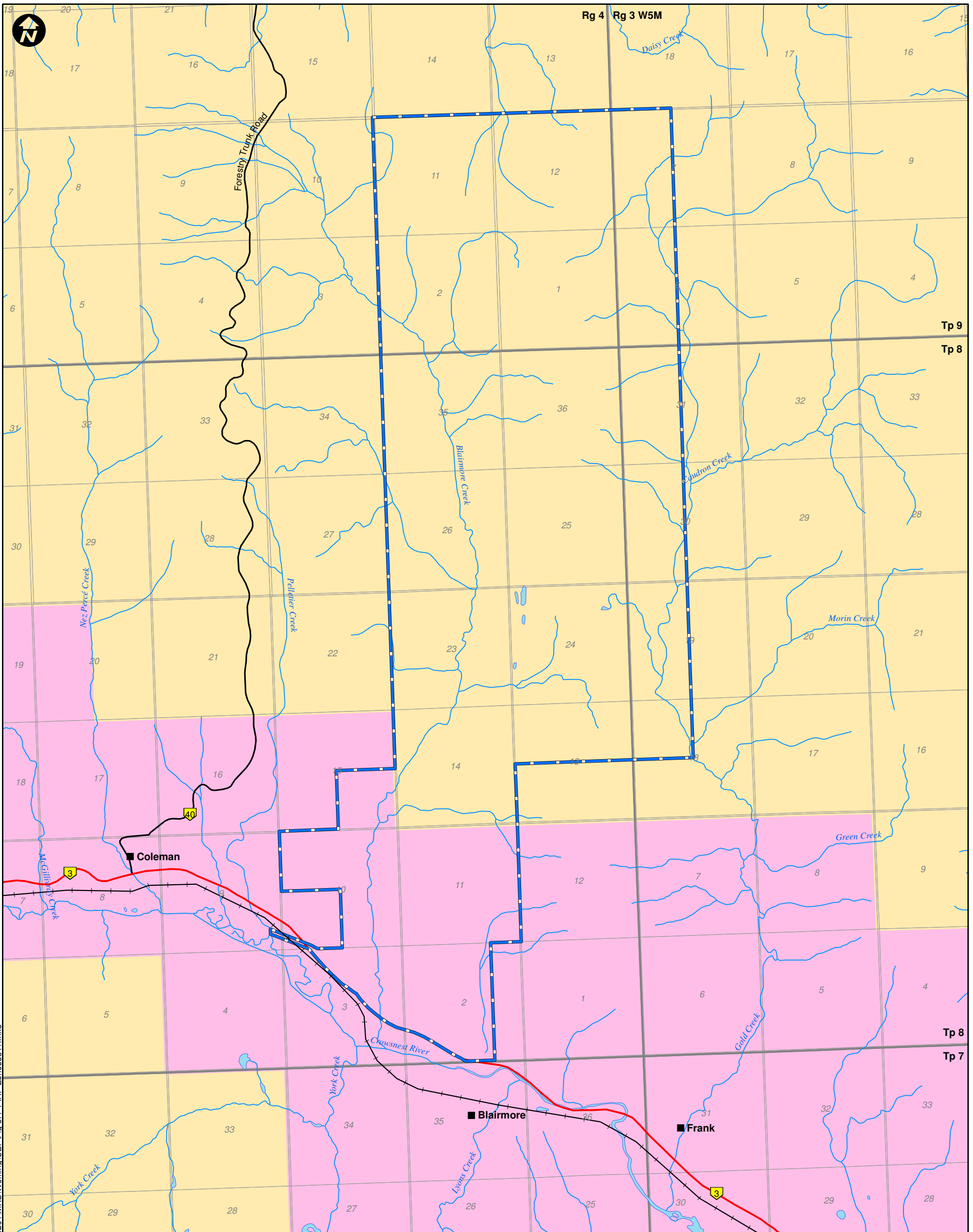
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Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015

**FIGURE**  
**3.2-5**







Document Path: K:\Active Projects 2014\AP\_14-00201 to 14-00250\14-00201\MXD\Working\CEP\Fig 3.4-1 IRP Zones8311.mxd

**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Livingstone-Porcupine Hills IRP
- Crowsnest Corridor Local IRP

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**INTEGRATED RESOURCE PLAN ZONES**

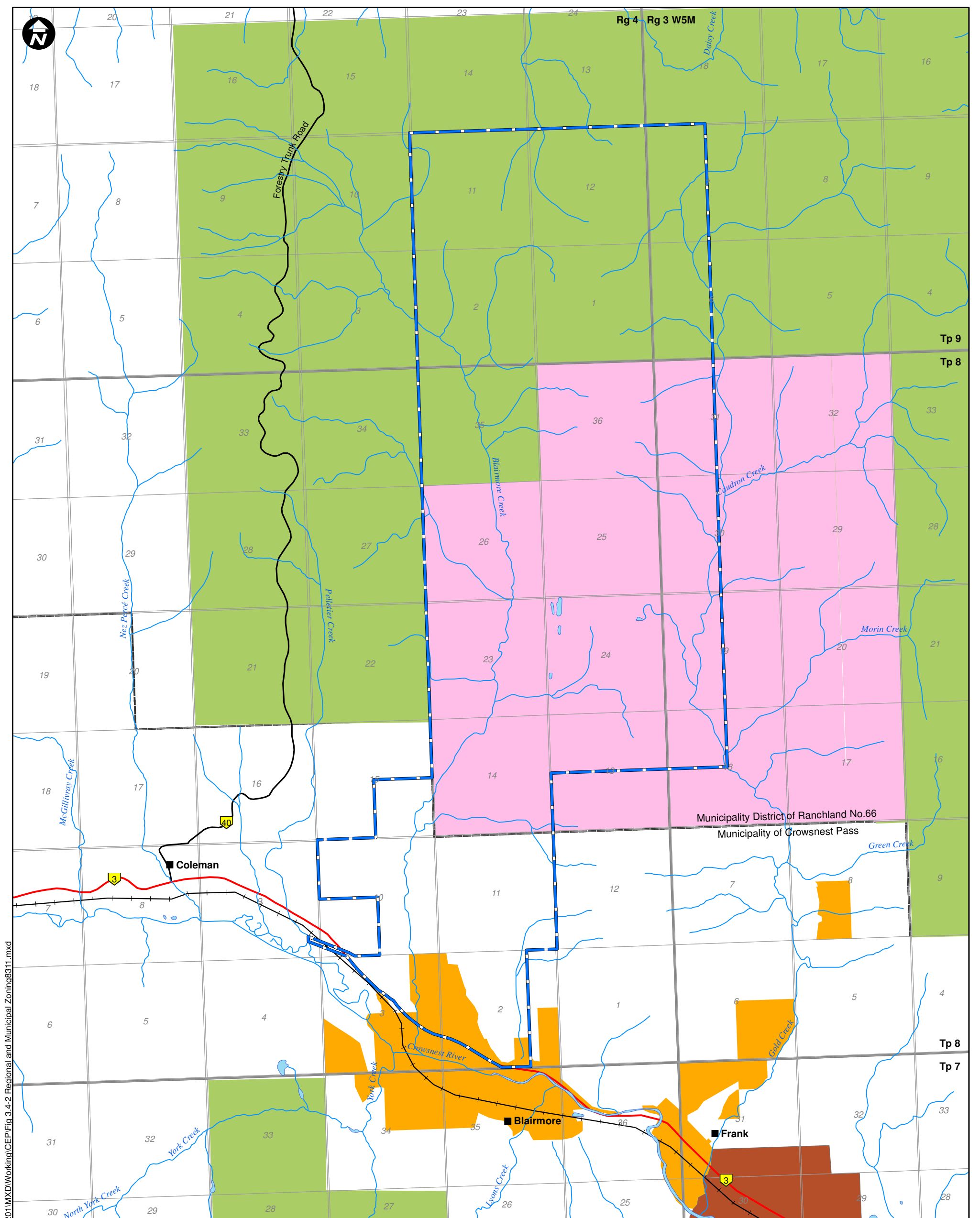
**NOTES**

AltaLIS, 2015; NRCAN, 2015; Riversdale, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015

**FIGURE**  
**3.4-1**





Document Path: K:\Active Projects 2014\AP\_14-00250\14-00201\MXD\Working\CEP\Fig\_3.4-2\_Regional and Municipal Zoning8311.mxd

**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Agriculture/White Area AWA
- Restricted Development Area RDA
- Forest Reserve
- Urban Land Units

**PROJECT**

**RIVERSDALE** GRASSY MOUNTAIN  
RESOURCES COAL PROJECT

**MILLENNIUM**  
EMS Solutions Ltd.

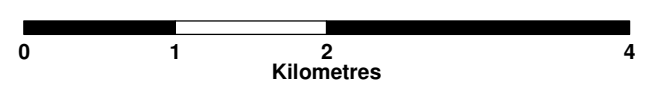
**TITLE**

**REGIONAL & MUNICIPAL ZONING**

**NOTES**

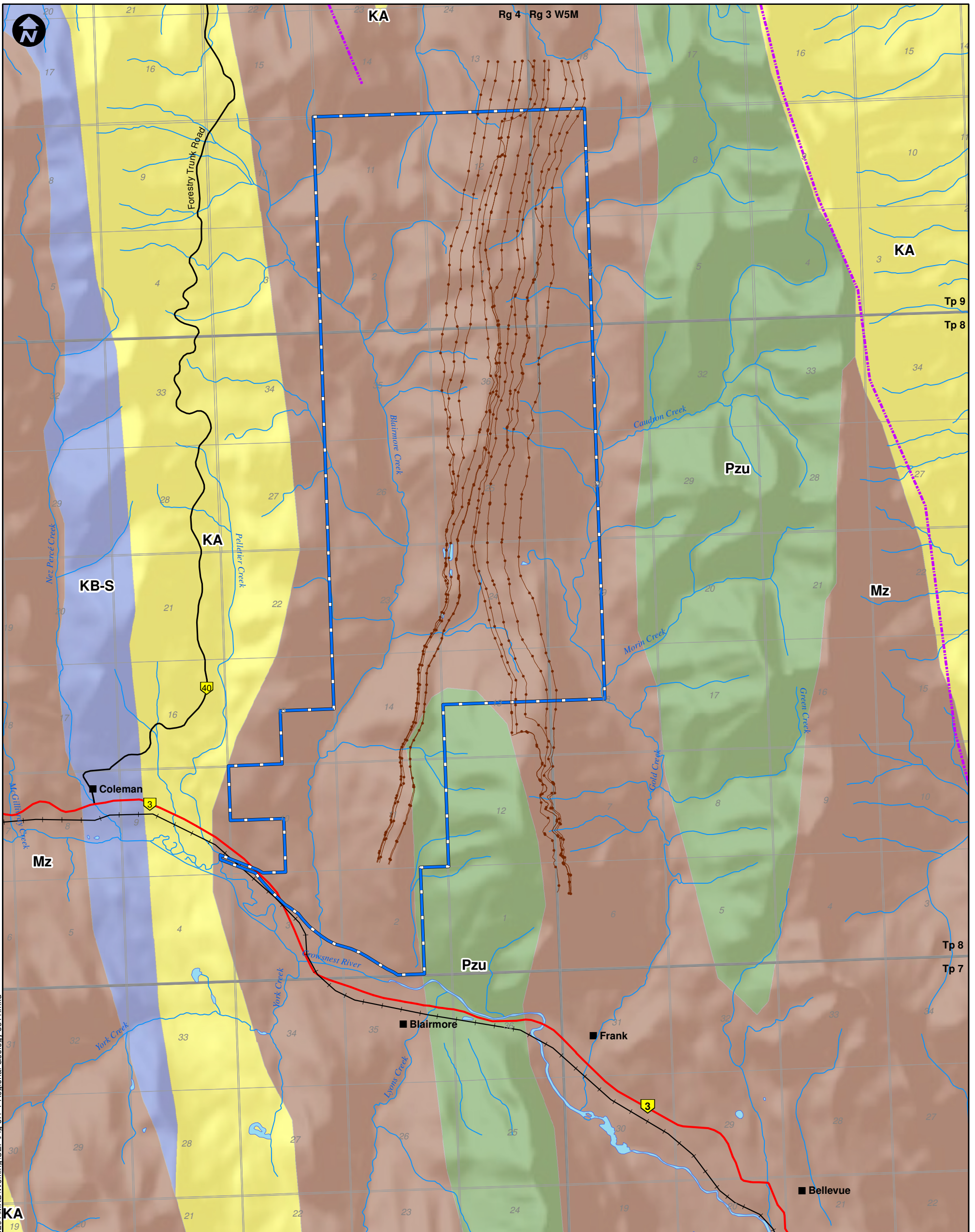
AltaLIS, 2015; NRCAN, 2015; Riversdale, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: CP  
CHECKED BY: CP  
DATE: FEBRUARY 26, 2015



**FIGURE**  
**3.4-2**





Document Path: K:\Active Projects\2014\AP\_14-00201 to 14-00250\14-00201\MXD\Working\CEP\Fig 5.1-1 Regional Geology 8311.mxd

**LEGEND**

- Thrust Fault
- Fault
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary

**Geologic Formation**

- Alberta Group
- Belly River-St. Mary River Succession
- Lower Mesozoic-Lower Cretaceous
- Upper Paleozoic

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**REGIONAL GEOLOGY**

**NOTES**

AltaLIS, 2015; ESRI, 2014; Golder, 2015; Riversdale, 2015  
Datum/Projection: UTM NAD 83 Zone 11

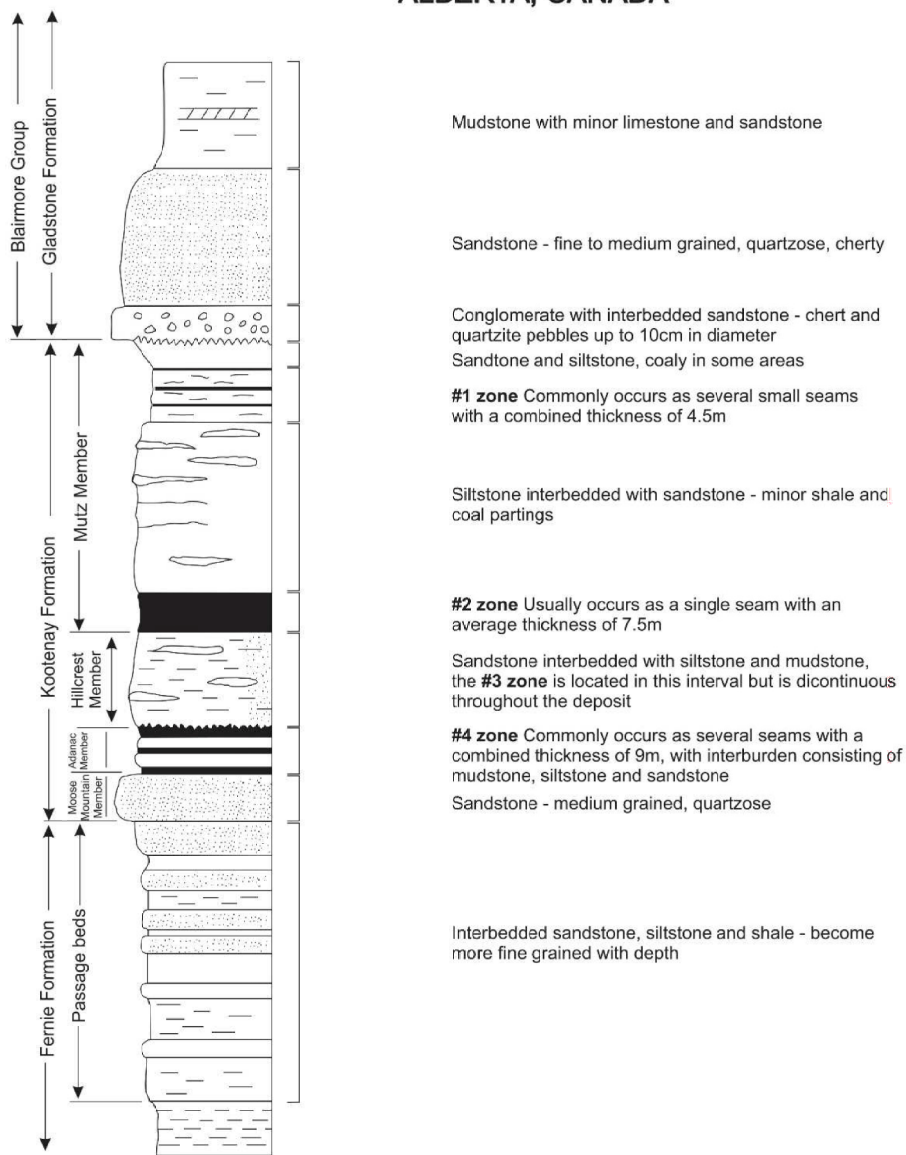
PROJECT: 14-00201-01  
DRAWN BY: JDC  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015

**FIGURE**

**5.1-1**



## STRATIGRAPHIC COLUMN OF THE LITHOLOGIES OBSERVED AT THE GRASSY MOUNTAIN AREA, ALBERTA, CANADA



### LEGEND

- Conglomerate
- Sandstone
- Siltstone
- Mudstone/Shale
- Coal
- Erosional Contact

#### PROJECT



**RIVERSDALE GRASSY MOUNTAIN  
RESOURCES COAL PROJECT**



#### TITLE

**REGIONAL STRATIGRAPHY**

#### NOTES

Riversdale, 2015

PROJECT: 14-00201-01

DRAWN BY: JDC

CHECKED BY: MB

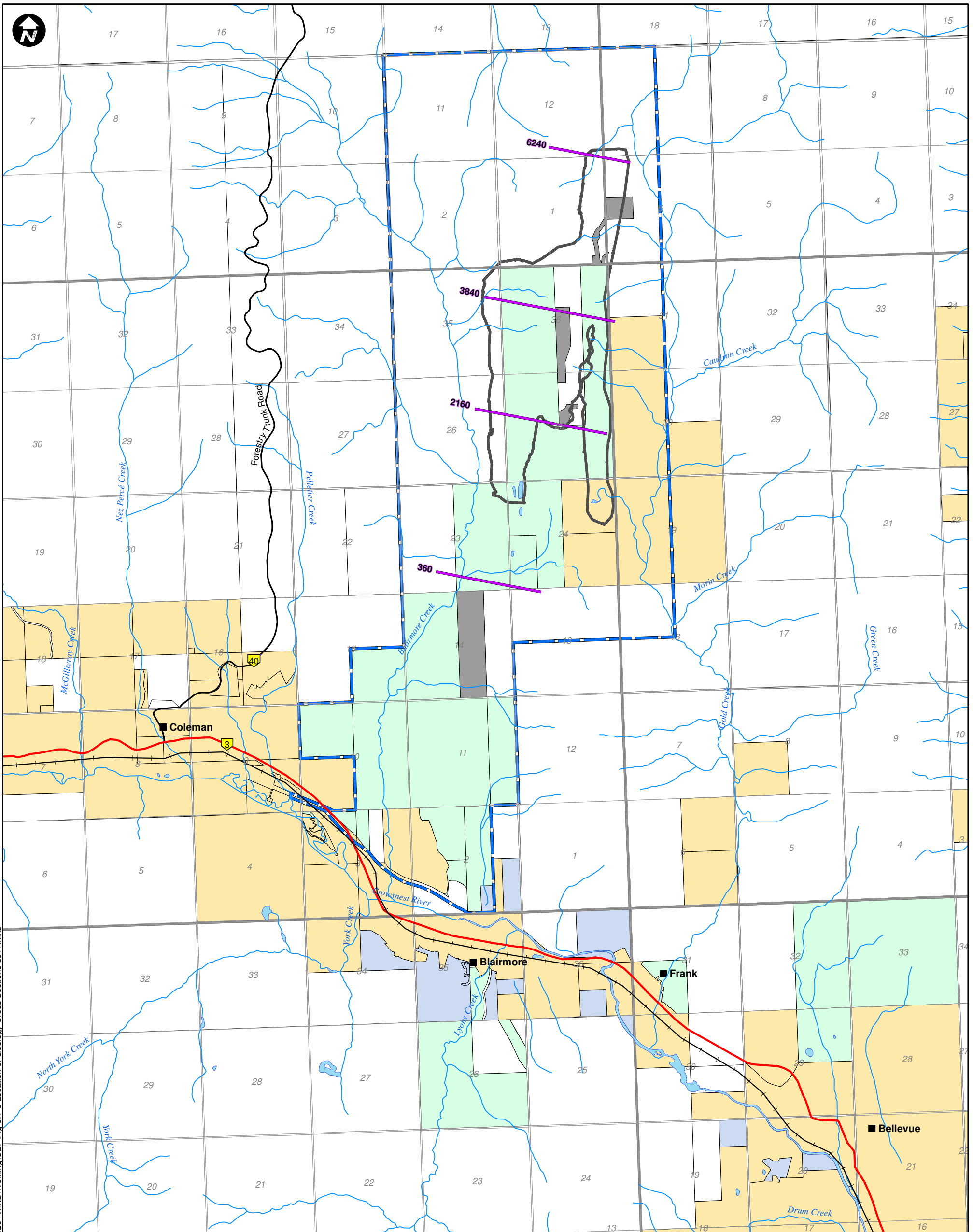
DATE: FEBRUARY 26, 2015

#### FIGURE

**5.1-2**

NOT TO SCALE





Document Path: K:\Active Projects 2014\AP\_14-00201 to 14-00250\14-00201\MXD\Working\CEP\Fig 5.1-3 Location of Geology Cross Sections 8311.mxd

**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Cross Section Line
- Private (Riversdale)
- Crown (Leased by Riversdale)
- Crown
- Municipal
- Private (Other)

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**LOCATION OF GEOLOGY CROSS SECTIONS**

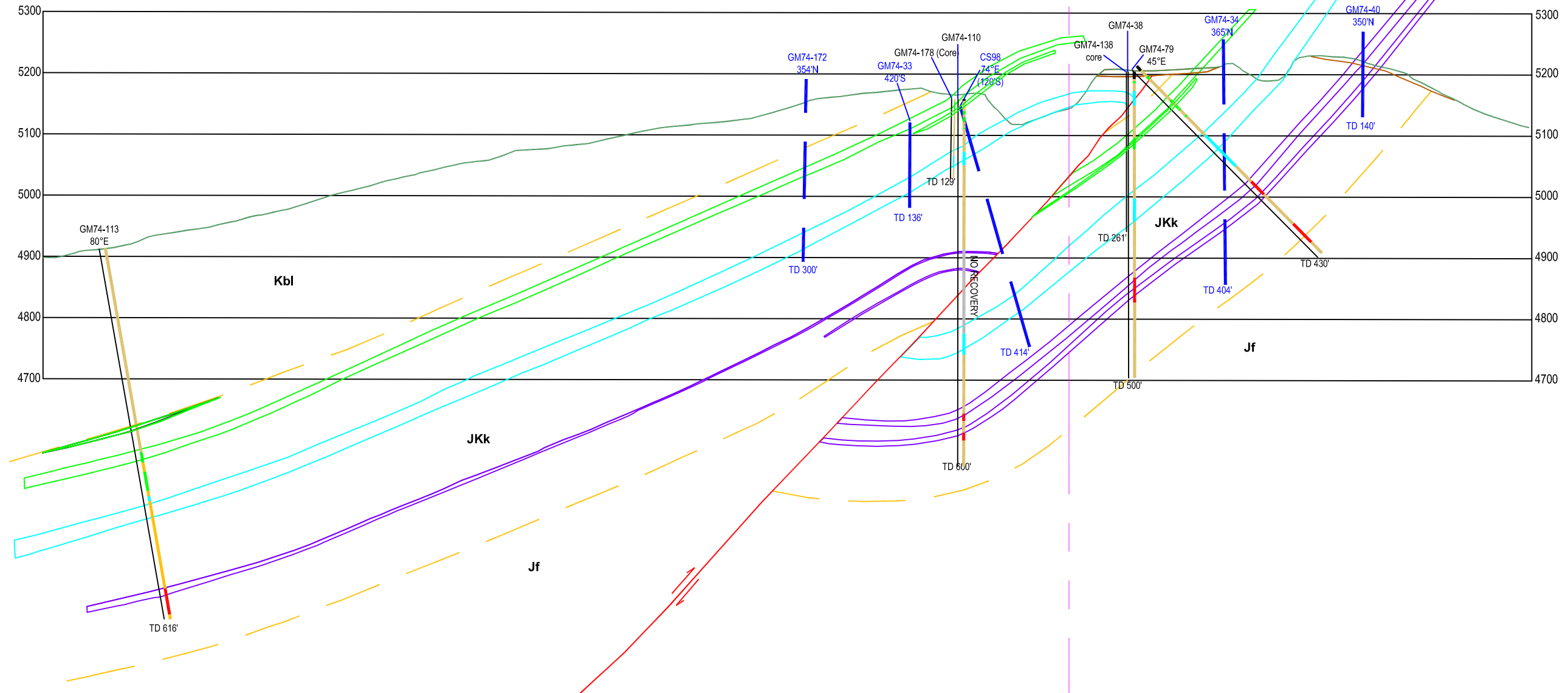
**NOTES**

AltaLIS, 2015; Golder, 2015; Riversdale, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: JDC  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015

**FIGURE  
5.1-3**





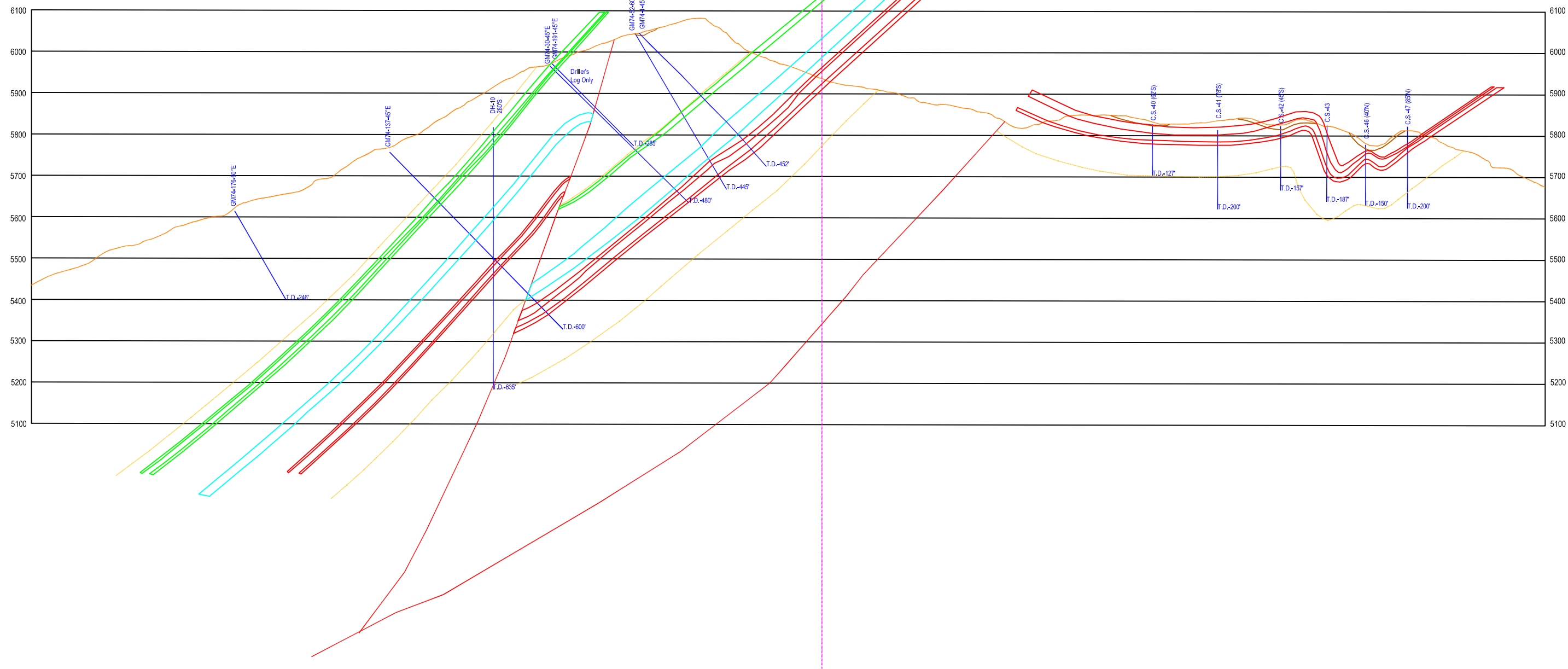
Document Path: \\C:\Projects\2014\AP 14-00201 to 14-00250\14-00201\Client\From Mike Benfield\February 20, 2015

**LEGEND**








	Topo		Seam4
	Till		Fault
	Seam1		Baseline
	Seam2		Contact




<p><b>PROJECT</b></p> <p><b>GRASSY MOUNTAIN COAL PROJECT</b></p>		
<p><b>TITLE</b></p> <p><b>PROJECT GEOLOGY - CROSS SECTION 360</b></p>		
<p><b>NOTES</b></p> <p>NORWEST, 2005</p>		<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: JDC</p> <p>CHECKED BY: MB</p> <p>DATE: FEBRUARY 25, 2015</p>
		<p>FIGURE</p> <p><b>5.1-4</b></p>

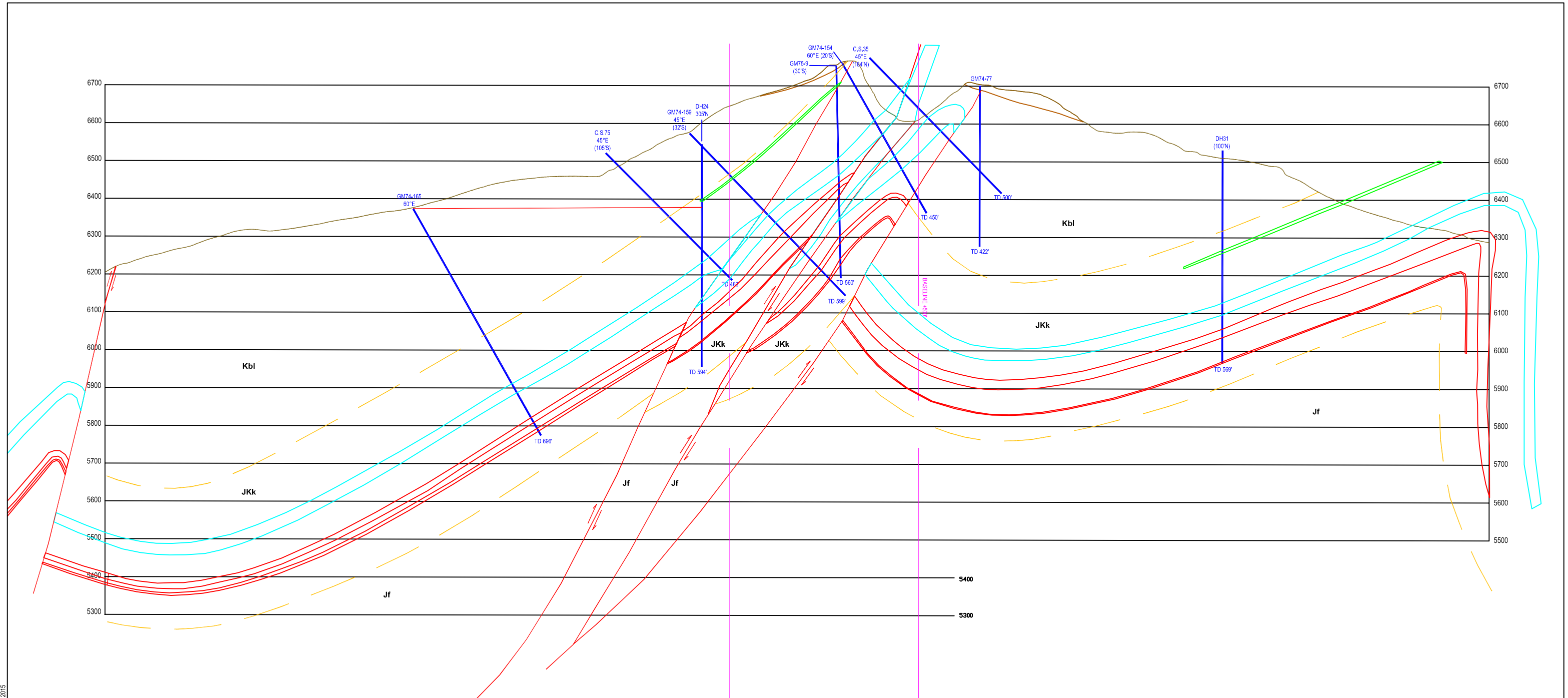
Document Path: \\K:\Active Projects\2014\AP 14-00201 to 14-00250\14-00201\Client\From Mike Benfield\February 20, 2015



**LEGEND**

	Topo		Seam4
	Till		Baseline
	Seam1		Contact
	Seam2		

<p><b>PROJECT</b></p>  <p><b>GRASSY MOUNTAIN COAL PROJECT</b></p>		
<p><b>TITLE</b></p> <p><b>PROJECT GEOLOGY - CROSS SECTION 2160</b></p>		
<p><b>NOTES</b></p> <p>NORWEST, 2005</p>		<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: JDC</p> <p>CHECKED BY: MB</p> <p>DATE: FEBRUARY 25, 2015</p>
		<p>FIGURE</p> <p><b>5.1-5</b></p>



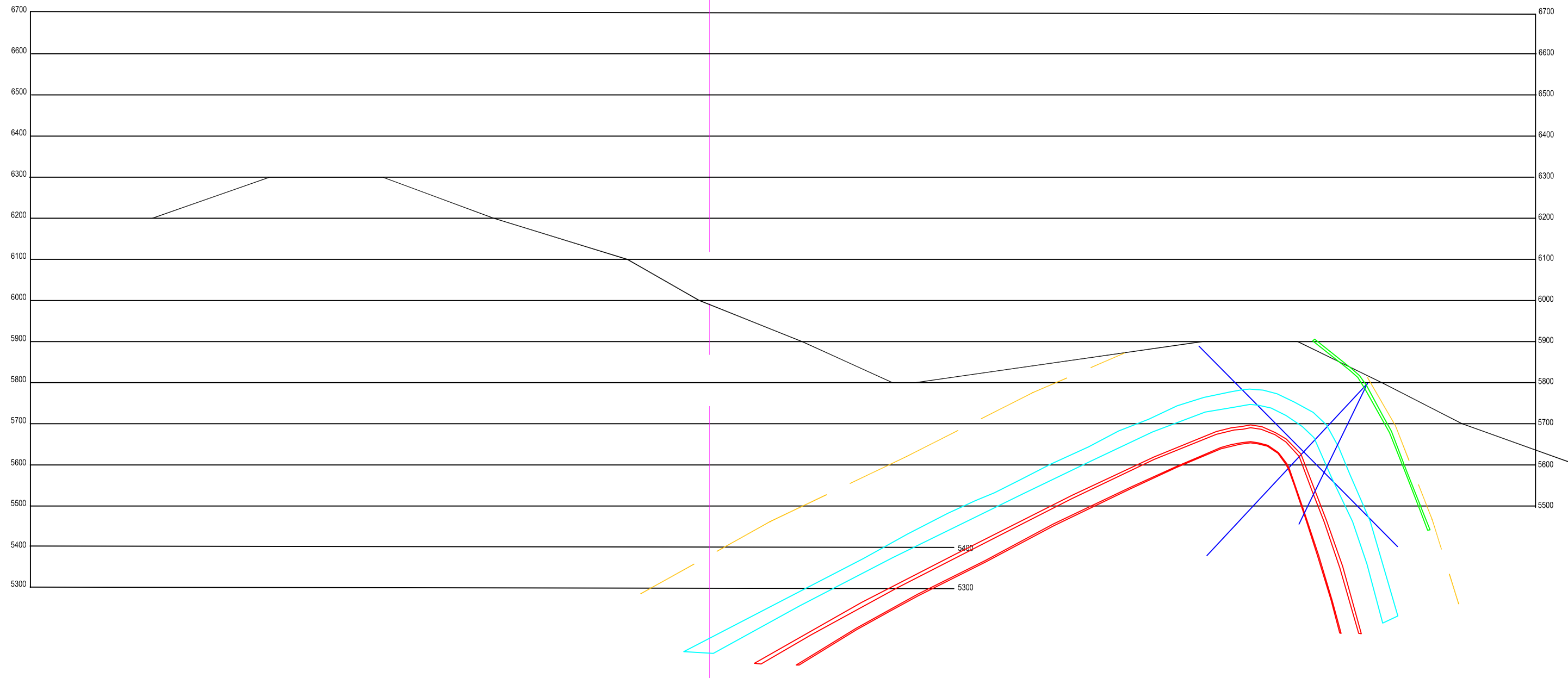
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**LEGEND**

	Topo		Seam4
	Till		Baseline
	Seam1		Contact
	Seam2		Fault



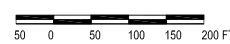
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<p><b>TITLE</b></p> <p><b>PROJECT GEOLOGY - CROSS SECTION 3840</b></p>		
<p><b>NOTES</b></p> <p>NORWEST, 2005</p>		<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: JDC</p> <p>CHECKED BY: MB</p> <p>DATE: FEBRUARY 25, 2015</p>
		<p>FIGURE</p> <p><b>5.1-6</b></p>

Document Path: \\K:\Active Projects\2014\AP 14-00201 to 14-00250\14-00201\Client\From Mike Bennett\February 20, 2015

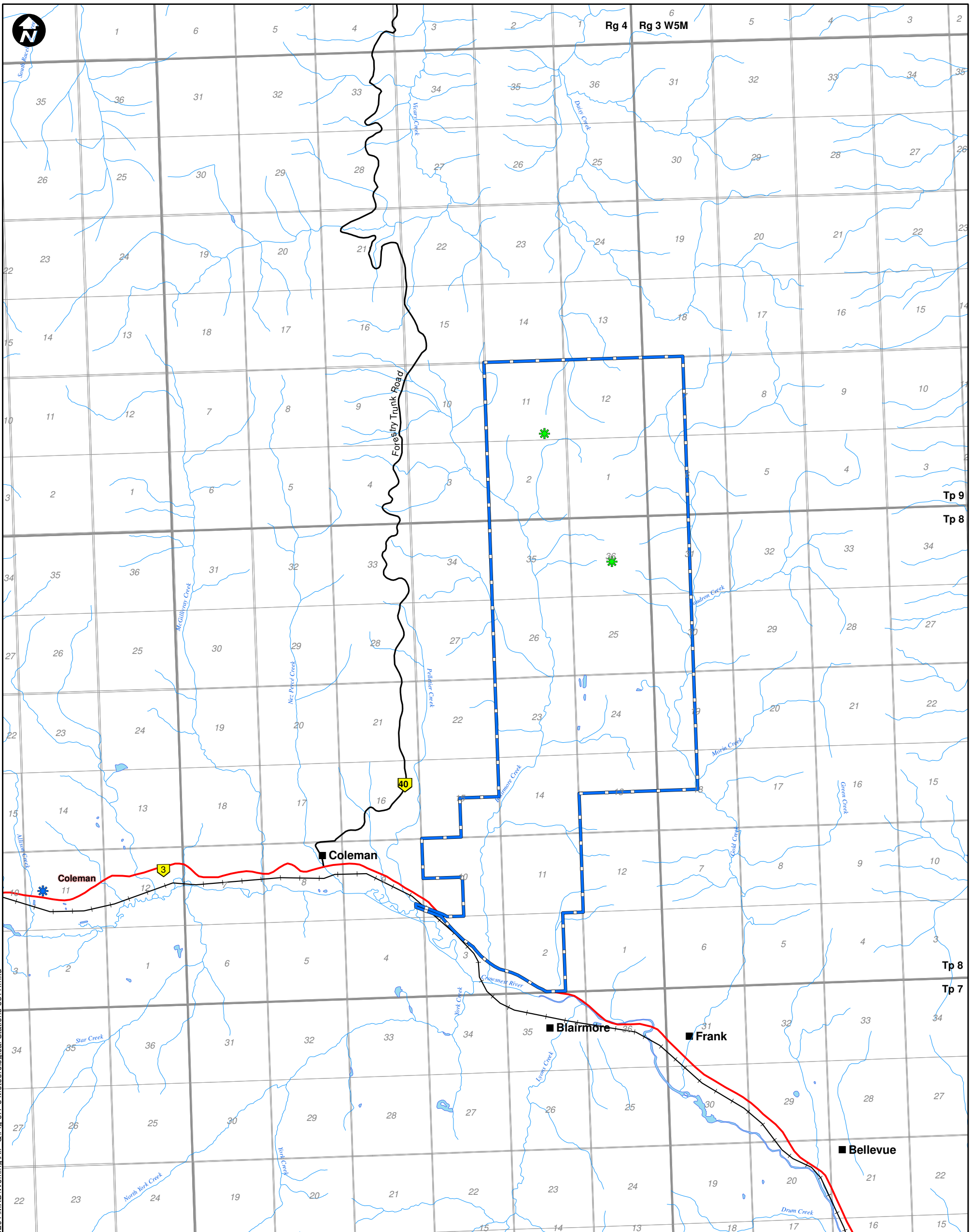


**LEGEND**

	Topo		Seam4
	Seam1		Baseline
	Seam2		Contact

<p><b>PROJECT</b></p>  <p><b>GRASSY MOUNTAIN COAL PROJECT</b></p>		
<p><b>TITLE</b></p> <p><b>PROJECT GEOLOGY - CROSS SECTION 6240</b></p>		
<p><b>NOTES</b></p> <p>NORWEST, 2005</p>		<p>PROJECT: 14-00201-01</p> <p>DRAWN BY: JDC</p> <p>CHECKED BY: MB</p> <p>DATE: FEBRUARY 25, 2015</p>
		<p>FIGURE</p> <p><b>5.1-7</b></p>





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**LEGEND**

- Environment Canada (Station ID: 3051720)
- Project Specific Station
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**METEOROLOGICAL STATIONS**

**NOTES**

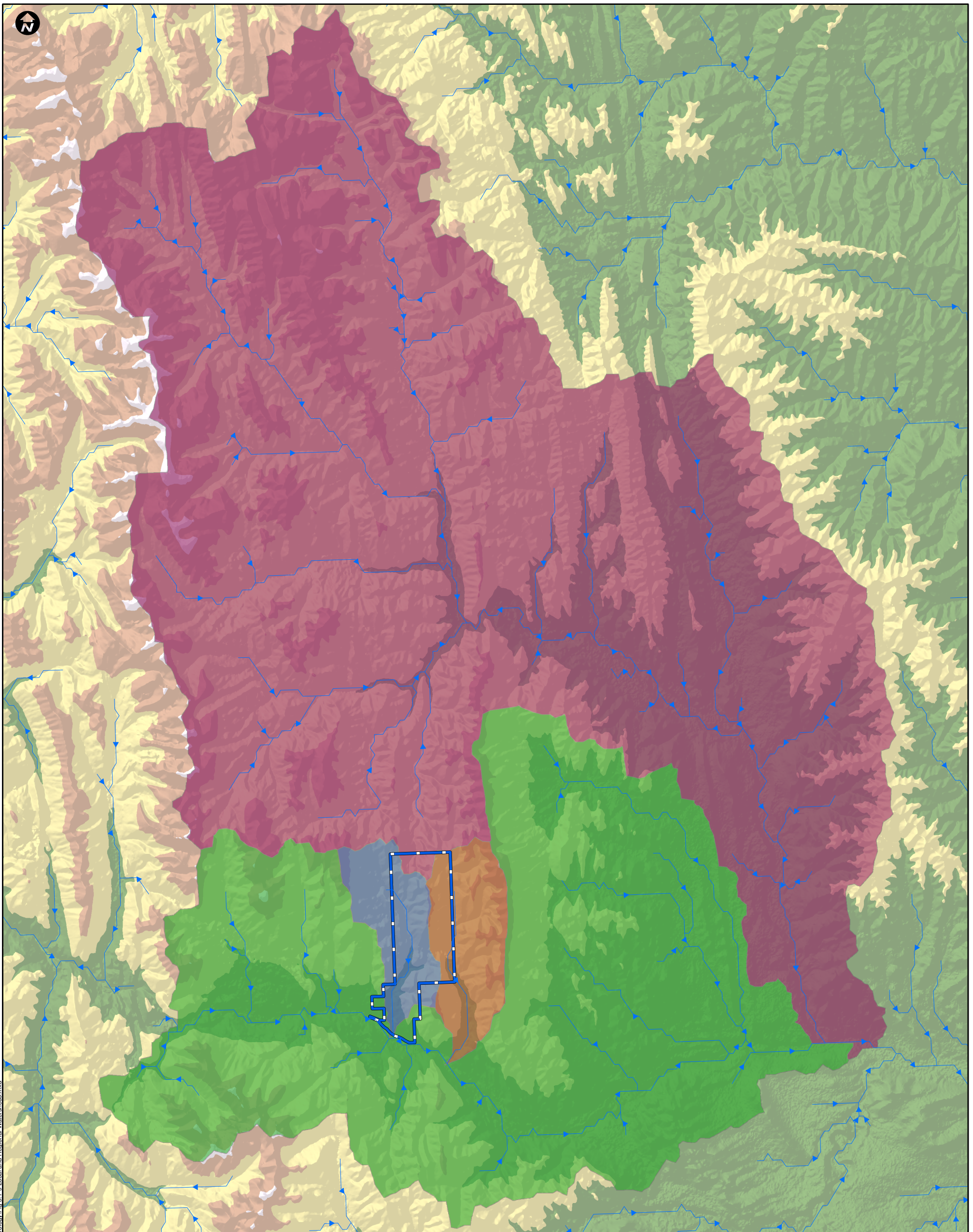
AltaLIS, 2015; Dialectic Research, 2105; MEMS, 2015 NRCAN, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: JDC  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015





**FIGURE**  
**5.1-8**





**LEGEND**

-  Watercourse Flow Direction
-  Mine Permit Boundary

**Watershed**

-  Blairmore Creek
-  Crowsnest River
-  Gold Creek
-  Old Man River

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**LOCAL AND REGIONAL WATERSHEDS**

**NOTES**

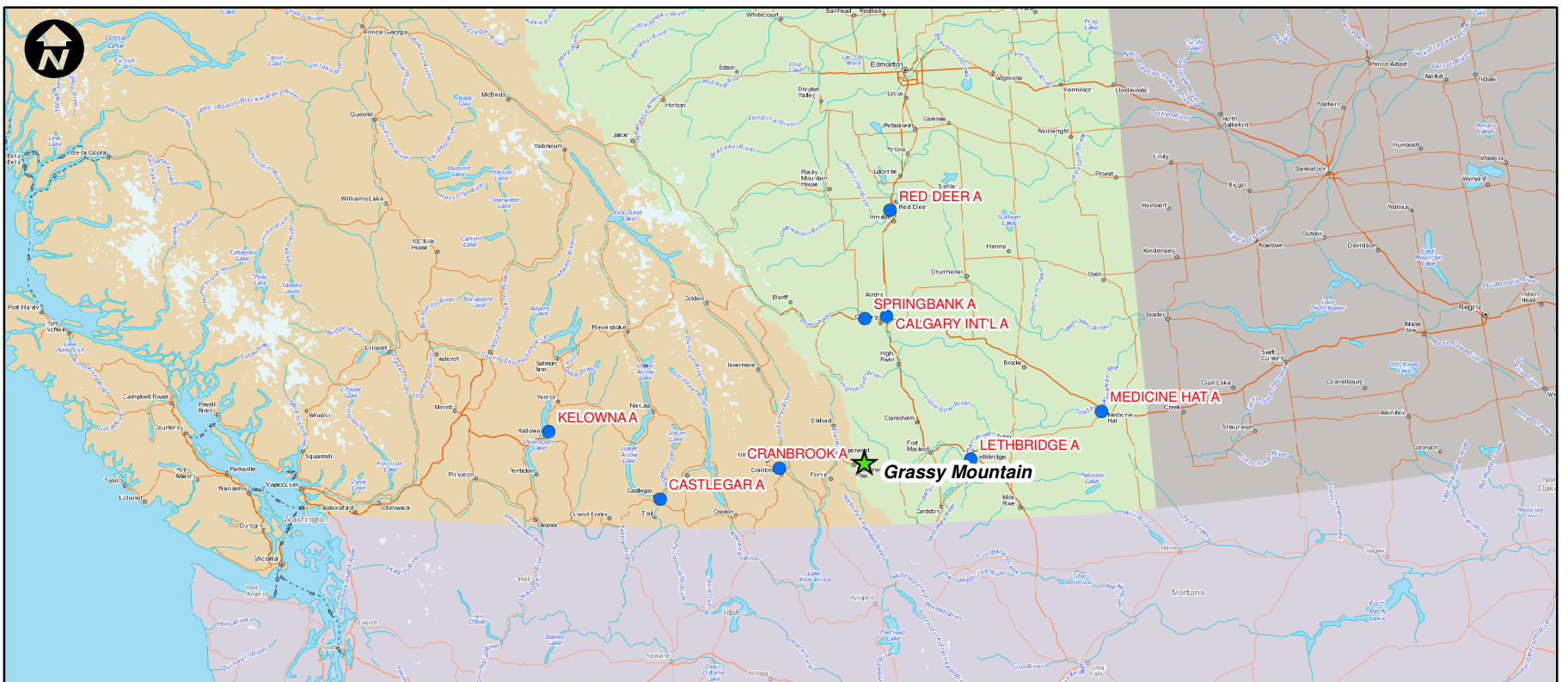
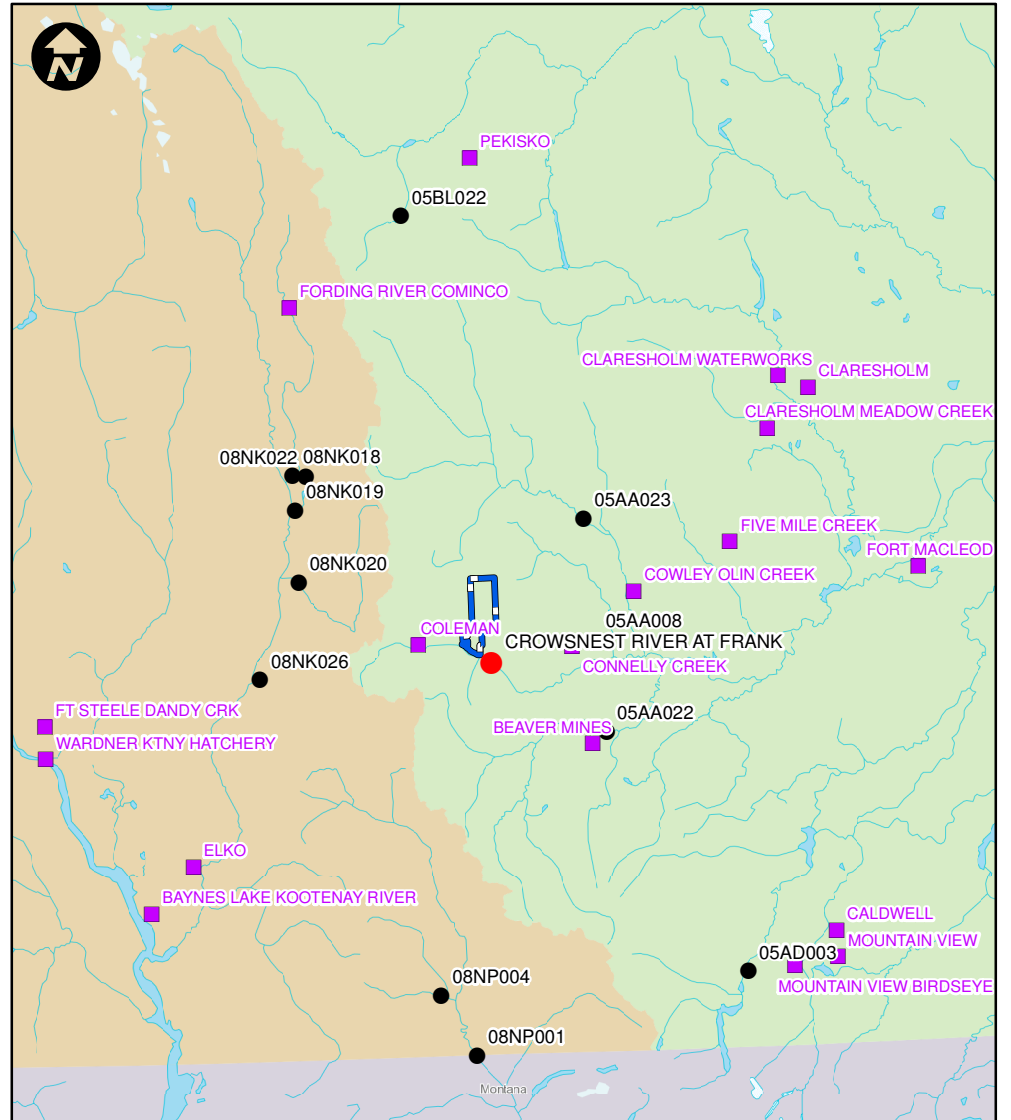
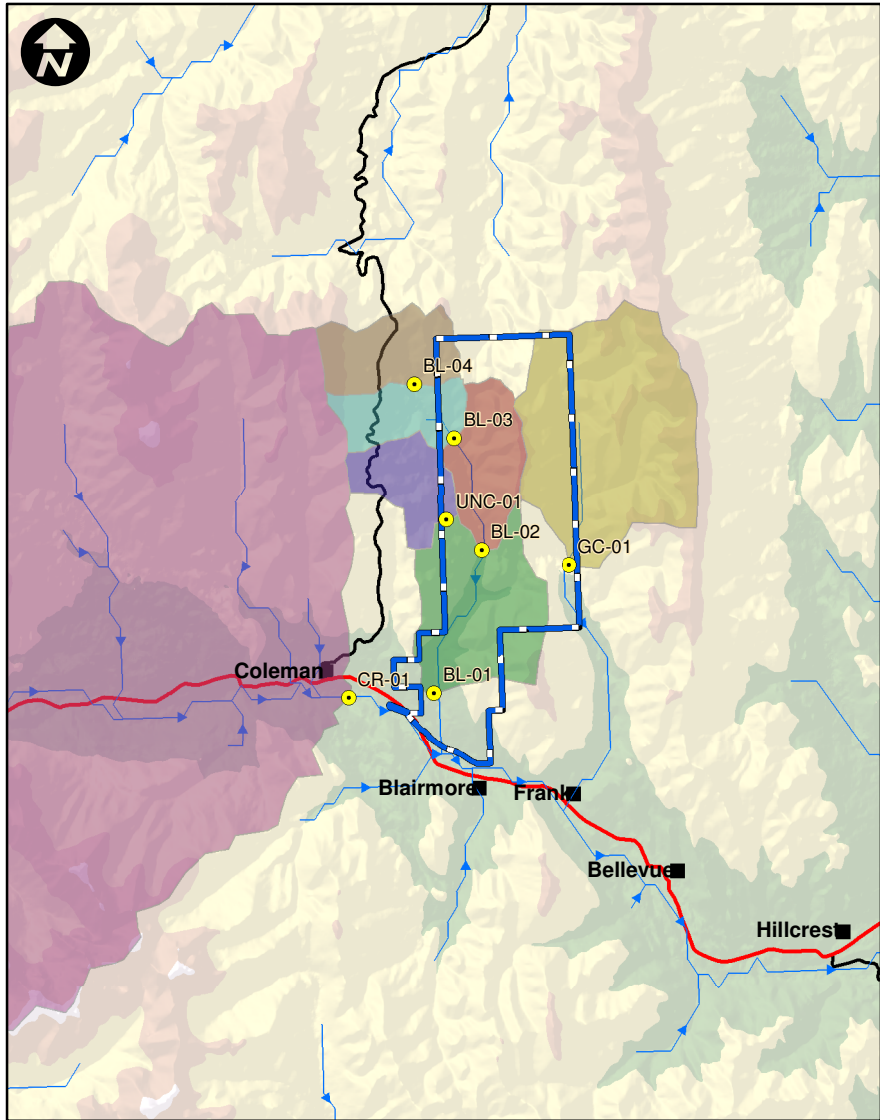
SRK Consulting (Canada) Inc., 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: JDC  
CHECKED BY: MB  
DATE: FEBRUARY 27, 2015

**FIGURE**  
**5.1-9**







**LEGEND**

- (BL-01) Local Hyrometric Station
- Regional Hydrometric Sation
- Crownest River At Frank Hydrometric Sation
- Regional Precipitation Station
- ★ Project Location
- Regional Evaporation Station
- Mine Permit Boundary

**PROJECT**



**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**REGIONAL HYDROLOGY GAUGING STATIONS**

**NOTES**

AltaLIS, 2015; SRK Consulting (Canada) Inc., 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01

DRAWN BY: JDC

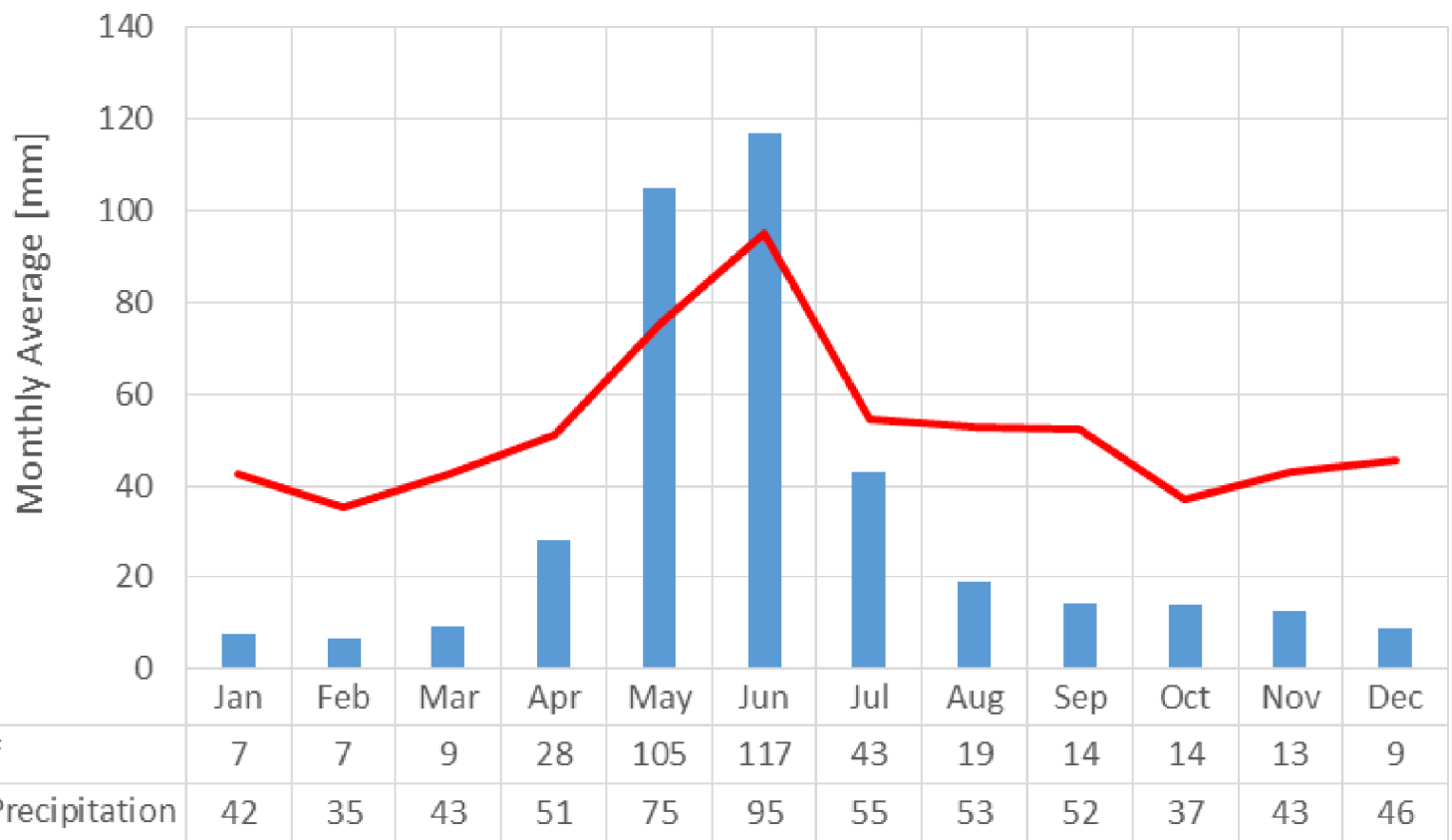
CHECKED BY: MB

DATE: FEBRUARY 26, 2015

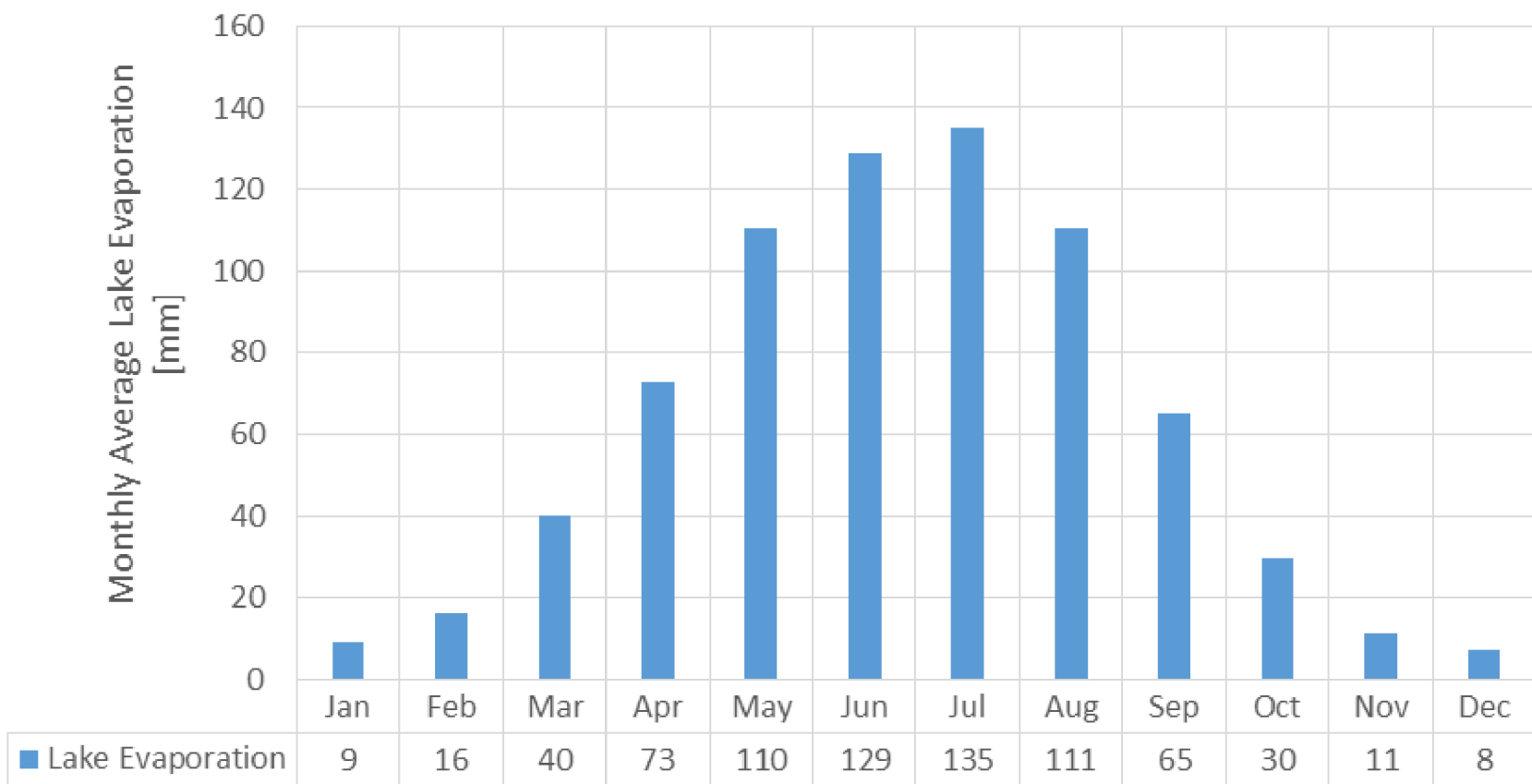
**FIGURE**

**5.1-10**

VARIABLE SCALES





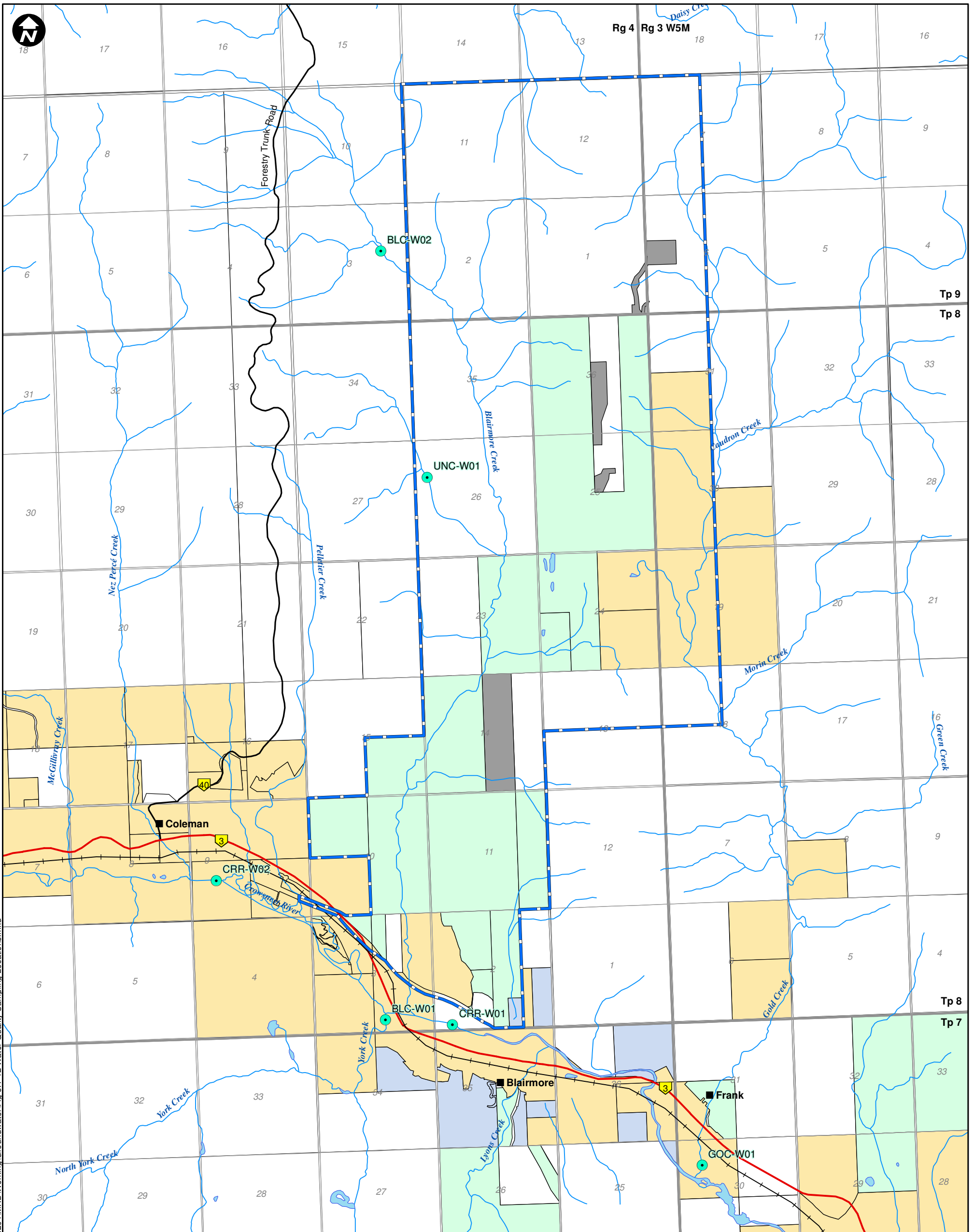
**MONTHLY AVERAGE RUNOFF AND PRECIPITATION AT GRASSY MOUNTAIN**



**MONTHLY AVERAGE LAKE EVAPORATION AT GRASSY MOUNTAIN**

Document Path: K:\Active Projects 2014\AP\_14-00201 to 14-00250\14-00201\MXD\Working\Hydrology\Fig 5.1-11 Hydrologic Regime.mxd

<b>PROJECT</b>  <b>RIVERSDALE</b> RESOURCES		<b>GRASSY MOUNTAIN</b> <b>COAL PROJECT</b>		 <b>MILLENNIUM</b> EMS Solutions Ltd.	
<b>TITLE</b> <b>HYDROLOGICAL REGIME</b>					
<b>NOTES</b> SRK Consulting (Canada) Inc., 2015				PROJECT: 14-00201-01 DRAWN BY: JDC CHECKED BY: MB DATE: FEBRUARY 27, 2015	
NOT TO SCALE				<b>FIGURE</b> <b>5.1-11</b>	



Document Path: K:\Active Projects 2014\AP\_14-00201\14-00201\MXD\Working\Groundwater\Fig 5.1-12 Water Quality Sampling Locations.mxd

**LEGEND**

- Water Quality Sampling Location
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Private (Riversdale)
- Crown (Leased by Riversdale)
- Crown
- Municipal
- Private (Other)

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**WATER QUALITY SAMPLING LOCATIONS**

**NOTES**

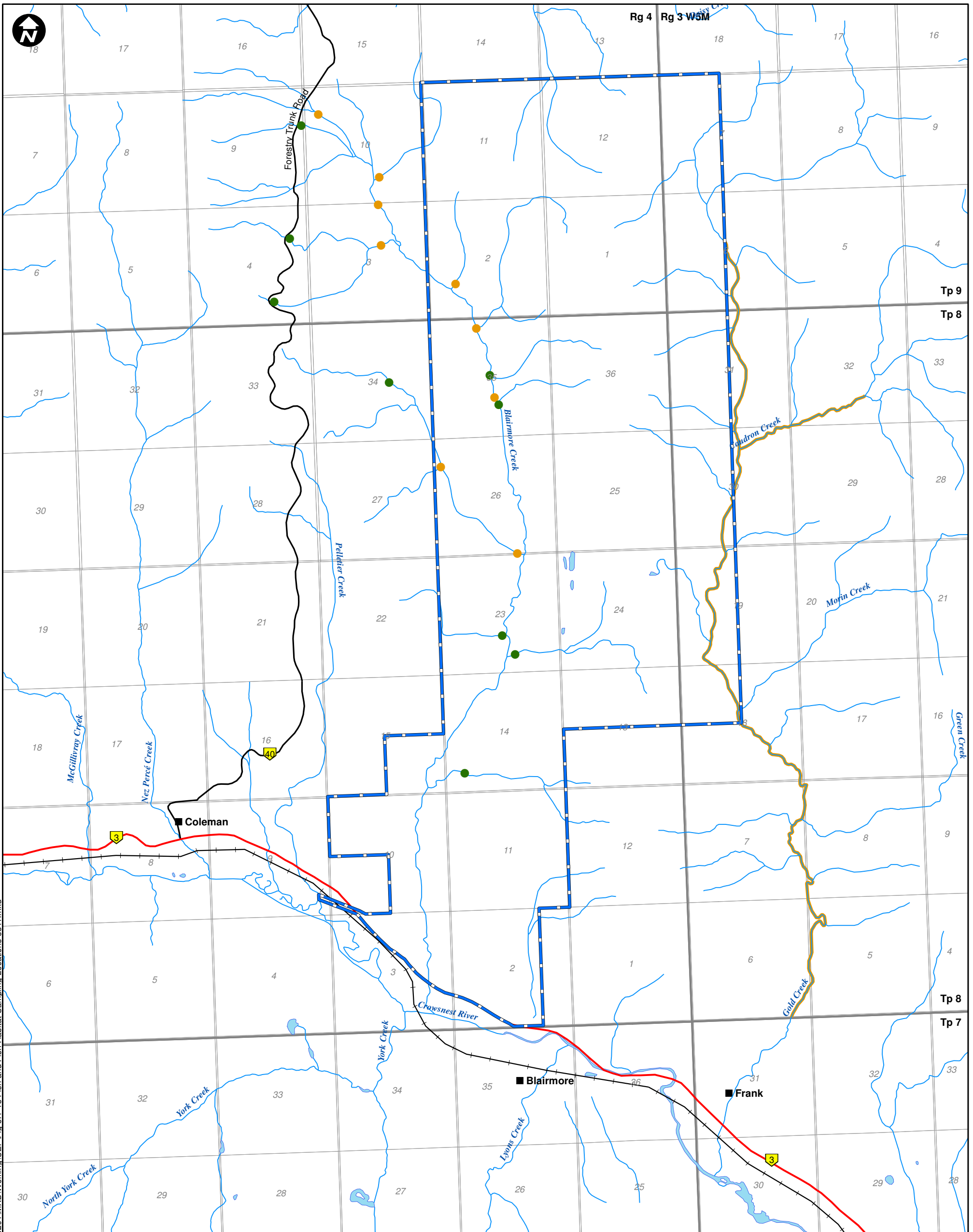
AltaLIS, 2015; NRCAN, 2015; Riversdale, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
DRAWN BY: JDC  
CHECKED BY: MB  
DATE: FEBRUARY 26, 2015



**FIGURE**  
**5.1-12**





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**LEGEND**

- Fish Sample Location
- Fish Habitat Assessment Location
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Identified West Slope Cutthroat Trout
- Mine Permit Boundary

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**FISH & FISH HABITAT SAMPLING LOCATIONS**

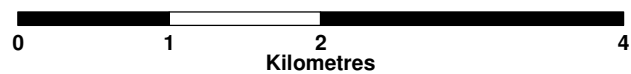
**NOTES**

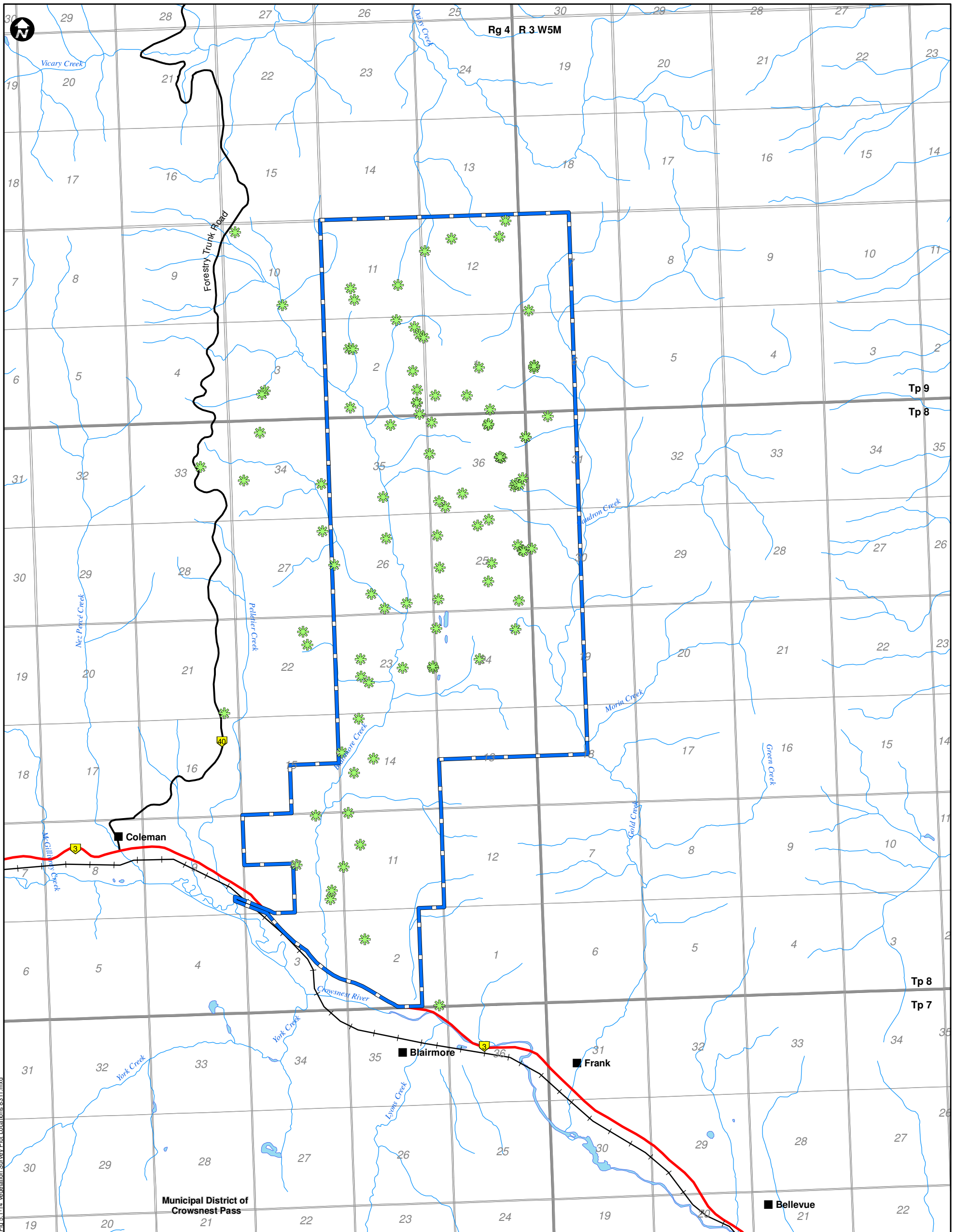
AltaLIS, 2015; MEMS, 2015; NRCAN, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
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DATE: FEBRUARY 26, 2015

**FIGURE**

**5.1-13**





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**LEGEND**

- Vegetation Survey Plot Locations
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**VEGETATION SURVEY PLOT LOCATIONS**

**NOTES**

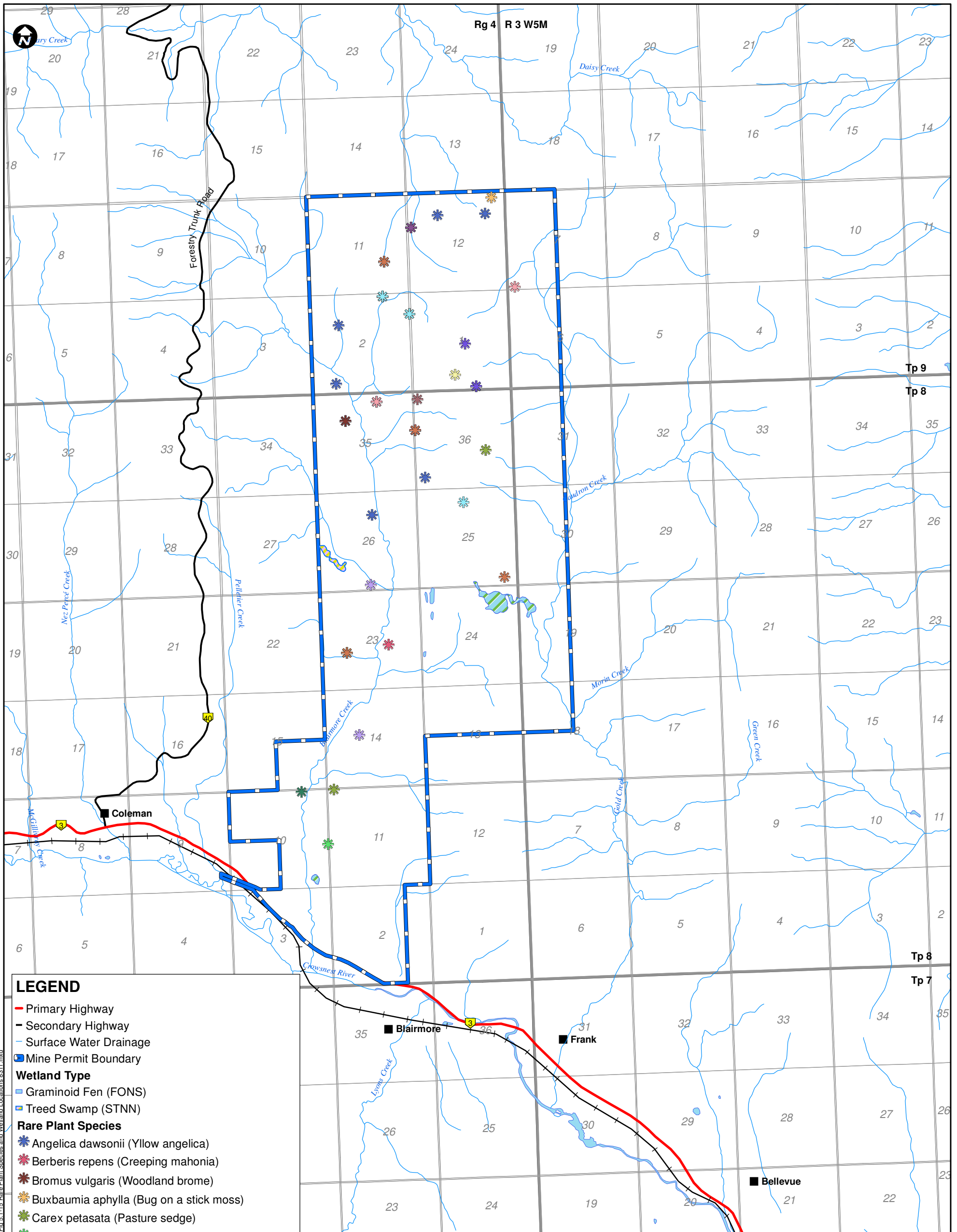
AltaLIS; 2015; GeoBase, 2011; MEMS, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
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DATE: FEBRUARY 27, 2015

**FIGURE**

**5.1-14**





**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary
- Wetland Type**
- Graminoid Fen (FONS)
- Treed Swamp (STNN)
- Rare Plant Species**
- ✱ Angelica dawsonii (Yellow angelica)
- ✱ Berberis repens (Creeping mahonia)
- ✱ Bromus vulgaris (Woodland brome)
- ✱ Buxbaumia aphylla (Bug on a stick moss)
- ✱ Carex petasata (Pasture sedge)
- ✱ Crepis atribarba (Slender hawk's-beard)
- ✱ Dicranella crispa (Curl-leaved fork moss)
- ✱ Dicranum tauricum (Broken-leaf moss)
- ✱ Eriogonum cernuum (Nodding umbrella-plant)
- ✱ Eucephalus engelmannii (Elegant aster)
- ✱ Pellia endiviifolia (Liverwort)
- ✱ Pellia neesiana (Liverwort)
- ✱ Phacelia hastata (Silver-leaved scorpionweed)
- ✱ Piperia unalascensis (Alaska bog orchid)
- ✱ Racomitrium aciculare (Moss)
- ✱ Streptopus roseus (Rose mandarin)
- ✱ Streptopus streptopoides (Twisted-stalk)
- ✱ Tellima grandiflora (Fringe-cups)
- ✱ Vulpicida canadensis (Brown-eyed sunshine lichen)

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**RARE PLANT SPECIES AND WETLAND LOCATIONS**

**NOTES**

AltaLIS; 2015; GeoBase, 2011; MEMS, 2015  
Datum/Projection: UTM NAD 83 Zone 11

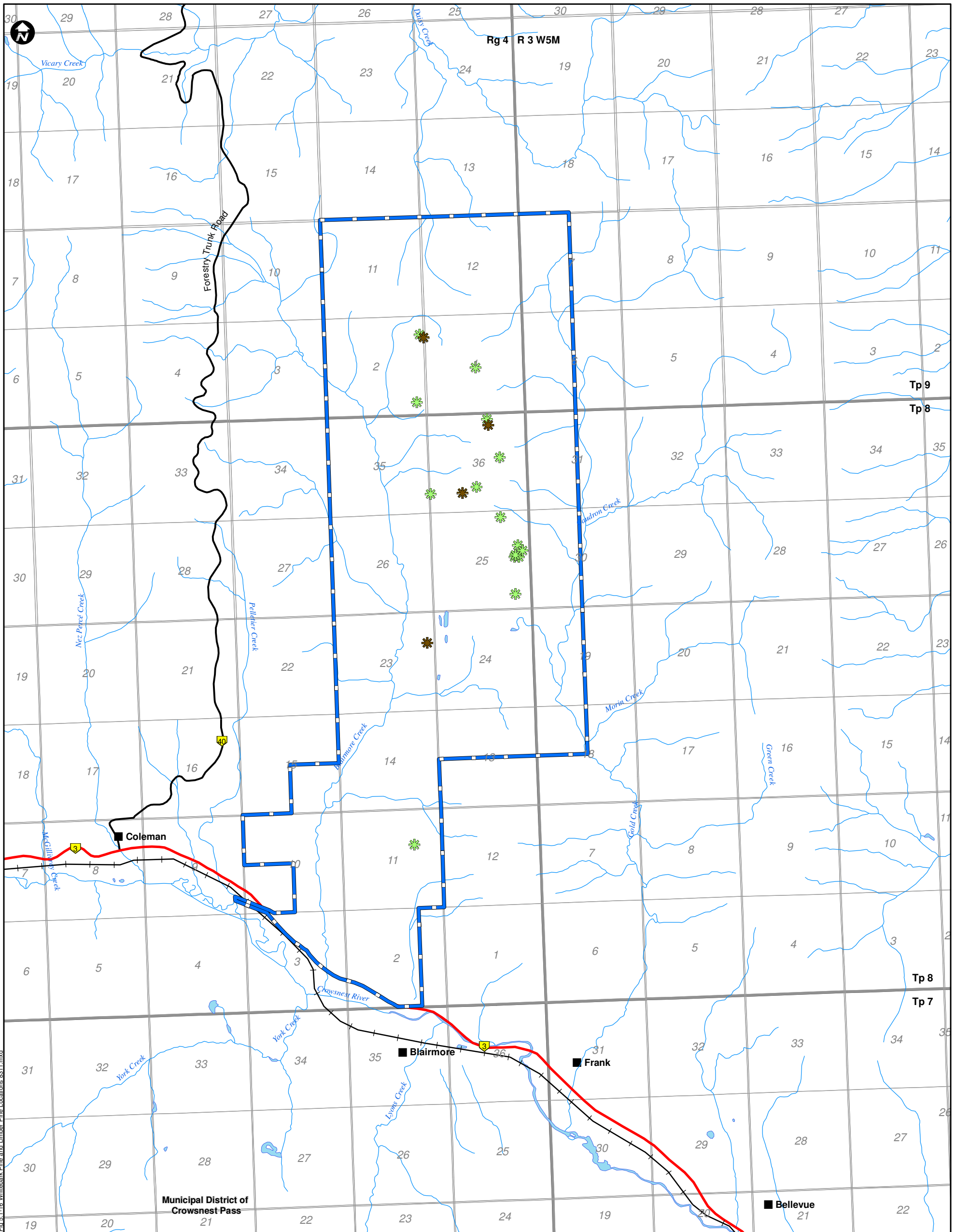
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DATE: FEBRUARY 27, 2015

**FIGURE**

**5.1-15**







**LEGEND**

- Pinus Albicaulis (Limber Pine)
- Pinus Flexilis (Whitebark Pine)
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**WHITEBARK PINE AND LIMBER PINE LOCATIONS**

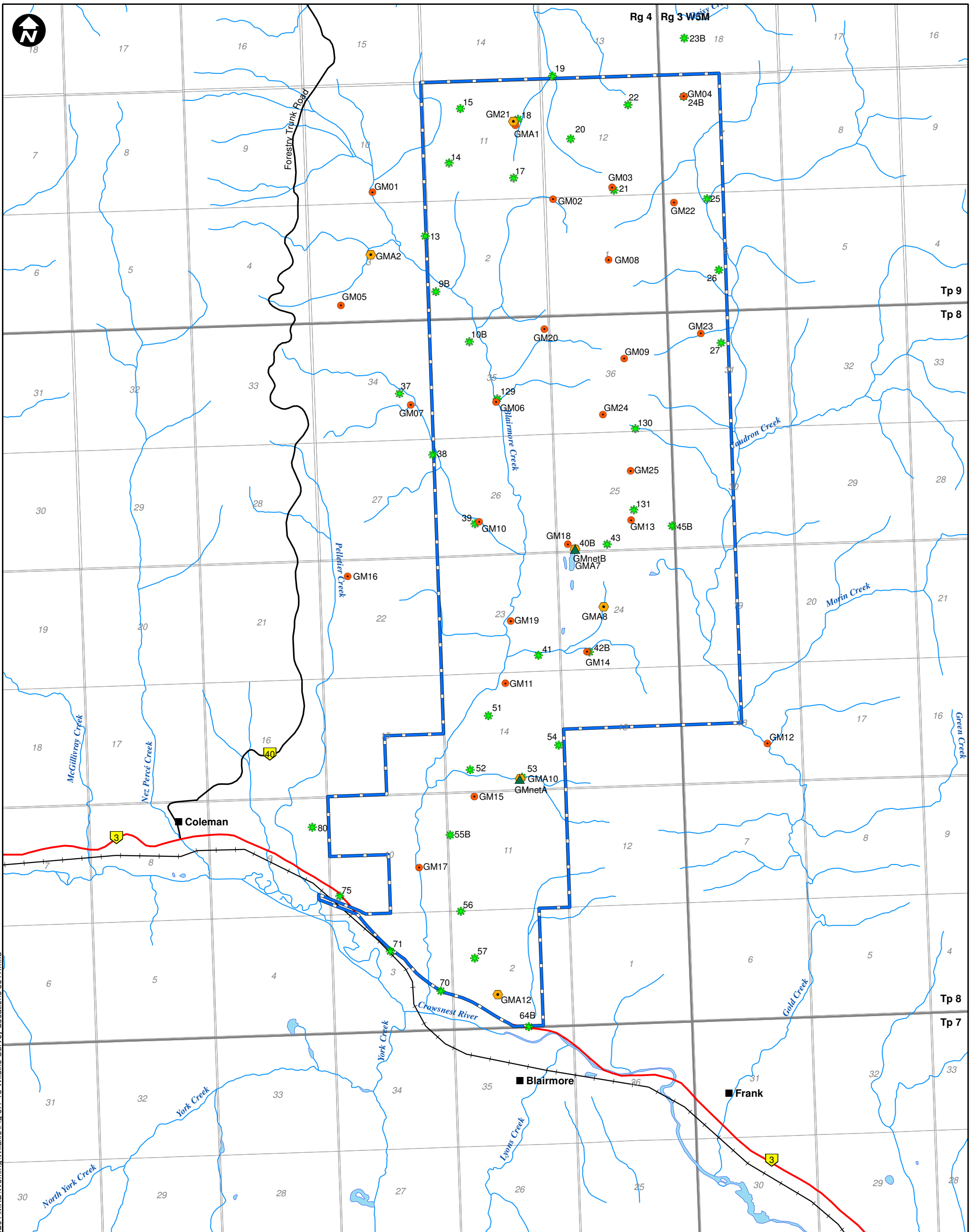
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AltaLIS; 2015; GeoBase, 2011; MEMS, 2015  
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
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**FIGURE  
5.1-16**





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**LEGEND**

- ✱ Amphibian Survey Location
- ▲ Bat Mist-Netting Survey Location
- Bat Acoustic Survey Location
- Wildlife Camera Location
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**WILDLIFE SURVEY LOCATIONS**

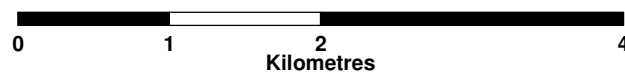
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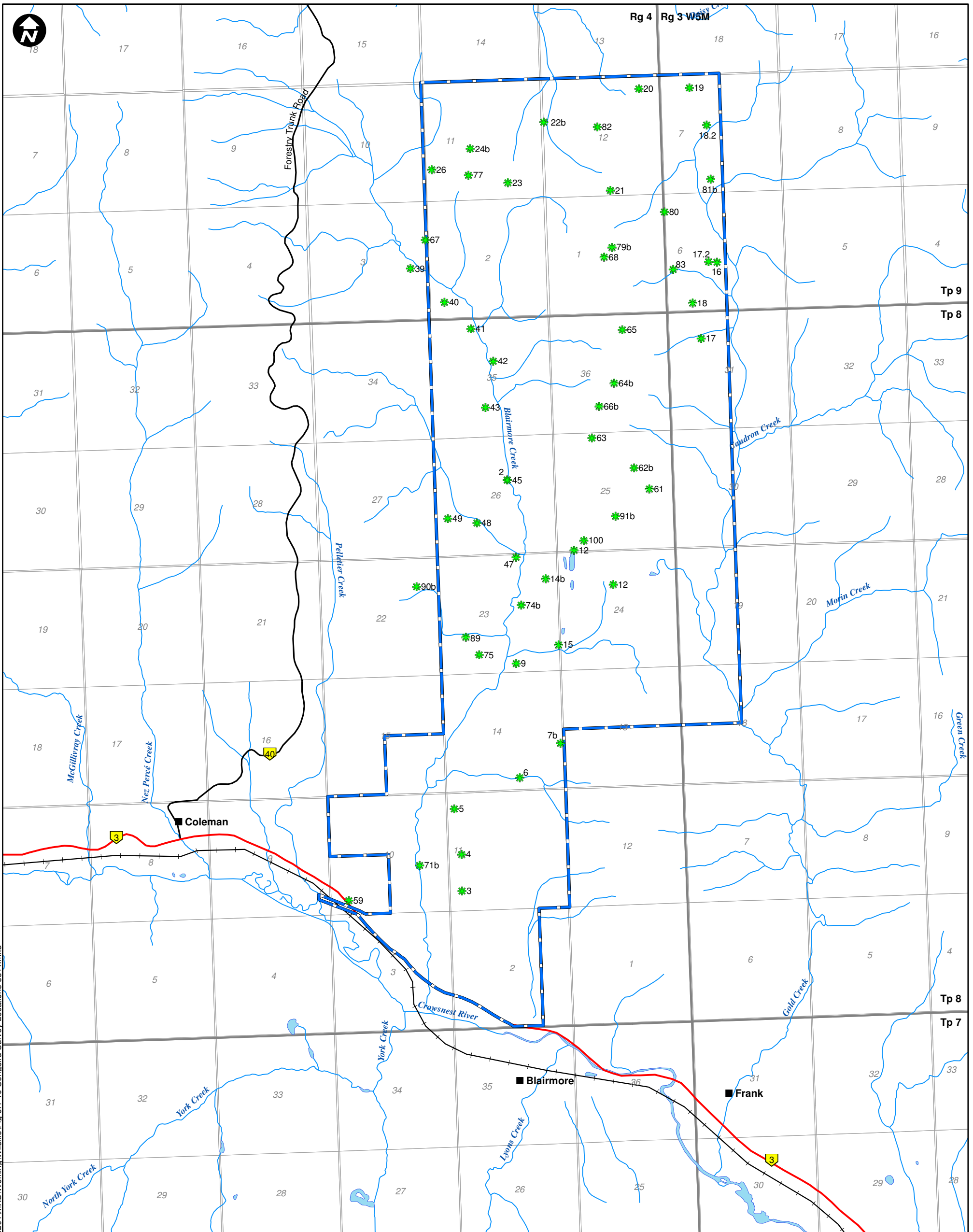
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Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01  
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**FIGURE**

**5.1-18**





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**LEGEND**

- ✱ Songbird Survey Locations
- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**SONGBIRD SURVEY LOCATIONS**

**NOTES**

AltaLIS, 2015; MEMS, 2015; NRCAN, 2015  
Datum/Projection: UTM NAD 83 Zone 11

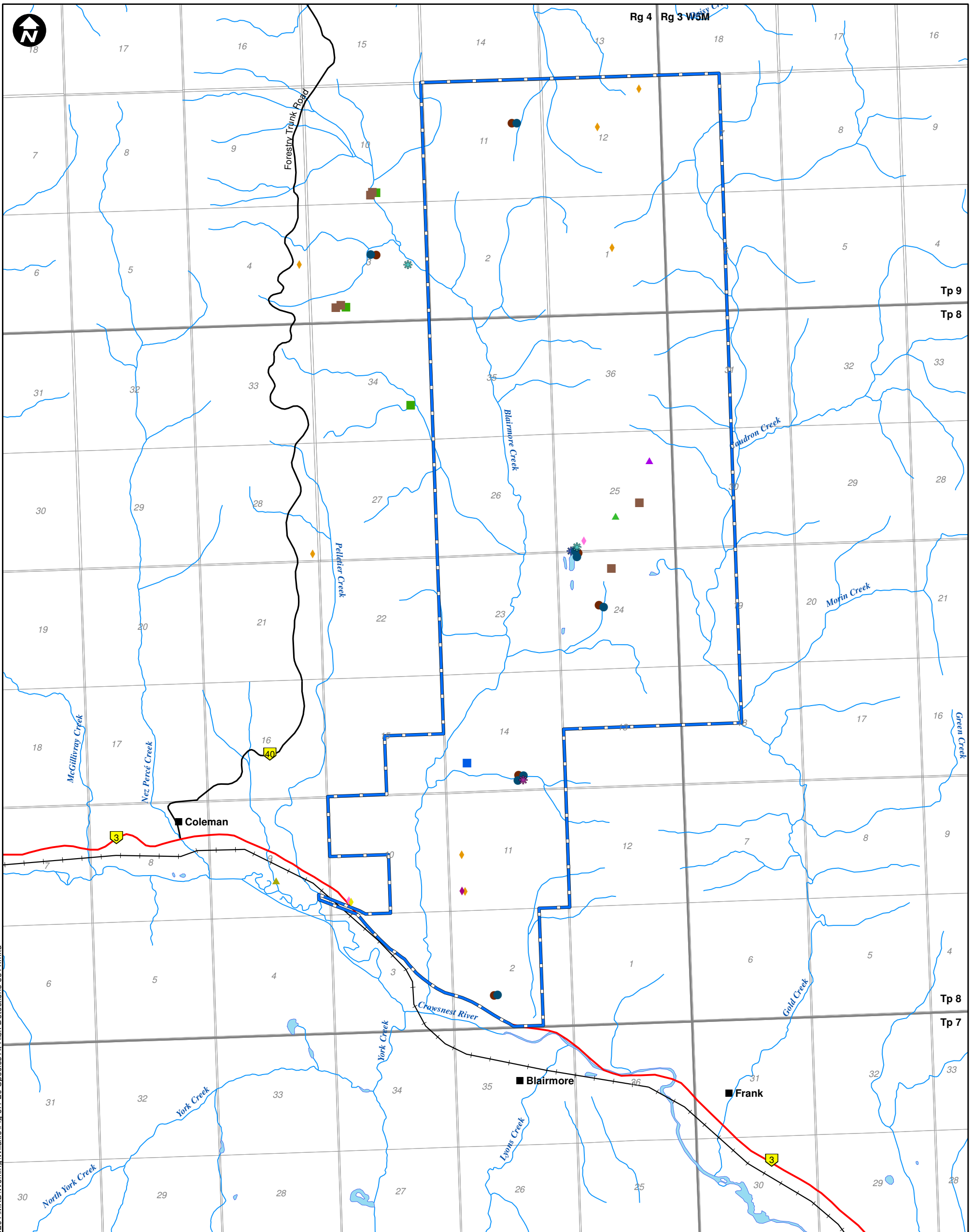
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**FIGURE**

**5.1-19**







Document Path: K:\Active Projects 2014\AP\_14-00201\MXD\Working\Wildlife\Fig 5.1-20 Species At Risk Detections 8311.mxd

**LEGEND**

- Primary Highway
- Secondary Highway
- Surface Water Drainage
- Mine Permit Boundary

**Species At Risk Detections**

- ✱ Ambystoma sp.
- ✱ Columbia Spotted Frog
- ✱ Western Toad
- Bobcat
- Canada Lynx
- Grizzly Bear
- ▲ Bald Eagle
- ▲ Golden Eagle
- ▲ Great Gray Owl
- Hoary Bat
- Little Brown Myotis
- ◆ Common Nighthawk
- ◆ Olive-sided Flycatcher
- ◆ Sora
- ◆ Western Wood Pewee

**PROJECT**



**RIVERSDALE**  
RESOURCES

**GRASSY MOUNTAIN  
COAL PROJECT**



**TITLE**

**SPECIES AT RISK DETECTIONS**

**NOTES**

AltaLIS, 2015; MEMS, 2015; NRCAN, 2015  
Datum/Projection: UTM NAD 83 Zone 11

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**FIGURE**  
**5.1-20**

