



Section D

Environmental Impact Assessment Methodology

Table of Contents

		Page
D	ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY.....	D-1
D.1	INTRODUCTION.....	D-1
D.2	ENVIRONMENTAL IMPACT ASSESSMENT CONSIDERATIONS	D-2
D.2.1	Environmental Impact Assessment Requirements	D-2
D.2.2	Environmental Impact Assessment Definitions.....	D-3
D.2.3	Public Disclosure Document and EIA Terms of Reference	D-3
D.2.4	Scope of Assessment.....	D-4
D.2.5	Steps in the Environmental Impact Assessment Process.....	D-11
D.3	APPLICATION OF THE METHODOLOGY.....	D-19

List of Tables

Table D.2.4-1	Definitions of Spatial and Temporal Boundaries	D-7
Table D.2.4-2	Grassy Mountain Coal Project Inclusion List: Existing, Approved and Planned (Reasonably Foreseeable) Projects using/within the Wildlife Regional Study Area	D-8
Table D.2.5-1	Steps Used to Conduct the Environmental Impact Assessment	D-11
Table D.2.5-2	Evaluation Criteria for Assessing the Environmental Impact.....	D-15

List of Figures

Figure D.2.4-1	Grassy Mountain Coal Project Local Study Areas
Figure D.2.4-2	Grassy Mountain Coal Project Regional Study Areas
Figure D.2.4-3	Existing and Planned Project Associated with the Grassy Mountain Coal Project

D ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

D.1 Introduction

This section provides an outline of the methodology that Benga Mining Limited (Benga) used to carry out the environmental impact assessment (EIA) for the proposed Grassy Mountain Coal Project (the Project). This Application has been integrated in accordance with the Final Terms of Reference (fToR) issued by the Alberta Energy Regulator (AER) and the Environmental Impact Statement Guidelines (EIS Guidelines) issued by the Canadian Environmental Assessment Agency (CEAA) in order to facilitate an efficient review of the Project by regulatory review agencies as well as Aboriginal groups and the public.

The EIA is one part of a process, defined by Beanlands and Duinker (1983) as a "process or set of activities designed to contribute pertinent environmental information to project or program decision-making. In doing so, it attempts to predict or measure the environmental effects of specific human activities or do both, and to investigate and propose means of ameliorating those effects."

There are five steps within the EIA process:

- Step 1: the project and EIA screening phase (*i.e.*, does the project meet EIA thresholds?);
- Step 2: the scoping phase (*i.e.*, preparation and finalization of the Terms of Reference – in general defining what environmental and social features will be evaluated, the spatial and temporal scale of evaluation, how features will be evaluated and who will be involved);
- Step 3: the environmental baseline study phase;
- Step 4: the interpretive, predictive, mitigative and evaluative phase (*i.e.*, the preparation and review of an environmental assessment report); and
- Step 5: the post-construction assessment phase (*i.e.*, monitoring and/or follow-up, and compliance).

This report forms the latter stages of the fourth step of the EIA process: government and public review of the Project EIA. Baseline environmental studies, as well as Benga's interpretation, prediction and evaluation of environmental and social impacts of the Project, have been completed. Should the Project be approved, monitoring and/or follow-up during construction and operations will constitute the fifth and final step of the EIA process.

The EIA methodology used for the Project has been adopted from several sources [*e.g.*, Canadian Environmental Assessment Agency (2015), Government of Alberta (2013); Morris and Therivel (2009); Noble (2006); Hanna (2005); Alberta Environment, Energy Resources Conservation Board, and

Natural Resources Conservation Board (2000); Barnes *et al.* (1994); Beanlands and Duinker (1983); FEARO (1990); FEARO (1994); Hegmann *et al.* (1995); Hegmann *et al.* (1999); Roots (1994)] and has been used in the environmental evaluation of many resource and industrial projects (Coalspur 2012, CVRI 2012 and VCI 2012). In addition, consultation with applicable government and regulatory agencies, Aboriginal groups and the public was carried to ensure environmental concerns associated with the Project were identified and appropriate mitigation strategies developed. The methodology is practical, technically sound, familiar to Alberta and Federal Government Review Agencies and has received acceptance by the Federal Court of Canada. The EIA carried out under this methodology will allow decision-makers to make judgment as to whether the Project is acceptable, should be approved and is in the public interest.

D.2 Environmental Impact Assessment Considerations

D.2.1 Environmental Impact Assessment Requirements

The following Project application has been prepared to address environmental assessment requirements under applicable Provincial and Federal legislation.

Provincial Legislation

Provincial regulatory requirements are outlined in Sections 39 through 59 of the Alberta *Environmental Protection and Enhancement Act* (EPEA). Benga was advised by the AER that the Project is a mandatory activity pursuant to Schedule 1(j) of the *Environmental Assessment (Mandatory and Exempted Activities) Regulation*. In accordance with Section 44(1) of the EPEA, Benga was instructed to prepare and submit an EIA report for the Project pursuant to the provisions of Part 2, Division 1 of the *Act*.

Federal Legislation

The Project is considered a designated project under the *Regulations Designating Physical Activities* (SOR/2012-147). The Canadian Environmental Assessment Agency (the CEA Agency) determined that a federal environmental assessment (EA) is required for the Grassy Mountain Coal Project pursuant to the *Canadian Environmental Assessment Act, 2012* (S.C. 2012, c. 19, s. 52). Federal EA requirements are noted in Sections 5(1), 5(2) and 19(1) of the *Canadian Environmental Assessment Act, 2012* (S.C. 2012, c. 19, s. 52) and the guidelines for the preparation of an environmental impact statement for the Grassy Mountain Coal Project (CEA Agency, 2015).

CEA Agency (Canadian Environmental Assessment Agency). 2015. Guidelines for the Preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012. Grassy Mountain Coal Project. Issued July 6, 2015.

D.2.2 Environmental Impact Assessment Definitions

As outlined by Beanlands and Duinker (1983), without a clear definition of terms used in an EIA document, the report can become subject to a wide range of interpretation by reviewers. To avoid any confusion in interpreting the information presented in this application by government and public reviewers, a glossary of terms and abbreviations used in this report are provided in [Appendix 4 of the Application](#).

D.2.3 Public Disclosure Document and EIA Terms of Reference

D.2.3.1 Provincial

In November 2014, Benga prepared a Public Disclosure Document (PDD) and proposed Terms of Reference (pToR) for the Project. These documents marked the first step in the regulatory process. The PDD provided regulators, stakeholders and the public with information about the Project as well as anticipated Project development timelines. The pToR identified information required by the AER to be considered and addressed in the preparation and submission of a Project EIA report.

The PDD and pToR for the Project were prepared with notice of their availability being publicly advertised in the Calgary Herald, Crowsnest Pass Herald, Edmonton Journal, Lethbridge Herald, Pincher Creek Echo and the Alberta Sweetgrass in December 2014. Responses to the advertisement were requested by January 23, 2015. Open House meeting to encourage public review and comment on the proposed EIA ToR were also held.

Following the public comment period, and with input from applicable Federal government agencies, final ToR for the EIA were formally issued by the AER, pursuant to Section 48(3) of EPEA, on March 16, 2015. In accordance with Section 49(n) of EPEA, a copy of the final ToR is provided in [Appendix 1 of the Application](#), in the form of a concordance table, showing where each item is addressed in the Application.

D.2.3.2 Federal

In March 2015, Riversdale Resources submitted a Project Description to the CEAA as the Project is considered a designated Project in accordance with the *Regulations Designating Physical Activities* (SOR/2012-147). This document marked the first step in the Federal regulatory process.

The CEAA conducted a 45 day review of the Project Description, which included a 20-day public comment period, to determine whether an environmental assessment of the project is required. Written comments from the public were to be provided by April 20, 2015. Following the public comment period, and with input from applicable Federal government agencies, the CEAA decided

that a federal environmental assessment was required for the Grassy Mountain Coal Project pursuant to the *Canadian Environmental Assessment Act, 2012*.

On May 14, 2015, the CEAA formally commenced the environmental assessment process and issued draft environmental impact statement guidelines for the Project. These draft guidelines were made available for public comment. Written comments from the public were due June 13, 2015. Following the public comment period the environmental impact statement guidelines were finalized (CEAA 2015). The environmental impact statement guidelines provide the nature, scope, and extent of the environmental assessment information to be provided by Benga for the Project. A copy of the environmental impact statement guidelines is provided in [Appendix 2 of the Application](#), in the form of a concordance table, showing where each item is addressed in the Application.

D.2.4 Scope of Assessment

D.2.4.1 Scope of the Project

The scope of the Project for the EIA includes all phases (construction, operation, decommissioning and reclamation) of the coal mine, coal processing plant and associated facilities and infrastructure required to carry out these activities. Specifically, the scope of the Project includes:

- construction of predevelopment activities (*i.e.*, timber clearing, soil salvage, site drainage and blasting);
- construction, operation and reclamation of mine pit and dump areas;
- construction, operation and reclamation of coal handling and preparation plant facility (CHPP) including all coal cleaning waste disposal areas;
- construction, operation and reclamation of mine access road, coal conveyor, loadout and associated infrastructure areas; and
- construction, operation and reclamation of water management facilities that include domestic sewage treatment, dewatering wells, settling ponds, ditches and mined out areas.

A proposed golf course development area and helipad relocation have been identified by the Agency as “incidental physical activities” associated with the development of the mine. These areas are included as part of the Project assessment.

A full description of the scope of the Project is included in [Sections A \(Introduction\)](#) and [C \(Project Description\)](#) of the Application.

D.2.4.2 Valued Components

In the Alberta EPEA, environmental effects must include an evaluation of the environmental, social, economic and cultural consequences of a project. Positive and negative impacts are to be assessed with an indication of plans the proponent will implement to manage negative impacts.

In the *CEA Act, 2012*, an environmental effect refers to any change that a project may cause in the environment. This includes the effect of any such change on health and socio-economic conditions, physical and cultural heritage, current use of lands and resources for traditional purposes by Aboriginal persons, or on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. In contrast to the EPEA, only negative effects are analysed as per the *CEA Act, 2012*.

The Project EIA has addressed potential effects by identifying Valued Components (VCs). VCs are those environmental attributes associated with Project development, which have been identified to be of concern either by directly-affected stakeholders, government agencies or the professional community. They can be referred to as key indicators or parameters in the ToR. VCs consider both biophysical (*i.e.*, ecosystem) and socio-economic attributes because of the broad-based definition of environmental effect, as outlined in federal and provincial legislation.

For each VC, measurable parameters were selected, where possible and appropriate, to facilitate quantitative or qualitative measurement of potential Project effects and cumulative effects. Measurable parameters provide a means to determine the level or amount of change in a VC. For example, a measure of total suspended solids might be chosen as the measurable parameter for sedimentation effects in watercourses and on fish habitat and condition. Each environmental discipline was responsible for identifying and defining measurable parameters for their respective VCs. The degree of change in these measurable parameters was used to help characterize Project-specific and cumulative effects and evaluate potential residual effects. Thresholds or standards were identified, where possible and appropriate, for each measurable parameter.

A list of the VCs identified for the Project and the rationale for their selection is presented in [Section E](#) (Environmental Impact Assessment) and the respective Consultant Reports in the Application.

D.2.4.3 Assessment Boundaries

Section 2.1 of Alberta Environment and Parks' *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (Government of Alberta 2013) provides guidance for establishing Local and Regional Study Areas for an EIA report. Although the guidance on spatial boundaries is prescriptive, the guidance for temporal boundaries is not. Scientific rationale for the selection of spatial and temporal scales is provided.

The establishment of assessment boundaries for each discipline studied represented a compromise involving limitations such as economic realities and the temporal and spatial scales over which natural systems operate. Beanlands and Duinker (1983) recognize five types of boundaries that should be considered in an EIA. These five types of boundaries have been assessed for the Project and are presented below.

- **Project Boundaries:** These boundaries are defined as the temporal and spatial limitations imposed by the Project's activities. For the Project, spatial limitations are confined to activities associated with development of the coal mine, coal processing plant, access road, conveyor and related infrastructure. The Project Footprint includes all lands subject to direct disturbance from the Project and associated infrastructure.
- **Temporal Boundaries:** These boundaries have been defined as lasting approximately 24 years, concomitant with the life of the Project. Segments of the temporal boundaries include the duration of the construction, operation and abandonment phases of the Project.
- **Administrative Boundaries:** These boundaries have time and space limitations imposed because of administrative or economic reasons. Spatially, the Project Footprint lies entirely within the Province of Alberta, but the resources affected by the Project are subject to the jurisdictions of the Municipal, Provincial and Federal Governments.
- **Ecological/Socio-economic Boundaries:** As identified by Beanlands and Duinker (1983), these boundaries are the most difficult boundaries to define for the EIA. This is due to the fact that there are both temporal and spatial limitations over which biological, social and economic systems function. Limitations will vary widely among species depending upon factors such as transport mechanisms, population cycles and recovery rates to pre-impact site conditions. For the Project, the Ecological/Socio-economic boundaries varied considerably both spatially and temporally. Temporal and spatial variability were dependent upon the particular discipline being studied.
- **Technical Boundaries:** The technical boundary identified for the Project is the temporal and spatial limitation imposed to evaluate or measure change. For example where temporal and spatial limitations precluded the collection of quantitative information, impact predictions were assessed on the basis of evaluations of professional judgment.

Based on the aforementioned criteria, [Table D.2.4-1](#) was prepared to assist in establishing the spatial and temporal dimensions for the study areas for each disciplines studied during the EIA.

Spatial Boundaries	Temporal Boundaries
INTERNATIONAL: Impact could extend to international level	YEAR ROUND: Significant throughout the year
NATIONAL: Impact could extend to national level	SEASONAL: Significant on a seasonal basis, depending on nature of VEC
PROVINCIAL: Impact could extend to Provincial level	OCCASIONAL: Significance is intermittent
REGIONAL: Impact could extend to the region surrounding the proposed Project	CYCLICAL: Importance varies with cyclical changes over time
LOCAL: Impact limited to the local area in close proximity to the proposed Project	PERIODIC: Importance limited by period of Project development

(adapted from Barnes *et al.* 1994)

The Local Study Area (LSA) is established based on the zone of the Project influence, beyond which the potential environmental, cultural and socio-economic effects of the Project are expected to be non-detectable. The Regional Study Area (RSA) is established based on the extent to which it would be expected that the interaction of residual effects of the Project with the residual effects of other projects would be detectable. It is also the area in which socio-economic effects are expected to be detectable. VC-specific boundaries are established for both the LSA, for Project-specific effects, and the RSA, for cumulative effects. Effects on those VCs that have impacts more directly tied to the footprint of the Project are also assessed at the spatial scale of the Project footprint.

The spatial boundaries of each of the disciplines are shown in [Figure D.2.4-1](#) (LSA) and [Figure D.2.4-2](#) (RSA). The temporal boundaries range from the life of the Project (24 years) to Project Closure (up to 41 years following Project initiation). The discipline specific LSA and RSA spatial and temporal scales for each of the disciplines studied are discussed in more detail in each section of [Section E](#) and in the respective Consultant Report (within the Study Area subsection).

D.2.4.4 Assessment Cases

The Project EIA considers the following assessment scenarios, as per the ToR and the Guideline for Preparing EIA reports (Government of Alberta 2013):

1. **Baseline Case**, which includes existing environmental conditions, existing projects and “approved” activities;
2. **Application Case**, which includes the Baseline Case plus the Project; and

3. **Planned Development Case (Cumulative Effects)**, which includes the “Application Case” combined with past studies, existing and anticipated future environmental conditions, existing projects or activities, plus other “planned” projects or activities.

For the purposes of defining assessment scenarios, “approved” means approved by any federal, provincial or municipal regulatory authority, and “planned” means any project or activity that has been publicly disclosed prior to the issuance of the Project’s ToR or up to six months prior to the submission of the Project Application and the EIA report, whichever is most recent.

Existing, approved and planned projects and activities in the region (known or reported as of February 1, 2016) that were considered in the assessment are listed in [Table D.2.4-2](#) and are shown on [Figure D.2.4-3](#). Local and Regional Study Areas vary in size for each of the VCs, as discussed in [Section D.2.4-3](#). The project list provided in [Table D.2.4-2](#) was generated to capture all projects found within the largest RSA (*i.e.*, wildlife grizzly bear RSA). As can be seen on [Figure D.2.4-3](#), not all Projects are contained within the study areas of each of the respective disciplines.

Table D.2.4-2 Grassy Mountain Coal Project Inclusion List: Existing, Approved and Planned (Reasonably Foreseeable) Projects using/within the Wildlife Regional Study Area				
Company	Project	Existing & Approved Activity (Baseline Case)	Project (Application Case)	Planned Projects (CEA Case)
Mining Operations				
Benga Mining Limited	Grassy Mountain Coal Project		<input checked="" type="checkbox"/>	
Various	Historic Mining Development ~1890 to 1990	<input checked="" type="checkbox"/>		
Teck Coal Limited	Coal Mountain Operations	<input checked="" type="checkbox"/>		
	Elkview Operations	<input checked="" type="checkbox"/>		
	Elkview Baldy Ridge Extension			<input checked="" type="checkbox"/>
	Michel Creek Coking Coal Project			<input checked="" type="checkbox"/>

Table D.2.4-2 Grassy Mountain Coal Project Inclusion List: Existing, Approved and Planned (Reasonably Foreseeable) Projects using/within the Wildlife Regional Study Area

Company	Project	Existing & Approved Activity (Baseline Case)	Project (Application Case)	Planned Projects (CEA Case)
Timber Operations				
Crown	Operations to end of 2015	<input checked="" type="checkbox"/>		
	Operations to 2025			<input checked="" type="checkbox"/>
	Operations to 2030			<input checked="" type="checkbox"/>
	Operations to 2041 - predicted			<input checked="" type="checkbox"/>
	Operations to 2056 - predicted			<input checked="" type="checkbox"/>
Oil and Gas Operations				
Devon Canada Corporation	Multiwell Gas Battery 02-19-011-03 W5M	<input checked="" type="checkbox"/>		
	Compressor Station 04-13-009-04 W5M	<input checked="" type="checkbox"/>		
Harvest Operations Corp.	Burmis Gas Test Battery 12-19-007-02 W5M	<input checked="" type="checkbox"/>		
HOC Energy Corp.	Single Well Gas Battery 10-07-006-02 W5M	<input checked="" type="checkbox"/>		
Legacy Oil & Gas Inc.	Gas Single-Well Battery 13-35-007-03 W5M	<input checked="" type="checkbox"/>		
Nova Gas Transmission Ltd.	Interconnect 01-15-008-05 W5M	<input checked="" type="checkbox"/>		
	Interconnect 09-11-008-05 W5M	<input checked="" type="checkbox"/>		
Shell Canada Limited	Single Well Gas Battery 10-01-006-03 W5M	<input checked="" type="checkbox"/>		
	Compressor Station 06-12-006-03 W5M	<input checked="" type="checkbox"/>		

Table D.2.4-2 Grassy Mountain Coal Project Inclusion List: Existing, Approved and Planned (Reasonably Foreseeable) Projects using/within the Wildlife Regional Study Area

Company	Project	Existing & Approved Activity (Baseline Case)	Project (Application Case)	Planned Projects (CEA Case)
	Multiwell Gas Battery 02-20-006-03 W5M	☑		
	Gas Gathering System 16-07-007-02 W5M	☑		
Misc.	Wellsites	☑		
	Access Roads	☑		
	Pipelines	☑		
Rural Development				
MD of Crowsnest Pass	Community of Coleman	☑		
	Community of Blairmore	☑		
	Community of Frank	☑		
	Community of Bellevue	☑		
	Community of Hillcrest	☑		
	Roadways, Utility Corridors & Services	☑		
MD of Ranchlands	Roadways, Utility Corridors & Services	☑		
	Community of Maycroft	☑		
MD of Pincher Creek	Community of Burmis	☑		
	Community of Lundbreck	☑		
	Community of Cowley	☑		
	Community of Beaver Mines	☑		
	Roadways, Utility Corridors & Services	☑		
Alberta Transportation	Roadways and Transportation Corridors	☑		

Table D.2.4-2 Grassy Mountain Coal Project Inclusion List: Existing, Approved and Planned (Reasonably Foreseeable) Projects using/within the Wildlife Regional Study Area

Company	Project	Existing & Approved Activity (Baseline Case)	Project (Application Case)	Planned Projects (CEA Case)
	Highway 3 Re-Alignment			☑
CP Rail	Rail Lines	☑		
ATCO	Castle Rock Ridge to Chapel Rock Transmission Project			☑
Various	Recreation and Tourism Facilities	☑		

D.2.4.5 Cumulative Effects

The requirement to assess cumulative effects is legislated under both EPEA [Section 49(d)] and the *CEA Act, 2012* [Section 19(1)(a)]. Benga identified potential cumulative effects resulting from the Project when combined with those of other existing, approved and planned projects in the region. As outlined in [Section D.2.4.3](#), the cumulative environmental effects assessment boundaries vary for each discipline. Existing, approved and planned projects in the region considered in the wildlife (grizzly bear) cumulative effects assessment are listed in [Table D.2.4-2](#).

D.2.5 Steps in the Environmental Impact Assessment Process

The steps used to conduct the EIA for the Project are shown in [Table D.2.5-1](#) and described in this Section.

Table D.2.5-1 Steps Used to Conduct the Environmental Impact Assessment

Step	Task
1. Scoping	Identify local and regional issues of concern
	Select local and regional VCs
	Identify spatial and temporal boundaries for each resource discipline to encompass the respective VCs
	Identify potential impacts (project and cumulative) due to actions and possible effects

Table D.2.5-1 Steps Used to Conduct the Environmental Impact Assessment	
Step	Task
2. Analysis of Effects and Identification of Mitigation	Complete the collection of local and regional baseline data
	Assess effects of proposed project action and other cumulative actions on selected VCs
	Recommend mitigation measures
3. Impact Rating	Characterize residual effects
	Compare results against defined thresholds, such as standards, guidelines, land use objectives and trends, or other defined thresholds
	Determine impact rating of project and cumulative effects on selected VCs
4. Follow-up	Recommend monitoring and effect management. Review of regulatory regime changes.

D.2.5.1 Scoping

The purpose of the scoping exercise was to define the Project and identify local and regional issues of concern, the VCs, the study area boundaries and potential Project and cumulative impacts.

Issues of concern were based on:

- concerns expressed by government, the professional community and directly-affected stakeholders;
- EIA ToR;
- review of applicable legislation;
- consideration of available reference material and literature;
- previous assessment experience including proposed developments in the Project study areas; and
- issues and concerns related to resources traditionally used by indigenous peoples.

Based on the evaluation of these issues, VCs for the Project were identified. Throughout the EIA process, new VCs were identified and grouped into the appropriate resource discipline. Generally, Project VCs were selected for analyses based on the extent of the interaction between the Project and the issue of concern. For some VCs, key questions were also developed to focus the assessment.

Spatial and temporal boundaries for each resource discipline were established to encompass the respective VCs. Potential project and cumulative activities for each VC were identified. A list of the VCs identified for the Project for each environmental discipline is presented in [Section E – EIA](#)

[Methodology](#) as well as the respective Consultant Reports. The rationale for the selection of the respective VCs is presented in the relevant Consultant Reports.

D.2.5.2 Analysis of Effects and Identification of Mitigation

Baseline conditions for each VC were described based on existing information and Project-specific investigations. Once baseline conditions for the resource were determined and Project activities were defined, an evaluation was carried out to determine whether environmental protection measures were required to mitigate impacts on the VC.

The assessment of potential effects involved evaluating changes to VCs arising directly from the Project (*i.e.*, Project effects), as well as effects arising from the Project in combination with past, present and planned projects or activities (*i.e.*, cumulative effects).

The assessment of potential Project effects on each VC is presented in tabular form for each discipline, as shown in [Table D.2.5-2](#). Assessment of potential Project-specific effects on the environment was based on a combination of objective (measurable) and subjective (deduced) evaluations that were specific to the VC being considered. The evaluation considered those protection or mitigation measures which would be required to meet regulatory requirements, company or public acceptance during routine planning/design, construction, operation and/or abandonment phases of the Project. In addition, potential accidents and/or malfunctions were considered in the assessment.

The CEA Act, 2012 defines mitigation as “the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.” The definition used in Alberta’s Environmental Assessment Program is virtually identical (Government of Alberta 2010).

Mitigation is often achieved through iterative Project design (*e.g.*, through site selection to avoid sensitive areas and application of best practices during construction). Additional mitigation measures, over and above mitigation integrated into Project design, were identified for each effect, as required. Types of mitigation measures that were considered include:

- environmental protection measures and protocols;
- site-specific measures (*e.g.*, timing of activities to avoid biologically sensitive periods, site-specific mitigation design measures); and
- contingency measures to address the possibility of accidental events that could affect the environment.

D.2.5.3 Evaluation of Significance

EIAs are based on the Government of Alberta's Guideline for Preparing EIA Reports (Government of Alberta 2013) as well as measured, estimated, or reasonably expected changes in some attributes of a selected VC (or environmental attributes/indicators). These VCs are considered representative of the larger environment, with the assumption that if little to no impact to the receptor is identified, the broader environment will not be impacted. The identification of VCs is dependent upon scientific understanding of the respective ecological components and their interactions in the overall environment within which the Project will be developed. Work activity is guided both by issues identified during the course of impact assessment and in response to the final ToR for the Project.

For each identified VC, an assessment of the potential impact was made using the attributes of direction, geographic extent, magnitude, duration, likelihood, reversibility, and confidence in the relationships between cause and effect. An overall impact assessment rating for each VC is derived based on the individual attributes.

A residual Project impact is defined as an effect that cannot be fully reversed. Thus, the quantification and description of a residual Project impact, by definition, includes consideration of available mitigation procedures and opportunities. Impacts discussed in this EIA include those occurring due to the maximum disturbance scenario (*e.g.*, all Project components developed and operating at one time) and those impacts remaining after mitigation and reclamation activities have been completed (*i.e.*, residual Project impacts).

The definition of each criterion used in the assessment is described below and are presented in [Table D.2.5-2](#). Criteria and definitions that pertain to a specific component are included in that component.

- Magnitude;
- Geographic Extent;
- Duration;
- Frequency;
- Reversibility;
- Project Contribution;
- Confidence Rating;
- Probability of Occurrence; and
- Impact Rating or Significance.

Table D.2.5-2 Evaluation Criteria for Assessing the Environmental Impact		
Criteria	Criteria Definition¹	
Magnitude	Nil	No change from background conditions anticipated after mitigation.
	Low	Disturbance predicted to be somewhat above typical background conditions, but well within established or accepted protective standards and normal socio-economic fluctuations, or to cause no detectable change in ecological, social or economic parameters.
	Moderate	Disturbance predicted to be considerably above background conditions but within scientific and socio-economic effects thresholds, or to cause a detectable change in ecological, social or economic parameters within range of natural variability.
	High	Disturbance predicted to exceed established criteria or scientific and socio-economic effects thresholds associated with potential adverse effect, or to cause a detectable change in ecological, social or economic parameters beyond the range of natural variability.
Geographic Extent	Local	Effects occurring mainly within or close proximity to the proposed development area.
	Regional	Effects extending outside of the project boundary to regional surroundings.
	Provincial	Effects extending outside of the regional surroundings, but within provincial boundary.
	National	Effects extending outside of the provincial surroundings, but within national boundary
	Global	Effects extending outside of national boundary.
Duration	Short	Effects occurring within development phase
	Long	Effects occurring after development and during operation of facility
	Extended	Effects occurring after facility closes but diminishing with time.
	Residual	Effects persisting after facility closes for a long period of time.
Frequency	Continuous	Effects occurring continually over assessment periods.
	Isolated	Effects confined to a specified period (<i>e.g.</i> , construction)

Table D.2.5-2 Evaluation Criteria for Assessing the Environmental Impact		
Criteria	Criteria Definition¹	
	Periodic	Effects occurring intermittently but repeatedly over assessment period (<i>e.g.</i> , routine maintenance activities).
	Occasional	Effects occurring intermittently and sporadically over assessment period
Reversibility	Reversible in short-term	Effects which are reversible and diminish upon cessation of activities.
	Reversible in long-term	Effects which remain after cessation of activities but diminish with time.
	Irreversible	Effects which are not reversible and do not diminish upon cessation of activities and do not diminish with time.
Project Contribution	Neutral	No net benefit or loss to the resource, communities, region or province.
	Positive	Net benefit to the resource, community, region or province.
	Negative	Net loss to the resource, community, region or province.
Confidence Rating	Low	Based on incomplete understanding of cause-effect relationships and incomplete data pertinent to study area.
	Moderate	Based on good understanding of cause-effect relationships using data from elsewhere or incompletely understood cause-effect relationship using data pertinent to study area.
	High	Based on good understanding of cause-effect relationships and data pertinent to study.
Probability of Occurrence	Low	Unlikely
	Medium	Possible or probable
	High	Certain
Significance	Insignificant	Effects are predicted to be within the range of natural variability and below guideline or threshold levels
	Significant	Effects of the Project are predicted to cause irreversible changes to the sustainability or integrity of a population or resource

¹ Criteria provide general direction for the environmental assessment, some modification may and will occur within the individual disciplines

The above criteria also take in consideration additional guidance from Federal and Provincial regulators, including:

- **Magnitude of the Impact:** Alberta Environment defines magnitude as *“a measure of how adverse or beneficial an effect may be”* (Government of Alberta 2010). Guidance on magnitude from the CEAA is as follows: *“Magnitude refers to the severity of the adverse environmental effects. Minor or inconsequential effects may not be significant. On the other hand, if the effects are major or catastrophic, the adverse environmental effects will be significant. When using this criterion, it is important to consider the extent to which the project could trigger or contribute to any cumulative environmental effects.”* (FEARO 1994)
- **Geographic Extent:** Alberta Environment defines geographic extent as *“spatial boundaries within which an effect of a defined magnitude occurs”* (Government of Alberta 2010). Guidance on geographic extent from the CEAA is as follows: *“Localized adverse environmental effects may not be significant. Alternatively, widespread effects may be significant. When considering this criterion, it will be important to take into account the extent to which adverse environmental effects caused by the project may occur in areas far removed from it (e.g., acid rain and the long-range transportation of atmospheric pollutants), as well as contribute to any cumulative environmental effects.”* (FEARO 1994)
- **Duration and Frequency:** Alberta Environment defines duration as *“the period of time in which an effect on a valued ecosystem component may exist or remain detectable”* and defines frequency as *“the number of times during the life of the Project that the effect may occur”* (Government of Alberta 2010). Guidance on duration and frequency from the CEAA is as follows: *“Long term and/or frequent adverse environmental effects may be significant. Future adverse environmental effects should also be taken into account. For example, many human cancers associated with exposure to ionizing radiation have long latency periods of up to 30 years. Obviously when considering future adverse environmental effects, the question of their likelihood becomes very important.”* (FEARO 1994)
- **Degree to which the Effects are Reversible or Irreversible:** Alberta Environment defines reversibility as *“capability of the environment to return to a capacity or condition equivalent to the baseline after the impact ceases”* (Government of Alberta 2010). Guidance on reversibility from the CEAA is as follows: *“Reversible adverse environmental effects may be less significant than adverse environmental effects that are irreversible. In practice, it can be difficult to know whether the adverse environmental effects of a project will be irreversible or not. It will be important to consider any planned decommissioning activities that may influence the degree to which the adverse environmental effects are reversible or irreversible.”* (FEARO 1994)
- **Environmental Standards, Guidelines, or Objectives:** *“If the level of an adverse environmental effect is less than the standard, guideline, or objective, it may be insignificant. If, on the other hand, it exceeds the standard, guideline, or objective it may be significant.”* (FEARO 1994)

In all criteria there are both objective and subjective considerations. Objective considerations include quantitative comparisons between anticipated residual project impacts and established quantitative limits such as ambient air objectives and water quality guidelines, regional environmental objectives and forestry harvest quotas. Subjective considerations, or professional judgements, are required when impacts cannot be predicted quantitatively due to limited data availability or when there are no benchmarks against which to compare quantitative impacts.

For each individual impact assessment, a final impact rating of insignificant or significant is stated. This is based on the integration of quantitative analysis (where possible) and professional judgement that takes into account the various rankings for each criterion (direction, magnitude, geographic extent, duration, likelihood, reversibility, and confidence). This is applied to both the Project-specific impact and cumulative effects assessments.

D.2.5.4 Follow-up Monitoring

Once residual Project-specific environmental effects and their contribution to cumulative effects have been assessed, a follow-up program or monitoring program might be necessary. Follow-up programs are a federal requirement. The AER defines follow-up programs as programs for verifying the “...accuracy of the Environmental Assessment of a project and/or to determine the effectiveness of any mitigative measures...”. (Government of Alberta 2010).

Follow-up programs might be warranted when:

- there is a need to address project-related issues of concern;
- there is a need to test the accuracy of the environmental assessment;
- there is a need to verify that mitigation measures were effective or successful;
- environmental effects of a project were assessed using new or unproven analytical or modelling techniques or the project involves technology or mitigation measures that are new or unproven;
- there is limited experience implementing the type of project being proposed in the environmental setting under consideration; or
- scientific knowledge used to predict the environmental effects of the project is limited.

Follow-up programs can be time and resource intensive and are only required where there is an identified need for a program based on the criteria set out above. In some instances, a monitoring program might adequately address issues and ensure the environment is protected.

Monitoring typically refers to a program designed to:

- confirm the effectiveness of a broad range of approved mitigation techniques;
- determine whether increased or different approved mitigation techniques are required to achieve mitigation or reclamation goals; and
- identify and address unanticipated effects.

Recommended follow-up and monitoring programs are identified for specific disciplines in [Section A – Project Introduction](#) and in the respective Consultant Reports. If a follow-up or monitoring program is recommended, recommendations are provided with respect to:

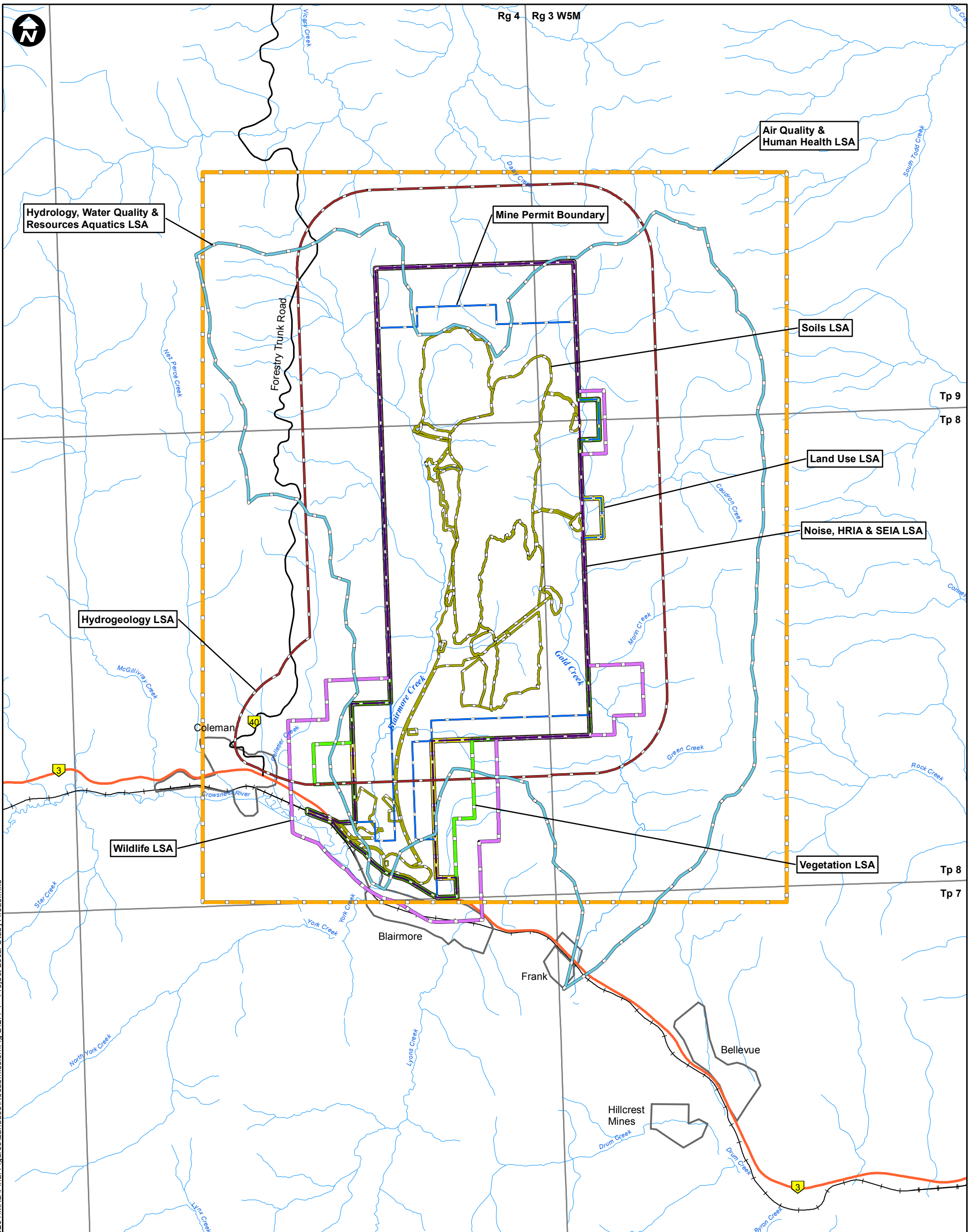
- the parameters to be measured;
- the methods and equipment to be used;
- the location and timing of surveys; and
- how results of the follow-up or monitoring program will be applied, including consideration of an adaptive management approach.

D.3 Application of the Methodology

Based on the above-described methodology, this EIA focused on potential effects of the Project on identified VCs in combination with other activities in the region over the anticipated 24 year economic life of the Project.

Based on the input received during the public consultation program, advice from government and regulatory agencies, and professional community participants, Benga is confident that the methodology and approach used to conduct the EIA has enabled a comprehensive and accurate assessment of the effects of the Project.

Figures



Document Path: K:\Active Projects 2014\AP_14-00201 to 14-00250\14-00201\MXD\Final Figures\Landuse\Resubmission\Fig D.2.4-1 - Project Local Study Areas.mxd

LEGEND

- Proposed Mine Permit Boundary
- Land Use LSA
- Hydrogeology LSA
- Vegetation LSA
- Wildlife LSA
- Hydrology, Water Quality & Aquatics Resources
- Air Quality & Human Health LSA
- Soils (Footprint)
- Noise, Historical Resources & Socio-Economic LSA

PROJECT



RIVERSDALE
RESOURCES

**GRASSY MOUNTAIN
COAL PROJECT**



TITLE

PROJECT LOCAL STUDY AREAS

NOTES

AltaLIS, 2016; MEMS, 2016; NRCAN, 2015; Riversdale, 2016
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01

DRAWN BY: CP/SL

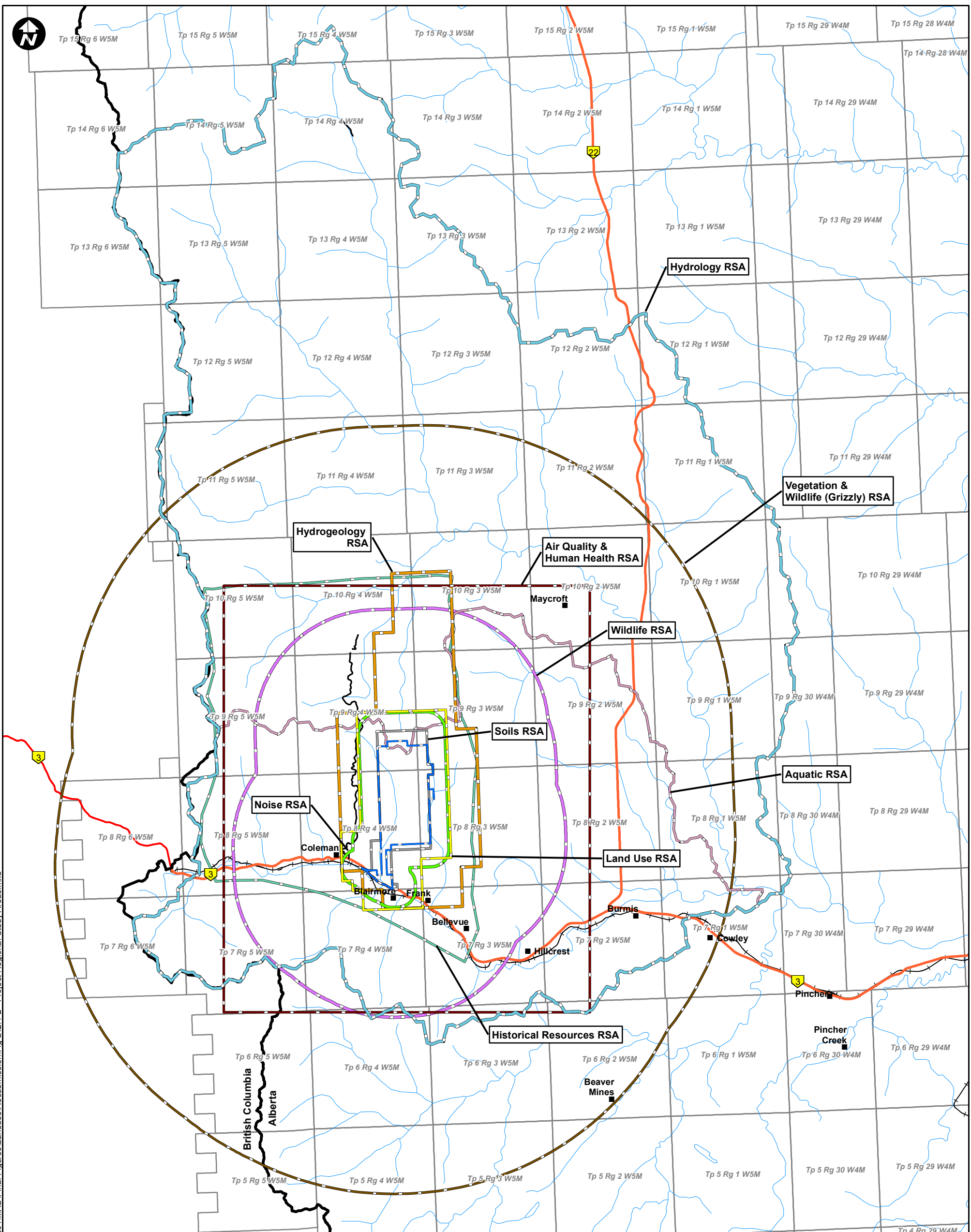
CHECKED BY: MB

DATE: JUNE 22, 2016

FIGURE

D.2.4-1





Document Path: K:\Active Projects 2014\AP_14-00201 to 14-00250\14-00201\MXD\Final\Figures\Landuse\Resubmission\Fig.D.2.4-2 - Project Regional Study Areas.mxd

LEGEND

- Proposed Mine Permit Boundary
- Hydrogeology RSA
- Wildlife RSA
- Vegetation & Wildlife (Grizzly) RSA
- Hydrology RSA
- Soils RSA
- Land Use RSA
- Noise RSA
- Air Quality & Human Health RSA
- Historical Resources RSA
- Aquatic RSA

PROJECT



RIVERSDALE
RESOURCES

**GRASSY MOUNTAIN
COAL PROJECT**



TITLE

PROJECT REGIONAL STUDY AREAS

NOTES

AltaLIS, 2016; NRCAN, 2015; MEMS, 2016; Riversdale, 2016
Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01

DRAWN BY: CP/SL

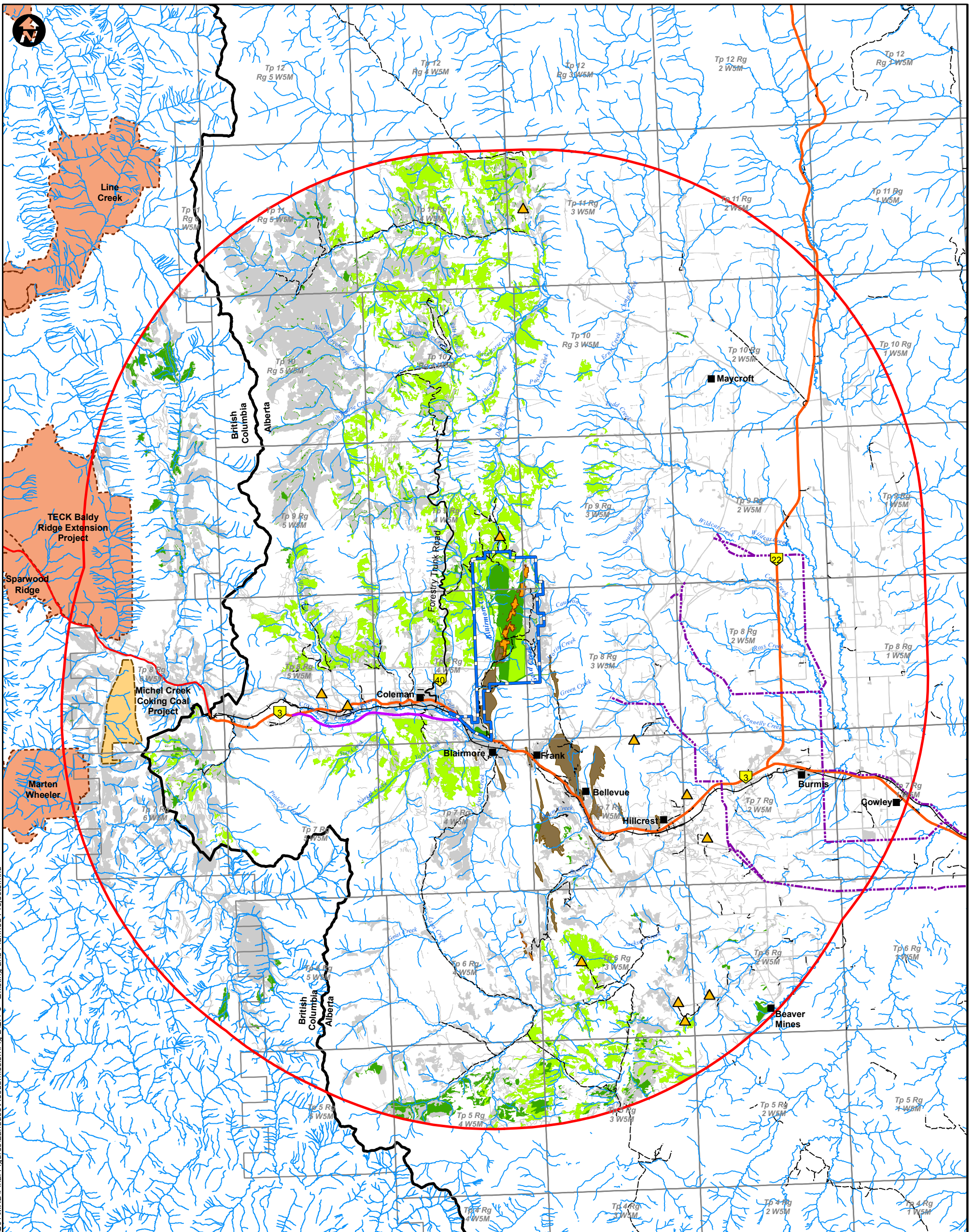
CHECKED BY: MB

DATE: JUNE 16, 2016

FIGURE

D.2.4-2





LEGEND

Gas Plant or Compressor	Existing Development
Town	Historic Surface Mine
Primary Highway	Historic Underground Mine
Secondary Highway	Existing TECK Coal Mine Permit and Baldy Ridge and Coal Mountain Extensions
Trail	Michel Creek Coking Coal Project
Surface Water Drainage	Forestry - Operations to 2032
Alberta Transportation Highway 3 Realignment	Forestry - Operations to 2045
AltaLink Castle Rock Ridge to Chapel Rock Proposed Transmission Line	
Provincial Border	
Proposed Mine Permit Boundary	
Regional Study Area	

PROJECT



RIVERSDALE RESOURCES

GRASSY MOUNTAIN COAL PROJECT



MILLENNIUM EMS Solutions Ltd.

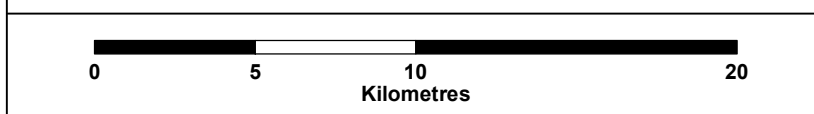
TITLE

EXISTING AND PLANNED PROJECTS WITHIN THE VICINITY OF THE PROPOSED PROJECT

NOTES

AER, 2016; AltaLIS, 2016; NRCAN, 2016; Riversdale, 2016
 Datum/Projection: UTM NAD 83 Zone 11

PROJECT: 14-00201-01
 DRAWN BY: SLJ/L
 CHECKED BY: MB
 DATE: JULY 11, 2016



FIGURE

D.2.4-3