
Environmental Protection and Enhancement Act

Guide to Content for Energy Project Applications

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Introduction

Activities specified in the *Activities Designation Regulation* under the *Environmental Protection and Enhancement Act* for energy projects require an approval from the Alberta Energy Regulator (AER) prior to their construction or operation. The *Act* outlines the application procedure necessary to apply for an approval with further detail provided in the *Approvals and Registrations Procedure Regulation*. The Regulation outlines the information and content that is required in an application in order to inform the decision whether to grant an approval.

This *Guide to Content for Energy Project Applications* applies to the preparation of applications for all energy projects identified in Schedule 1, Divisions 1, 2, and 3 of the *Activities Designation Regulation* and the *Responsible Energy Development Act*. The Guide supplements the Regulation and provides further clarity to applicants on information requirements for an approval that:

- is required to construct and operate a new energy plant or facility;
- is renewed in order to continue the activity in subsequent years;
- is amended to address changes to the construction or operation of an operating plant or facility; or
- is amended to address the reclamation stage of the activity.

The information is necessary to explain to the Director the proposed activity and its anticipated effects within and on the environment over the life span of the activity. Submitting sufficient information to make a decision at the time of the application, improves the speed of the application review process for approval, and the eventual approval, if issued.

The guidance concentrates on requirements for new activities, or for activities that are extending their approval for an additional term (renewal) and content requirements for completing an amendment to an approval to address changes to the construction or operation of an operating plant or facility.

The AER provides templates (forms) for the collection of required information for some activities. Where the Appendices reference available forms, such as the *Landfill Application Form*, for all or part of a proposed activity, it is the acceptable manner for submitting information applicable to that component of the activity.

Applications for an approval for use and treatment of potable water at an energy project must be submitted to the Department of Environment and Sustainable Resource Development, using published guides.

Applications for licences or approvals under the *Water Act* may be coordinated with the *Environmental Protection and Enhancement Act* approval application, but should be submitted separately to the Alberta Energy Regulator.

Submission of information required under the *Climate Change and Emissions Management Act*, if applicable, may be coordinated with the *Environmental Protection and Enhancement Act* approval application, but should be submitted separately to Alberta Environment and Sustainable Resource Development (ESRD) using ESRD's published guides.

Goals of Approval Application and Process:

Environmental Protection and Enhancement Act (EPEA) approvals are important to the Province's environmental management system. Approvals, and the associated application process, support endeavor to promote environmental performance and innovation without compromising compliance and assurance.

Approvals include obligations based both upon standardized requirements and recognize and accommodate site and area-specific requirements (such as consideration of sensitive areas, cumulative releases, or disturbances contributing to cumulative environmental effects).

Approvals, and their application process, can be used to evaluate flexible approaches to meeting environmental outcomes. The application process supports the development of an *EPEA* Approval, which identifies the applicant's obligations and responsibilities for design, construction, operation, and reclamation of an industrial plant or facility. The submitted application may serve as a foundation for the approval and pertinent portions may be incorporated into the approval terms and conditions.

Detailed written applications and applicant cooperation in the approval process demonstrate an understanding of and commitment to the environmental objectives of the area as well as environmental management requirements for the activity for all phases of its life span. Applications are also subject to *EPEA*'s public review process and should convey complete and understandable information about the activity, its risks, anticipated effects, and proposed mitigation measures to support public review and comment.

An industrial applicant's application must provide reliable information on the potential environmental cumulative effects considerations within the activity's proposed area, as well as proposed environmental risk avoidance and mitigation strategies. This information should include, without limitation:

- an assessment of the long term and short term environmental effects of the activity;
- substantiation of and commitment to the suitability or "fit" of the activity (if activity or use limitations exist within an area) and sustainability in the regional and local contexts;
- an explanation of and commitment to the local and regional area environmental objectives, and protection from adverse effects, due to their contributions to cumulative development;
- information regarding local public and other affected parties' issues that need to be addressed, including preventing speculation in, or interference between, developments;
- assurance that any unique environmental considerations are addressed;
- a recognition and support of opportunities for optimization and coordination of development, shared or linked infrastructure, or fostering "beneficial use" of materials to maximize their use as a resource; and
- promoting optimization and recognizing opportunities to coordinate development.

This Guide encourages the applicant to evaluate and demonstrate any relevant environmental protection and stewardship considerations, such as:

- promoting innovation beyond standard benchmarks;
- allowing the applicant to present, where acceptable, alternative technical solutions that meet the environmental objectives;
- promoting a range of other risk avoidance or mitigation strategies, including for example, waste minimization and reuse; and
- protecting or coordinating with other users and uses in the local and regional areas.

The applicant must also include proposed monitoring and performance measures, details and considerations, to obtain information:

- to enable performance evaluation of all aspects of the activity with respect to:
 - compliance with environmental regulatory requirements,
 - achievement of identified environmental outcomes,
 - verification of information from Environmental Impact Assessments, and
 - substantiation of performance optimization;
- projecting changes or trends in local circumstances that should be addressed;
- verifying efforts to coordinate performance with other parties, particularly in circumstances where coordination is required; and
- supporting broad performance evaluation for area-, media-, or industry-specific policies and standards.

The *Guide to Content for Energy Project Applications* poses questions to assist the applicant in considering the choice of technology most suitable to conduct their activity. The activity must meet the current technical and policy requirements for a sector, including those for specific equipment or individual processes.

Understanding the Spatial Context:

The location, setting or duration of an activity provides its context, and therefore may inform some obligations and requirements in a resulting approval.

Environmental issues or opportunities are influenced by the natural setting surrounding the activity, such as the landscape, ecology, and geology. This setting informs the local and regional context by contributing to an understanding of the physical, chemical or biological characteristics of:

- ambient air;
- surface water, such as any major rivers, lakes, and/or wetlands;
- habitats and/or ecosystems;
- known groundwater aquifers; and
- receptors, such as humans, wildlife and vegetation.

In addition to the natural setting, environmental issues and opportunities can be associated with the presence of other development activities. Trends or projected changes due to natural or human influences should be noted for consideration.

The local and regional context is also informed by adopted local, sub-regional or regional environmental objectives, plans and management approaches that must be considered by the applicant.

The *Guide to Content for Energy Project Applications* also poses questions to direct the applicant to identify considerations, issues and opportunities at differing spatial scales of management. This aids the applicant in planning and preparing management approaches for the activity in the regional, sub-regional and local context that the Director must be able to assess when considering whether to grant the approval and determine its terms and conditions.

Larger activities often have greater need to speak to the spatial context as their operation has more potential to affect the environment and others within a larger area. Smaller activities often are able to focus on their operation with consideration to others in the more immediate area. Applicants must provide the rationale used to define the spatial and temporal scales evaluated for the application.

Local

The local context depicts the setting at the proposed site and its immediate vicinity. The applicant should include:

- an overview of the local area;
- the extent and variability of the receiving environment; and
- any unique environmental conditions.

Similar to the regional context, issues or opportunities in the local context are influenced by the local natural setting, other activities in the area, and local concerns and values. The application should include a description of the nature and influence of these within the local context.

In particular, those activities that rely on municipal water, waste and wastewater systems must inform the AER of any relevant considerations or requirements imposed on the activity and note any specific neighbouring concerns.

Regional and Sub-Regional Scales

The applicant needs to depict the setting of the proposed industrial facility or plant site in the context of the surrounding local area, region and sub-region, and consider the relevant environmental objectives, legislation, management plans and frameworks, principles, criteria, targets, and thresholds for those areas in determining effects. Issues and opportunities can be identified for which planning or management approaches need to be explored.

This depiction of the regional context should include the nature and influence of other activities and substance releases in the region, particularly in situations where releases will require coordination, or compounding factors will need consideration such as water use. Where the government has identified specific economic or social goals or limitations

through legislation or policy documents, these too should be considered in the application submission.

Should it be determined that the proposed activity has a less direct influence at the regional scale and greater influence at a sub-regional or local scale, the depiction of the spatial context should focus on these smaller scales, but remain aware of and consider larger issues and opportunities. This includes consideration of any relevant issue-specific and/or sub-regional plans.

General Instructions

Before Preparing your Application:

It is important to review this section prior to preparing an application for an industrial approval. These instructions will enhance the efficiency and effectiveness of preparing the application, by assisting in:

- identifying, gathering and assessing the necessary information; and
- organizing and presenting the information in the application in the manner needed by the Director.

Applicants are encouraged to use appropriate expertise of specialists in areas where the applicant's knowledge alone is not adequate to address the environmental issues.

The applicant is responsible to ensure that information submitted to the government is accurate and reliable, and will represent the person responsible for the activity. In ongoing interactions with the AER both during the application process, and in long-term operation, the person responsible may also choose to be represented by an agent provided written confirmation of this is received by the department.

The application forms a critical reference for any *Environmental Protection and Enhancement Act* approval that may be granted. Applicants can remove ambiguity and expedite review and development of their approval by using clear commitment language to describe:

- the installation of the equipment that will be used;
- the methods or processes that will be used to eliminate or mitigate environmental effects; and
- all monitoring and reporting actions.

Documents without commitment language or those with internal inconsistencies will have to be revised or may contribute to the rejection of the entire application. Commitment language means using words such as “will” and “shall” rather than “may” or “might”. This is important because some elements of the application may be directly referenced by approval terms and conditions.

Applicants should organize their applications in the order and manner of the Guide's Table of Contents for faster handling of their applications.

Additional Approval Application Requirements and Support Materials:

The AER and ESRD publish a range of guidance and procedures that also support the development of an application, including policy and legislative documents for a variety of activities and environmental media. The AER and ESRD websites contain links to these documents or other websites containing documents with additional supporting information for applicants, for example:

- relevant generic and industry- or media- specific policies or legislation (such as the *Soil or Groundwater Monitoring Directives*);
- procedural or methods policies or legislation (such as the Air Quality Model Guideline or the Guidance for Assessing Best Available Technology Economically Achievable (BATEA) and Developing Technology-based Standards);
- applicable location-specific policies or legislation; and
- websites that contain ambient environmental data that may be relevant to the applicant and the local area.

Using the Guide:

This Guide is intended for use by a broad range of applicants and applies to several different types of industrial activities.

While every question may not apply to all applications, to the greatest degree possible, all questions should be answered with the help of the appropriate guidance policies and legislative requirements.

Terms used throughout the Guide are intended to act as clear descriptions for the information required. Avoiding jargon or technical definitions promotes a general understanding of the information or assessment required for an application's review. For example:

- “substance releases” is intended to include emissions, effluent, and discharges;
- “ponds” also refer to lagoons, end pit lakes, dugouts, pits, and sumps;
- “process sludges” include bottoms, residue, residuals, and backwash; and
- “wastewater” is intended to cover the range of water streams including industrial, domestic and runoffs; which includes: process water, produced water, liquid born waste, liquid effluent, fluid discharge; industrial runoff, stormwater, or surface runoff and runoff, and domestic wastewater municipal wastewater, sewage, and grey water.

The applicant's submission should reference policy-specific, or legislation-defined, terms or otherwise provide clear descriptions to enhance reviewer and public review understanding.

The Guide uses the instructional word *should* to indicate that among several possibilities, one is recommended as particularly suitable without necessarily mentioning or excluding others. The word *shall* is used to indicate requirements that must be followed. The word *may* is used to indicate a course of action permissible within the limits of the guidance.

Any conflicts between the language in this Guide and legislation or policy that directs applicant's requirements will be resolved in favour of the legislation or policy.

The Parts of this Guide are expressly designed to assist proponents in preparing the most effective applications. Each Part contains three distinct elements to guide, inform, and direct the thinking and drafting of an application:

- Interview-like questions are posed in the blue-text boxes to illustrate the questions an application must answer;
- Blue text adds additional explanation of the Director's information needs which the application must satisfy;
- The articles of the Guide direct how the application should provide information.

Drafting Advice, Information References and Assumptions

The applicant's approach to managing their plant or facility in order to meet appropriate policy and environmental outcomes must be fully described in an application. To this end, responses to the articles of this Guide must be supported by source data, information and assumptions used to support any analysis, models, or evaluations. In addition to the submission of assessment or modelling results, applicants should also identify and discuss the accuracy and sources of uncertainties in results.

Professional judgement is a critical component of any plant or facility's design. However, conclusions based on professional judgement must be backed by a clear rationale to support their conclusions, which includes the assessment of the ability to comply with the applicable regulatory implications and obligations from legislation, policies, approvals, and current plans or multi-stakeholder planning initiatives.

All relevant references should be provided in the application to allow reviewers to confirm information sources. References may be provided either in the body of the application or in a Reference Section.

Staff may request the submission of the above information if it cannot be sourced from easily accessible public records.

Formatting Advice

For all requested descriptions, pertinent data and analysed information must be supplied electronically and sources referenced.

The AER is accepting mailed applications on CD or memory stick to the EPEA and WA Applications Center, or emailed applications in an unprotected pdf format to the appropriate AER area email address. Mail and email contact information can be found in Appendix A.

Applicants can submit deficiency or supplemental information request responses, or project updates, directly to the approvals coordinator contact identified in the deficiency or information request letter.

Maps

The basic information on maps and diagrams should include:

- scales;
- “North” orientation arrow;
- legal land location grid (section, township, range);
- important geographic or topographic features (e.g., waterbodies, watercourses, roads, rail lines); and
- important geopolitical locations and boundaries (e.g., cities, towns, Municipal Districts and Counties, parks.)

The information presented on maps and diagrams must be clearly labelled directly on the document or in a legend. This is also important on process flow diagrams.

Map scale and paper size should be appropriate to the information being conveyed. Information that is too small to interpret will result in Supplemental Information Requests for legible versions.

In some instances, air photo mosaics can be used as an alternative to maps. In addition to the basic requirements, air photo mosaics should include the date or dates of the original air photos.

Part 1: New Plants and Facilities

1. Applicant Identification

Who is the person legally responsible for the activity?

Who is authorized to represent the person responsible?

How can Alberta Environment and Sustainable Resource Development contact the applicant and any representatives?

- 1.1. Provide the applicant's name using the Authorization of Application for Approval Form (Appendix A). If an agent is authorized to represent the person responsible, also provide this full name. If the person responsible or agent is a corporation, provide the full Alberta registered name of the corporation.
- 1.2. Provide the mailing address of the person responsible; and the agent's office mailing address, if different.
- 1.3. Provide the mailing address of the plant or facility where the activity is conducted, and the regional office of the person responsible, if different.
- 1.4. For each contact on the application, provide the following information:
 - name and signature;
 - title and corporate department;
 - telephone number;
 - fax number; and
 - email address.

2. Plant or Facility Identification

What is the activity and where is it occurring?

- 2.1. Describe the main activities of the plant or facility with the most suitable classification referenced in the *Activities Designation Regulation*. If additional activities proposed for the site are also classified as regulated activities, provide this description in addition.
- 2.2. Provide the location of the plant or facility using both:
 - legal land description; and
 - latitude and longitude coordinates.

- 2.3. Provide a map showing the direction and distance of the plant or facility to nearby towns, cities, villages, or residences and special areas (e.g., recreation areas, camps or protected areas), other plants and facilities, and wetlands and watercourses or other potential locations of receptors.
- 2.4. Provide information about the physical size and capacity of the plant or facility site, and the area with a reasonable potential to be affected by the activity. Provide maps and scaled diagrams.

3. Project Background

What regional initiatives, plans, or management frameworks will the project need to consider?

What other regulatory decisions and authorizations are required for this proposed project? What is the current status of these decision processes?

What environmental issues or requirements have been identified these other decisions and authorizations?

Plans, Public Interest Decisions, and Regulatory Authorizations (Leases, Licences, Approvals and Permits)

- 3.1. Identify all government approved regional initiatives or plans that pertain to the area with requirements that relate to environment and resource management for the proposed activity, such as Land Use Framework Regional Plans and Management Frameworks, Integrated Resource Plans, Water Management Plans, or Municipal Development Plans.
- 3.2. Related to this proposed project, identify any Hearing results or decisions by:
- the Alberta Energy Regulator (AER);
 - the Alberta Utilities Commission (AUC);
 - the Natural Resources Conservation Board (NRCB);
 - the local Regional Authority or Municipality; or
 - the Canadian Environmental Assessment Agency (CEAA);
- and identify and reference any terms, conditions or commitments for this project that relate to the environment. Staff may request the submission of this information if it cannot be sourced from public records.
- 3.3. Specify the date an Environmental Impact Assessment (EIA) report was accepted by the Director for the purposes of a Hearing identified in 3.2.
- 3.4. Identify any authorizations related to this proposed project and their date of issuance, such as Leases, Permits or Approvals and their amendments issued by:
- the Alberta Energy Regulator (AER);
 - the Alberta Utilities Commission (AUC);
 - the Natural Resources Conservation Board (NRCB);

- the local Regional Authority or Municipality; or
- Alberta Environment and Sustainable Resource Development (ESRD) or the AER for authorizations under the *Environmental Protection and Enhancement Act* (including on-site potable water treatment and use and stormwater runoff), the *Water Act*, the *Climate Change and Emissions Management Act*, the *Public Lands Act* and the *Forests Act*;

and identify and reference any terms, conditions or commitments for this project that relate to the environment. Staff may request the submission of this information if it cannot be sourced from public records.

- 3.5. Identify any *EPEA* applications for other plants or facilities that may require coordination of the application process for this proposed activity.

Financial Security

Is your project subject to financial security?

- 3.6. If financial security is required, provide the calculation for it, and include the assumptions and justification for their use in the calculation. For more information on determining if financial security is required and how to calculate the amount, refer to Appendix A.

Proposed Project Timelines and Consultation

When does this proposed project commence, and how long does this proposed activity occur?

Have you consulted the public?

- 3.7. Provide proposed or estimated project timelines and major milestones. Highlight any significant schedule constraints or considerations. Include:
- project duration from initial site preparation through to estimated time of operations ceasing and final closure;
 - proposed or actual dates for commencement and completion of construction;
 - proposed or actual dates for commencement of operation; and
 - proposed or actual dates for public consultation.
- 3.8. If public consultation or stakeholder engagement has, or will be, conducted outside of this approval review process, provide the following information:
- target audience(s);
 - type, purpose, and frequency of consultation or engagement; and
 - identified environmental concerns and how they were, or will be, addressed in the project design.

4. Current Setting for the Proposed Project and its Environmental Condition

What is the setting for the activity and what are the factors in this setting that will influence the design, construction, operation, and reclamation of the facility or plant?

What environmental risks must be addressed and what environmental objectives must be achieved?

Information and assessment of risks and issues presented in this section of an application will provide the basis for considerations for evaluation and requirements in Sections 5 through 8, ensuring that the proponent is considering the broader implications of the activity in the area throughout its full life cycle.

Determining the activity's geographical setting and its condition, as well as human and biological receptors prior to the influence of the proposed activity, informs the nature of environmental issues in the area. This supports evaluation in Sections 5 through 8 of the potential effects from the activity and their required mitigation measures, and the likely long-term end land use after the site is reclaimed.

This section's assessment also must identify and assess the consequence of other existing and emerging influences and environmental pressures to environmental conditions in the area, such as other activities and land or water uses.

For all requested descriptions, pertinent data and analysed information must be supplied electronically along with referenced sources.

- 4.1. Describe the current setting and condition of the environment, including features of the local and regional landscape, drainage and surface watercourses, and groundwater. Identify existing land use and zoning for the site and adjacent lands.
- 4.2. Describe the current ambient air quality and identify influences and environmental pressures within a 5-kilometre radius of the site. Include:
 - topography and elevation;
 - any ambient air environmental monitoring data (collected at or near the site which represents air quality prior to the influence of the proposed activity) and its collection location;
 - the various environmental influences, effects and trends; and
 - all constraints and limiting factors in the receiving environment.
- 4.3. Provide a current soil or land survey and data for the site and surrounding lands, and assess:
 - land capability class and rating(s);
 - soil classification and distribution;
 - Results of soil monitoring conducted at or near the site which is representative of soil quality prior to the influence of the proposed activity;
 - anthropogenic effects on the soil, including previous disturbances, contamination issues, quality and quantity of soil;

- suitability for reclamation, of each topsoil and subsoil horizon including any constraints to future reclamation such as sensitive soils, chemical or physical characteristics, amounts (volume and depth of topsoil and subsoil). For mine sites include overburden characterization;
- local and regional vegetation types, include:
 - types of vegetation,
 - rare vegetation,
 - weeds (named under the *Weed Control Act*), and
 - health or anthropogenic effects on vegetation due to previous disturbances, air deposition, logging and clearing, etc.; and
- for mine sites and in-situ developments, estimate the volume and describe the type of timber.

4.4 Pre-Disturbance Setting and Environmental Condition

If previous development or disturbance has already occurred on the proposed location, what was the setting and environmental condition prior to this residential, commercial, or industrial development?

- 4.4. For the situations identified above, where the end land use is likely to return to a natural, agricultural or forested land, describe the soil and vegetation for the site prior to the previous development or disturbance considering the factors listed in 4.3. This information will guide efforts to monitor and salvage soil material for future reclamation of the site.
- 4.5. Describe the nature and condition of wildlife in the area, including the species and their habitats, and identify any sensitive species and special habitats.
- 4.6. Describe and evaluate the current environmental conditions, and characteristics and features within the area of both the site and proposed receiving watercourses for the area with reasonable potential to be affected by the activity. Include:
- associated geological considerations and other influences or environmental pressures;
 - local area meteorology, including precipitation;
 - runoff coefficients and infiltration rates;
 - any collected water quality (characterization) data, which is representative of water quality prior to the influence of the proposed activity, and their collection location in the receiving watercourse, noting both the normal variability and any trends or elevated parameter levels as well as relationships to water quality guidelines for all potential uses;
 - any collected water quantity data, which is representative of water quantity quality prior to the influence of the proposed activity, and their collection location in the receiving environment, noting both the normal variability and trends;
 - any constraints or limiting factors in the receiving environment or area due to existing or potential water uses, such as protection of aquatic

life, local drinking water (including groundwater), agriculture, recreation, and indicators for identified vulnerable ecosystems;

- any applicable setback distance requirements (e.g., flood plains, riparian zones, neighbouring residential use);
- any constraints or limiting factors in the receiving environment or area in order to meet water quality objectives, address persistent or bioaccumulative substances, or to manage cumulative loading requirements;
- any frequency, season, or timing restrictions; and
- anthropogenic effects on the aquatic ecosystem due to previous disturbances and releases, including the various environmental influences, effects and trends to water quality in the area resulting from other industrial and municipal releases, increased water use and climate change.

4.7 and 4.8 Irrigation Suitability Pre-Assessment

If waste application or wastewater irrigation is proposed for areas remote to the proposed plant location, what is the setting for these application or irrigation locations, and what are the factors in these settings that will influence the design and operation of application or irrigation activities?

What environmental risks must be addressed for these additional locations and how will environmental objectives be achieved?

4.7. Describe and evaluate the current properties, and suitability of the receiving soil for irrigation/ land application using the appropriate guidance, which should include, but not be limited to:

- irrigation classification ratio;
- soil pH and texture;
- water holding field capacity; and
- soil analysis for existing, pre-application, soil concentrations for substances identified in the treated waste or wastewater stream (e.g., salts (EC and SAR), nutrients, metals and major ions).

4.8. Describe and evaluate any restrictions to irrigation or land application of waste in the area due to:

- proximity to water wells or high water tables;
- proximity to water bodies, surface drainage areas, or springs;
- proximity to property lines;
- potential public use (e.g., recreational areas, residential developments) exposure;
- potential agricultural use (crop or cattle grazing food consumption) exposure;
- frequency, season, or timing of applications;

- any other identified issues in the area; and
- identify if waivers for setbacks are required and provide signed land owner consent release forms.

4.9. For 4.1 to 4.8, provide the information both aspatially (in tabular form) and spatially in scaled maps, diagrams or annotated aerial photographs. For each monitoring location, please identify the source of the information, for example from an Airshed organization or Watershed Planning and Advisory Council, and the location from which the data is sourced.

4.10. In each of 4.1 to 4.8, identify and describe any pertinent terms, conditions or commitments that relate to the environment contained in government regional initiatives or plans identified in 3.1 (approved or under development). Describe the obligations or potential environmental obligations for the proposed plant or facility with respect to each initiative or plan.

5. Plant or Facility Design

What environmental risks must the design address and what environmental objectives must be achieved?

How is the risk management hierarchy¹ used in the proposed design? What opportunities and range of risk management actions, from avoidance through to mitigation of anticipated effects (such as improved efficiency, reduction, re-use, recycling and release controls), have been assessed in the:

- a) layout design;
- b) processes, including efficiency or minimization efforts;
- c) pollution and disturbance prevention; and
- d) treatment and control systems.

How does the design address risk factors identified in Sections 3 and 4 and how will adverse effects be prevented?

How will the activity contribute to meeting environmental objectives in the local or regional environment as identified in Sections 3 and 4?

Will the design meet the applicable technology benchmarks?

The Design Section assures that an applicant has designed a plant or facility to achieve desired environmental outcomes and meet requirements, as well as includes monitoring systems to evaluate its performance. This assessment includes information regarding:

- the potential environmental risks of the proposed activity due to the activity's processes, materials and substances, layout, and disturbance; and
- the anticipated effectiveness of the proposed mitigation measures to prevent adverse effects and contribute to meeting required environmental objectives.

This draws upon Government of Alberta's *Too Good To Waste* publication, Page 6 Diagram - Waste Management Hierarchy.

Discussions in this section can highlight efforts such as whether and how:

- regulatory benchmarks for design requirements are fulfilled or exceeded;
- potential risks or objectives identified in the local environment are anticipated and addressed through design;
- opportunities for improved design and operation are identified and maximized; and
- opportunities or requirements to coordinate management actions are identified and fulfilled.

Where new technologies are proposed for use in Alberta as part of the plant or facility's process, or as part of prevention, mitigation or treatment at the plant or facility, use the applicable questions in this section to discuss their performance considerations relative to known technology benchmarks, and provide examples of their acceptance through similar, or typical, environmental approvals issued in other jurisdictions. For untried technologies, similarly use the pertinent questions below, and provide reliable literature sources for the technology, as well as highlighting any benchmark, bench scale, or pilot testing proposed to confirm performance meets the requirements.

5.1. Describe the plant or facility's process and provide a process flow diagram of the specific industrial processes related to the proposed industrial activity. Include both the processing operations (e.g., reactors, distillation, cooling towers, steam generation, compression, sulphur forming.) and the control processes (e.g., landfills, storage infrastructure, surface water runoff controls, industrial wastewater treatment facilities, particulate removal.). Include:

- raw materials, products and by-products. Include maximum and normal operating and upset design quantities used or produced per unit of time. Provide all other pertinent capacity measurements for the site;
- major equipment and unit capacities; and
- mass balances.

5.2. Describe the substances that will be generated in a typical operating day at the plant or facility.

- For each process stream, examine the substances contained within and:
 - their characterization, including their nature, fate and transport (physical, chemical or biological properties or characteristics), and potential effects on the environment,
 - their quantity used or generated (note range variation in production or due to upsets). Tables in Appendix D and Appendix E can be used as examples for the types of sources of substances,
 - their source of introduction, and
 - the process streams' range of variation due to production changes or upsets.
- From on-site operations, identify the types and quantities of waste that will be generated during operation including the type and nature of the

waste (including designated hazardous waste) and potential effects on the environment.

- For waste that will be accepted at this site, identify:
 - the type and nature of the waste (including designated hazardous waste) and potential effects on the environment,
 - the origin of the waste (i.e., in or out of the province), the sector (domestic, commercial, or industrial), and
 - the anticipated quantity and duration of the storage.

5.3. Describe any alternative options examined in the proposed overall plant or facility processes to optimize efficiency and minimize anticipated substance releases and/or waste generation and discuss criteria used in selecting an option. Include any supporting mass or energy balances.

5.4. Describe how the proposed project's footprint on the land will be minimized (e.g., shared infrastructure and right-of ways, and /or collaborative land management practices, especially on the boundary of the site and/or waste minimization).

5.5. Provide scale diagrams of the proposed plant or facility site. On the diagrams, identify pollution prevention and control infrastructure and equipment associated with collection and storage of product or feedstock, hazardous materials, waste, wastewater, or runoff or permanent disposal (e.g., landfill). Include:

- types of buildings and their locations;
- names and locations of all equipment used in manufacturing, processing, storage, and other units;
- location of all aboveground or underground tanks and type of service (e.g., product, feedstock, or waste);
- location of any equipment (e.g., piping) that will be installed subsurface;
- location of all waste management areas (e.g., containment, transfer and acceptance, and processing or treatment areas); and
- location of all wastewater or runoff collection control infrastructure, pre-treatment and post-treatment storage areas.

Materials Storage

5.6. Provide design and specification details (not engineering blueprints) of the proposed control systems.

- For each materials storage, waste management, transfer, or disposal area, include:
 - primary containment method (e.g., tanks, containers),
 - berms, dykes and/or other secondary containment structures (e.g., waste storage liners),
 - special handling or storage methods for hazardous materials,
 - run on/run off controls, and

- leak detection systems;

and assess the suitability for the quantity and characterization of waste, and identify any design features to manage incompatibility of substances, such as segregation.

- For all aboveground and underground tanks, complete Appendix C Form, and identify:
 - tank locations,
 - type of service (e.g., produced water),
 - capacity (m³),
 - material type,
 - type of corrosion protection,
 - foundation or basepad preparation,
 - type and capacity of secondary containment,
 - measures planned to prevent overfilling of tanks (e.g., automatic shutoff valves, or high-level alarms), and
 - method of leak detection;

and assess the suitability of each tank and associated control systems for its content.

- For each runoff or wastewater management system, identify:
 - collection and control berms, dykes and/or piping and any lining systems,
 - primary containment method (e.g., tanks, ponds),
 - secondary containment structures such as liners, and
 - leak detection systems;

and assess the suitability for the volume and rate of each wastewater generated during normal and upset conditions (or runoff events), as well as the suitability for each wastewater stream's characterization.

- 5.7. Describe the proposed monitoring to evaluate the performance of collection and storage elements, and any leak detection systems, that will be used for each containment area or tank identified in 5.6, and their associated loading or transfer areas.

Wastewater and Runoff Treatment and Control

How will wastewater process streams (including runoff and domestic wastewater) be minimized or treated to meet release requirements?

For runoff see Appendix F.

5.8. Describe and provide process flow diagrams for the proposed treatment and release control systems for the substances identified in each wastewater stream, along with mass balances and flow directions. Include:

- wastewater reuse or minimization opportunities;
- anticipated volumes, rates, and amounts of each wastewater or runoff stream during:
 - predicted normal conditions (average daily/monthly volumes) and upset conditions,
 - predicted rainfall events (maximum daily/monthly volumes),
 - substances for each wastewater stream, their normal and maximum concentrations per unit of time and per unit of production, and the predicted duration of maximum concentrations,
 - substance fate and transport (physical, chemical or biological properties or characteristics), and potential effects on the environment;
- description of the physical size, location, and capacity of wastewater treatment systems along with:
 - explored alternatives and proposed method of treatment (including batch or continuous) and considerations for both normal and upset conditions, and
 - proposed location and method of release (batch or continuous), and control of release (e.g., valves, diffusers, irrigators).

5.9. Assess the suitability and capacity of the proposed treatment and release control systems for the substances identified in each wastewater stream, and for each proposed disposal alternative:

a) For releases to watercourses,

- use approved models to evaluate the potential effects in the environment for the following watercourse scenarios:
 - normal and maximum concentrations of substances in, and volumes of, wastewater to be released,
 - low and normal watercourse flow conditions, and normal and maximum background concentrations of substances as identified in Section 4,
 - if runoff or wastewater re-use is proposed, model the effect of the reduced return flow on the quantity and quality of the receiving environment, and

- use benchmark or bench scale testing to establish the anticipated chronic and acute whole effluent toxicity for normal and maximum resulting modelled concentrations;
- discuss proposed responses to consideration of potential implications identified in Section 4:
 - of all substances of concern in the area, and/or identify any needs for conditional limits (e.g., for low flows or upset conditions),
 - to upstream and downstream releases (effects due to cumulative loads), potential impacts on the nearest water users, and implications to any identified areas of ecological sensitivity or public concern,
 - any additional research, ambient or biological monitoring, treatment optimization, or modifications to the release location, that are necessary to ensure that environmental objectives can be met, and
 - propose contingency plans for treated wastewater streams that do not meet applicable receiving environment condition requirements;

and describe how compliance with the applicable technology benchmarks and methods for watercourse policies, criteria, objectives, restrictions, environmental guidelines and any applicable regional outcomes will be achieved.

b) For wastewater, runoff or sludge releases to land,

- using the treated wastewater or sludge characterization, calculate the required application rates and describe the technologies to manage considerations identified in Section 4 in accordance with applicable policy and soil criteria; and
- assess how locations will be rotated to achieve application frequency restrictions.

c) For wastewater or runoff disposal by deepwell injection,

- assess wastewater treatment alternatives, and specify reasons for selecting deepwell injection; and
- identify the proposed deepwell disposal receiving site and confirm they are authorized to receive this type of wastewater.

d) For wastewater or runoff release to municipal facilities or sludges to landfills,

- provide information regarding the proposed receiving municipal wastewater or stormwater system or landfill, including:
 - their acceptance letter and any requirements imposed,
 - their *EPEA* approval number, and
 - a screening assessment of their treatment system's ability to treat and monitor for the substances identified in the proposed industrial activity.

5.10. For the systems identified in 5.8 and 5.9, provide a scale diagram, showing the location of proposed treatment facilities and disposal locations (latitude and longitude coordinates) with considerations identified in Section 4.

- 5.11. For the systems identified in 5.8 and 5.9, describe proposed monitoring for performance evaluation of the treatment, reuse, and wastewater minimization elements.
- 5.12. For 5.8 to 5.10, identify locations and describe proposed monitoring and evaluation of the quality, quantity (rates/volumes/amounts) and whole effluent toxicity, for the release of treated wastewater.
- 5.13. Identify and describe any proposed ambient monitoring (ambient water quality, biological, or soil), associated with the release of treated wastewater.
- 5.14. For the systems identified in 5.8 and 5.9, provide data, calculations, models, and reliable literature sources for each wastewater stream proposed for release, and the associated release or disposal method.

Air Treatment and Control

How will air process streams and emission sources be controlled and treated?
See Appendix E.

- 5.15. Referencing 5.1 and 5.2, describe the substances that will be directly or indirectly released to the air in a typical operating day at the plant or facility, and include:
 - the source of each substance, and its quantity, to any component streams that will contribute to the air emission streams, including auxiliary or standby process equipment;
 - each substance's physical, chemical or biological characteristics, fate and transport and potential environmental effect(s); and
 - the proposed method of treatment or control, and method of release.
- 5.16. For each air emission stream, identify:
 - the volume(s) and concentrations generated, per unit time, of the release substance;
 - normal and maximum emission rate per unit time and per unit of production based on the design and throughput of the industrial site;
 - whether the emissions are continuous or intermittent, and the frequency (if intermittent); and
 - estimates of seasonal and/or monthly variability for each stream.
- 5.17. Describe the application of process technology, environmental control systems, and management practices that will be used to minimize substance release to the environment, and include:
 - description of the physical size, location, and capacity of environmental control units/operations (e.g., air pollution control units);
 - diagram(s) of the processes, flows, or operation units including engineered drawings;
 - alternative processes and technologies for the release of substances that have been evaluated, and a rationale for their exclusion;

- all applicable industry standards, guidelines, and practices, as well as the manner in which the design and operation will achieve these.

5.18. Using tables as required, provide the following details for any:

- reciprocating or turbine engines;
- all fired heaters (including space heaters), treaters, and boilers;
- incinerators; and
- flare stacks.

Reciprocating or Turbine Engines	Fired heaters, Treaters and Boilers	Incinerator	Flare Stacks
make and model number			
identification designation of each individual unit used at the plant site			
rated power(kW)			
fuel type			
exhaust stack diameter (m)		diameter (m)	diameter (m)
exhaust stack height above grade (m)		height (m)	height (m)
exhaust gas temperature(°C)		exit temperature (°C)	
			-net heating value of gas to be combusted in the flare under normal and emergency conditions
exhaust gas velocity (m/s)			exit velocity (m/s) of the flare, under normal and emergency conditions
-emission rate of the oxides of nitrogen (grams of NOx)/(kW*hr) -SOX	-NOx emissions for each heater, boiler, steam generator, etc. (ppm and g/GJ) -SOX *NPRI, **COPC, and GHG;	- NOx emissions for each incinerator (ppm and g/GJ) -SOX *NPRI, **COPC, and GHG;	-SOX, NPRI
peak height of the building with which each engine is associated			
confirm the engine meets the low NOx emission requirement and/or emissions standard and by what method	confirm the heater, boiler, or steam generator meets the low NOx emission requirement and/or emissions standards		- method used to control combustion, e.g., assisted by air, steam or non-assisted - flare tip design - type of igniter, pilots, etc
*NPRI- National Pollutant release Inventory **COPC- Chemicals of Potential Concern			

5.19. Provide the following details for any flare pits on site:

- under what conditions is it used;
- type of proposed liner;
- frequency of use, and what goes into the pit; and
- type of flare design (e.g., igniter, pilot).

- 5.20. Describe all fugitive emissions related to the site. Include:
- types of substances released;
 - source identification;
 - measured and estimated volumes;
 - method of measuring and estimating fugitive emissions; and
 - management approach.
- 5.21. Describe all significant area, or non-point, emission sources related to the industrial site (e.g., vehicle fleets, ponds, or onsite incineration). Include:
- types of substance released;
 - source identification;
 - measured and estimated volumes;
 - method of measuring and estimating associated emissions; and
 - management approach.
- 5.22. Assess the suitability and capacity of the proposed treatment and release control systems using a dispersion-modelling run to show the maximum ground level concentration:
- for substances of concern under both normal operating conditions, and upset conditions;
 - for emergency flaring scenarios, including:
 - rates and composition of flared streams (i.e., inlet stream, acid gas before sulphur recovery unit, tail gas after sulphur recovery unit, reactor over pressure); and
 - dispersion-modelling run depicting the maximum ground level concentration.
- and describe any temporary or permanent environmental effect(s) that may, or will, result from the substances being released to air, include:
- consideration of any unique situations arising from the plant location, size, or capacity; and
 - comparison to applicable ambient objectives, guidelines, or standards.
- 5.23. Provide scale diagrams of the plant, plant site, and the surrounding area with regard to air emissions, and include the location and distance between all:
- air emission point sources, including stacks, exhaust stacks, all other discharge points; and
 - monitoring and sampling equipment.
- 5.24. For 5.18 to 5.23, describe proposed monitoring for performance evaluation of the treatment and control equipment (source) systems.
- 5.25. Identify the location and describe proposed monitoring and evaluation of the ambient air quality.

- 5.26. For air emissions, provide data, calculations, models, and reliable literature sources for each waste stream proposed for release, and the associated release or disposal method. Include:
- the volume(s), generated per unit of time, of the release substance;
 - concentration of substance(s), and their physical or biological characteristics;
 - fate and transport and potential environmental effect(s) of the substance(s);
 - discharge rate per unit of time and per unit of production;
 - maximum emission rates based on the design of the industrial site;
 - typical emission rates based on current operations and throughput of the industrial site;
 - whether the discharge or emissions are continuous or intermittent, and the frequency (if intermittent); and
 - estimates of seasonal and/or monthly variability for each stream.

6. Construction

What environmental risks or objectives must be addressed solely during project's construction phase?

How will they be addressed or achieved?

How will reclamation materials be conserved and stored for future reclamation of the site?

Information submitted in this section is needed to identify and evaluate pollution prevention and environmental management requirements during the construction phase, as well as describe the conservation or preservation of reclamation materials.

Smaller plants or facilities often do not have extended construction operations, therefore requirements concerning wastewater or air releases during this phase may not be substantial.

- 6.1. Provide a brief table or outline of the schedule for construction, including major milestones.
- 6.2. Describe and map the location on the site where the construction site will be located, how it will be laid out, and how it will affect sensitive areas, sensitive soils, and rare vegetation (identified under the Section 4) and how such effects will be avoided and/or mitigated.
- 6.3. Provide scale diagrams of the site and surrounding area identifying locations of construction activities. Include:
- location of construction activities; and
 - locations of areas designated for infrastructure and equipment, waste storage, control, treatment, incineration, and disposal during construction.

Management of Reclamation Materials

- 6.4. Describe how reclamation materials will be salvaged and handled during construction. Include:
- protocols and equipment that will be used to ensure optimal soil salvage during construction (e.g., suspending and recommencing topsoil salvage when field conditions will result in the mixing, loss, degradation, or compaction of topsoil);
 - depths and horizons of soil planned for salvage;
 - special procedures that will be used to address any problem soils/subsoil/spoil;
 - quality control measures that will be employed during construction (An example might be the use of Professional Agrologists or Foresters); and
 - confirm that “as-built” details for soil materials will be permanently kept on record.
- 6.5. Identify the location and describe the method by which reclamation materials will be stored during and after construction. Include:
- storage methods (e.g., direct placement, stockpiles, or windrows);
 - storage locations provided on a map;
 - method for maintaining access (e.g., separation distances from other objects and stockpiles (preventing encroachment by future activities));
 - types of material (e.g., topsoil, subsoil, or spoil); and
 - methods to control erosion and prevent degradation of the stored material (e.g., seeding, vegetation, and weed control).
- 6.6. Describe how timber will be salvaged and non-merchantable timber and woody debris will be managed prior to and during construction.

Other Mitigation Requirements

- 6.7. For construction on contaminated or potentially contaminated land, describe how contamination will be identified, assessed, and remediated before construction, and/or how it will be risk managed through the construction period.
- 6.8. Describe and assess how contamination of the soil, groundwater, surface water, and air will be avoided, minimized, or managed during construction using approaches identified in Section 5. Include:
- construction and use of temporary sites for handling, recycling, storage, and/or disposal of waste, include:
 - berms, liners, tankage and other secondary containment;
 - control systems for runoff collection, treatment, and re-use;
 - method of leak detection; and
 - control and management of fugitive emissions and dust.

- 6.9. For releases during the construction phase, provide process flow diagrams with mass balances and flow directions, as well as pertinent calculations, models, and reliable literature sources for each air emission or wastewater stream you propose to release, as well as the release or disposal method. Include:
- identified substances of concern and how their potential effects on the environment will be prevented or mitigated;
 - their anticipated volumes, rates, and amounts during normal and upset conditions; and
 - proposed monitoring for performance evaluation of the treatment and release system.
- 6.10. Describe how environmental releases will be monitored and identify the location of existing and planned infrastructure for environmental monitoring during construction.
- 6.11. Identify and describe the location of all equipment that will be used for ambient monitoring at the site during construction.

7. Operation

**How will the plant be operated to ensure the environmental objectives are met?
What operating and environmental management systems will be employed?**

Information submitted in the Operation Section is needed to identify and evaluate the applicant's operating procedures and systems that enhance their ability to achieve and demonstrate the achievement of environmental outcomes and requirements. This section requires discussion of the various on-going monitoring, and reporting systems, as well as operating, training, management, and maintenance systems and how they contribute to ensure the designed environmental controls meet the stated goals, requirements and limits.

These system elements are often identified in Standard Operating Procedures, Emergency Response Plans, Maintenance Plans, Monitoring Plans, and Contingency Plans.

- 7.1. Describe the record keeping procedures to maintain copies of the application and correspondence with the AER.
- 7.2. Further to 5.12 and 5.24, describe the maintenance and quality management (operating procedures) proposed for release monitoring and performance evaluation.
- 7.3. For 7.4 and 7.5, if this monitoring is proposed to be jointly delivered, identify the agency or group that will be performing the work (e.g., an airshed zone) and provide the pertinent information regarding their monitoring network.
- 7.4. Further to 5.25, describe and assess the suitability of proposed ambient air-monitoring network and associated operating procedures to meet requirements. Include:
- the parameters to be monitored;
 - the monitoring frequency;

- the monitoring methodology;
 - quality assurance processes for the equipment; and
 - the rationale for selecting these monitoring locations.
- 7.5. Further to 5.13, describe and assess the suitability of proposed ambient monitoring of the receiving environment (e.g., watercourse) and operating procedures to meet requirements. Include:
- proposed confirmatory ambient water quality sampling and analysis recommendations, including frequency;
 - proposed toxicity, biologic, or sediment quality monitoring and analysis recommendations, including frequency;
 - quality assurance processes;
 - the rationale for selecting the monitoring locations; and
 - proposed notification and contingency plans in the event access becomes restricted.
- 7.6. Further to 7.2 and 7.5 submit a proposal for a periodic wastewater characterization testing, with comparison to existing data.
- 7.7. For 7.2 to 7.6 describe the record keeping procedures to meet applicable requirements.
- 7.8. For 7.2 to 7.6 describe the reporting procedures to meet applicable requirements.
- 7.9. Confirm in writing that a spill response and reporting plan for the plant or facility has been developed.
- 7.10. Confirm in writing that procedures and plans for storage, treatment, and monitoring systems related to wastewater, runoff, and sludge have been developed. In particular:
- operation and maintenance procedures; and
 - contingency plans for upset, repair, and maintenance periods.
- 7.11. Further to Section 5, confirm in writing that scheduled air emission control equipment maintenance surveillance and repair plans have been developed.
- A groundwater quality monitoring program must be designed and implemented at all approved industrial facilities where there is a risk of impact on groundwater quality from substances released from the activity. Groundwater monitoring is mandatory at facilities listed in Appendix B; however, groundwater monitoring may also be required at other facilities.*
- 7.12. Describe how substance releases to groundwater will be monitored, managed and reported. Provide the rationale for why groundwater monitoring will not be conducted if the activity is not listed in Appendix B.
- 7.13. In addition to the monitoring programs referred to above, describe how any other programs will identify, control, manage, monitor, and report on points of known and potential substance release to the groundwater.

- 7.14. Describe how releases from other media to soil will be monitored, managed, and reported, for example:
- air deposition, such as acid deposition (if any monitoring has been completed under the *Air Monitoring Directive*, provide a summary of the results); and
 - groundwater discharge.
- 7.15. If the plant or facility will accept third-party waste, describe the procedures for:
- acceptance of waste;
 - safe waste transfer at the plant or facility, including procedures for tank hook up, loading, and unloading;
 - labelling of waste drums and prevention of incompatible wastes mixing;
 - completing and tracking storage volumes with respect to capacity (maintaining waste inventory);
 - inspecting secondary containment (leaks), tank integrity, and liner integrity, including a description of the contingency plan for corrective actions;
 - control of contaminants, dust, odours, noise, vectors, vibration, and truck traffic to protect offsite neighbours; and
 - control of site access for the safety of staff and potential trespassers.
- 7.16. Confirm in writing that the applicable methods for classifying and characterizing waste will be used.
- 7.17. For soil storage locations, describe how ongoing protection from contamination and erosion will be provided.
- 7.18. If operator certification is required by legislation for an activity taking place on the site (e.g., landfill operator), or by an industry standard, provide evidence how that requirement is met.

8. Reclamation

When, how, and to what extent is the site going to be returned to equivalent land capability?

What environmental risks or objectives must be addressed solely during the project's reclamation phase?

How will they be addressed or achieved?

In order to fulfil the goals identified in the Environmental Protection and Enhancement Act for pollution prevention, mitigating environment impacts, and not impairing future use of the environment, a facility must be planned, designed, constructed, and operated with final reclamation in mind, and with a view to reclaiming parts of the site, whenever possible, throughout the life of the plant or facility.

This section requires the applicant to address reclamation and decommissioning of the plant or facility and associated active areas, referring to all three components dismantling, remediation of contamination, and reclamation of the surface of the land.

Applicants need to consider their setting and case specific situation in evaluating which portions of this section to fill out and how much detail to provide. For example, some questions may be less relevant for urban versus rural locations, or for agricultural situations versus commercial forestry locations with complex terrains.

*For most sites, such as chemical plants or landfills, substantive reclamation occurs at the end of the plant or facility's lifecycle. In these circumstances, the submission of a **Conceptual Reclamation Plan** outlines the applicant's future strategy regarding considerations specified in this section to identify the current land use and capability and return the site to equivalent land capability.*

*In circumstances where areas of the site will be reclaimed in an on-going manner, such as mining operations, a **Progressive Reclamation Plan** is required to propose the applicant's reclamation approach for review in order to develop appropriate approval conditions.*

Where the land is not owned by the Applicant, such as on public lands, it is particularly important that the applicant consult with affected parties to inform requirements.

For the closure and post-closure of landfills, Alberta Environment and Sustainable Resource Development has specific requirements referenced in Appendix A.

Conceptual Reclamation Plan

- 8.1. Identify and describe the end land-use and land capability ratings. Include:
 - the long-term, end land-use for the site and the surrounding lands, and where applicable, the municipal zoning category (note: where the long term land use is proposed to be restricted and different than the long term land-use in the area, for example, restricting to a commercial or industrial use, the applicant must obtain a written acceptance of the restriction from the municipality before finalizing the reclamation plans);
 - how the land capability ratings of the reclaimed site will be made equivalent to that of the preconstruction state; and
 - implications to wildlife and/or fish habitat.
- 8.2. Describe the proposed reclamation of landform, drainage, and watercourse(s). Include:
 - how they will be integrated with adjacent land use;
 - a plan for re-contouring (post-reclamation topography and landform design); and
 - the stability of slopes and lakes;
- 8.3. Provide a plan for replacing reclaimed soil that is compatible with the end land use. Include:
 - the practices and principles that will be used;
 - method to achieve acceptable soil quantity;

- depth and volume of the replaced soil, and the soil/materials balance, required to achieve reclamation goals;
- method to achieve acceptable chemical and physical soil quality;
- how and where de-compaction will occur (e.g., roads); and
- erosion control methods.

8.4. Provide a plan for revegetating the site. Include:

- type of vegetation and species list;
- seed/seedling source and quality;
- seeding rates, stocking rates (reforestation), and methods;
- weed management;
- fertilization rates and methods;
- wetlands (e.g., establishment of riparian species);
- wildlife habitat;
- time to achieve revegetation; and
- method for measuring revegetation success.

8.5. For releases of wastewater and runoff during and after the reclamation phase, provide the following, as applicable:

- substances of concern and how their potential effects on the environment will be prevented or limited;
- method of release or disposal;
- process flow diagrams with mass balances and flow directions;
- anticipated volumes, rates, and amounts during both normal and upset conditions;
- pertinent calculations and models used;
- support from the literature for innovative treatment systems; and
- monitoring programs for evaluating the performance of the treatment and release systems.

8.6. Describe how all wastes generated during reclamation will be managed.

8.7. Describe how dust, odours, contaminants, and noise will be controlled and monitored to protect offsite neighbours.

8.8. Describe how vapours from any remedial treatment systems will be controlled and monitored.

8.9. Identify the location of existing and planned infrastructure for environmental monitoring during reclamation.

8.10. Describe stakeholder involvement, including who will be involved, at what point(s), and in what manner.

8.11. Provide the contact information and means for which questions or concerns may be directed to the facility prior to and during reclamation activities.

For 8.12 and 8.13,

What environmental risks or objectives must be addressed in circumstances where releases to, or reconstruction of, watercourses during and after reclamation?

How will they be addressed or achieved?

How, and to what extent will the watercourses be returned to previous conditions?

- 8.12.** Describe and assess the effectiveness of alternatives for any proposed “engineered” watercourses (e.g., streams, lakes, wetlands). Include:
- applicable policy or regulatory requirements;
 - prevention or mitigation of interactions between material with adverse chemical properties and proposed watercourse (e.g., leaching into the subsurface, lined ponds);
 - flow regimes;
 - contingencies for failures;
 - contingency treatment;
 - monitoring systems; and
 - the viability of a sustained healthy aquatic ecosystem if proposed as a “compensation” watercourse.
- 8.13.** Evaluate the short and long-term effects of reclamation and recontouring to watercourses. Include:
- onsite surface water quality and quantity and the viability of sustained healthy aquatic ecosystem if proposed as a “compensation” watercourse;
 - nearby watercourses (quality and quantity);
 - onsite and offsite groundwater quality and quantity; and
 - implications to people and ecology in the area.

Progressive Reclamation Plan

- 8.14.** Provide a plan that shows the footprint of disturbed land, presenting each proposed reclamation footprint section, and highlighting its phase of reclamation. Note: on large sites it can be helpful to divide the site into different geographic areas and undertake a phased approach.
- 8.15.** Provide an approximate timeline for each phase of reclamation.
- 8.16.** Describe how progressive reclamation will be maximized to reduce cumulative impact to the site, adjacent lands, and other associated environmental media.
- 8.17.** Identify and describe how reclamation materials will be salvaged and handled during progressive reclamation. Include:
- protocols and equipment that will be used to ensure optimal soil salvage during construction (e.g., suspending and recommencing

topsoil salvage when field conditions will result in the mixing, loss, degradation, or compaction of topsoil);

- depths and horizons of soil planned for salvage;
- special procedures that will be used to address any problem soils, subsoil, and spoil; and
- quality control measures that will be employed during construction. An example might be the use of Professional Agrologists or Foresters.

8.18. Identify and describe how reclamation materials will be stored. Include:

- storage methods (e.g., direct placement, stockpiles, or windrows);
- storage locations, provided on a map;
- method for maintaining access (e.g., separation distances from other objects and stockpiles (preventing encroachment by future activities));
- types of material (e.g., topsoil, subsoil, or spoil); and
- methods to control erosion and prevent degradation of the stored material (e.g., seeding, vegetation, and weed control).

8.19. Address 8.1 to 8.13 for progressive reclamation.

Part 2: Renewals

A Renewal application is required for *Environmental Protection and Enhancement Act* approvals for subsequent periods of continued operation; and is an important component supporting a key principle of continuous improvement supported in *EPEA*. This application provides supporting information for the assessment of the past operating period, lays the foundation for opportunities to improve performance, and identifies actions to meet current regulatory benchmarks.

The renewal also updates the understanding of the setting and environmental conditions with current information, highlighting the nature and degree of changes in environmental risks and pressures over the previous approval period and from original conditions. This update must consider new, or changes to environmental objectives in the local, sub-regional or regional context. These considerations inform the potential need for adaptation of requirements to meet environmental objectives.

Information submitted in this Part is intended to:

- Confirm the nature and condition of equipment used;
- Confirm performance of the equipment and processes, and whether contemporary regulatory benchmarks for design requirements are fulfilled;
- Assess changes in the nature or magnitude of potential risks to achieving environmental outcomes, and of contributing to potential environmental adverse effects in the area of the activity;
- Evaluate performance of operating plans;
- Confirm completion of any coordinated management actions required during the previous approval period; and
- Assess opportunities or obligations to improve on both process and environmental performance in order to:
 - mitigate potential effects, or
 - opportunities for improved design and operation are identified and maximized, and
 - capitalise on new opportunities to work with others.

Potential improvements explored for the Renewal applications may be either to operational procedures, or can be associated with changes to design.

Coordinating Amendment Applications for Changes with Renewal Applications

In circumstances where proposed changes or additions coincide with the expiry of an approval, an application using *Part 2: Renewals*, augmented with the articles of *Part 3: Amendments* to further describe and evaluate the proposed changes in order to make appropriate amendments to the approval. Where the Part 3 articles duplicate requirements of Part 2, only a single response is required.

9. Confirm Applicant Identification

Who is the person legally responsible for the activity?

Who is authorized to represent the person responsible?

How can Alberta Environment and Sustainable Resource Development contact the applicant and any representatives?

Any changes in ownership or legal responsibility of the plant or facility should have been addressed through previous amendments to the approval using the form in Appendix A.

- 9.1. Provide the applicant's name using the Authorization of Application for Approval Form (Appendix A). If an agent is authorized to represent the person responsible, also provide this full name. If the person responsible or agent is a corporation, provide the full Alberta registered name of the corporation.
- 9.2. Provide the mailing address of the person responsible; and the agent's office mailing address, if different.
- 9.3. Confirm the mailing address of the plant or facility where the activity is conducted, and the regional office of the person responsible, if different.
- 9.4. For each contact on the application, provide the following information:
 - name and signature;
 - title and corporate department;
 - telephone number;
 - fax number; and
 - email address.

10. Confirm Plant or Facility Identification

What is the activity and where is it occurring?

- 10.1. Confirm the accuracy of the description of the main activities of the plant or facility with the most suitable classification referenced in the *Activities Designation Regulation*. If additional activities at the site are also classified as regulated activities, provide this description.
- 10.2. Provide the location of the plant or facility. Include:
 - legal land description; and
 - latitude and longitude coordinates.
- 10.3. Provide a map showing the plant or facility's direction and distance to nearby towns, cities, villages, or residences and special areas (e.g., recreation areas, camps, or protected areas), other plants and facilities, and wetlands and watercourses or other potential locations of receptors.

- 10.4. Provide information about the physical size and capacity of the plant or facility site, and the area that has been, or has a reasonable potential to be affected by the activity. Provide maps and scaled diagrams.

11. Update to Project Background

What new or changes to regional initiatives, plans or management frameworks will the project need to consider?

What other regulatory decisions or authorizations are associated with the activity's renewal or any proposed changes? What is the current status of these decision processes?

What new or changes to environmental issues or requirements have been identified in these processes?

Other regulatory authorizations may require renewal or amendment for changes independently from the Environmental Protection and Enhancement Act processes.

Update Plans, Public Interest Decisions, and Regulatory Authorizations (Leases, Licences, Approvals and Permits)

- 11.1. Identify all government approved regional initiatives or plans that pertain to the area with requirements that relate to environment and resource management for the activity, such as Land Use Framework Regional Plans and Management Frameworks, Integrated Resource Plans, Water Management Plans, or Municipal Development Plans.
- 11.2. Related to this project, identify any Hearing results or decisions by:
- the Alberta Energy Regulator (AER);
 - the Alberta Utilities Commission (AUC);
 - the Natural Resources Conservation Board (NRCB);
 - the local Regional Authority or Municipality; or
 - the Canadian Environmental Assessment Agency (CEAA)
- and identify and reference any terms, conditions or commitments that relate to the environment. Staff may request the submission of this information if it cannot be sourced from public records.
- 11.3. Specify the date an Environmental Impact Assessment (EIA) report was accepted by the Director for the purposes of a Hearing in 11.2.
- 11.4. Identify any authorizations related to this project and their date of issuance, such as Leases, Permits or Approvals and their amendments by:
- the Alberta Energy Regulator (AER);
 - the Alberta Utilities Commission (AUC);
 - the Natural Resources Conservation Board (NRCB);
 - the local Regional Authority or Municipality; or

- Alberta Environment and Sustainable Resource Development (ESRD) or the AER for authorizations under the *Environmental Protection and Enhancement Act* (including on-site potable water treatment and use and stormwater runoff), the *Water Act*, the *Climate Change and Emissions Management Act*, the *Public Lands Act*, and the *Forests Act*;

and identify and reference any terms, conditions or commitments for this project that relate to the environment. Staff may request the submission of this information if it cannot be sourced from public records.

- 11.5.** Identify any current *EPEA* applications for other plants or facilities that may require coordination of the renewal process for this activity.

Update Financial Security

Is your financial security sufficient?

- 11.6.** Confirm the amount and the status of the financial security that is required for this activity, by providing the calculation for it, including the assumptions and justification for their use in the calculation. For more information on determining if financial security is required and how to calculate the amount, refer to Appendix A.

Proposed Consultation and, if applicable, Project Timelines for Changes to the Activity

If applicable, when does this proposed project commence, and how long does this proposed project occur?

Have you consulted the public regarding the renewal or any proposed changes?

If changes are proposed to this activity within this Renewal, provide the project schedule information identified below and highlight any proposed engagement for these changes in addition to any proposed engagement for the Renewal.

- 11.7.** Provide project timelines and major milestones. Include:
- Confirmation of activity commencement date;
 - Confirmation of activity duration through to estimated time of operations ceasing and final closure; and
 - If changes are proposed, project duration from initial site prep through to commencement of operation, and:
 - proposed or actual dates for commencement and completion of construction,
 - proposed or actual dates for commencement of operation, and
 - proposed or actual dates for public consultation.

- 11.8. If public consultation or stakeholder engagement has, or will be, conducted outside of this approval renewal process, provide the following information:
- target audience(s);
 - type, purpose, and frequency of consultation or engagement; and
 - identified environmental concerns and how they were, or will be, addressed in this renewal application.

12. Update Current Setting and Environmental Conditions

What is the setting for the activity and what has changed in the setting?
What environmental risks must be addressed and have they changed?
What environmental objectives must be achieved and have they changed?
If changes are proposed for the plant or facility, what are the factors in this setting that will influence the design, construction, operation or reclamation of the facility or plant?

Information and assessment of risks and issues presented in this section of an application will provide the basis for considerations for evaluation and requirements in Sections 13 through 16, ensuring that the proponent is considering the broader implications of the activity in the area throughout its full life cycle.

Updating the activity's geographical setting and its condition, as well as human and biological receptors, informs the nature of current and future environmental issues in the area. This reflects the effects from previous operations, the effectiveness of mitigation measures employed at the facility and supports evaluation in Sections 13 through 16 regarding the potential effects from the activity and any changes to required mitigation measures.

This section's assessment also must identify and assess the consequence of other existing and emerging influences and environmental pressures to environmental conditions in the area, such as other activities and land or water uses.

If a description cannot be sourced from previous public government records regarding the setting and environmental condition of the area prior to the influence of the plant or facility, or from the previous approval operating period, staff may request its submission.

For all requested descriptions, pertinent data and analysed information must be supplied electronically along with referenced sources.

- 12.1. For this section, update the current setting and environmental conditions description, and also assess the facility's contributions to the influences (effects) in the area, highlighting changes over the past approval period.
- 12.2. Describe the current setting and any changes to features of the local and regional landscape, drainage and surface watercourses, and groundwater. Identify and highlight any changes in land use and zoning for the site and adjacent lands, since the last approval period.

12.3. Describe the current ambient air quality and identify influences and environmental pressures within a 5-kilometre radius of the site, and assess any changes over the last approval period. Include:

- topography and elevation;
- any collected ambient air environmental monitoring data at or near the site and its collection location;
- the various environmental influences, effects and trends; and
- all constraints and limiting factors in the receiving environment;

12.4. Provide current soil monitoring results for the site and surrounding lands, and assess changes over the last approval period to:

- land capability class and rating(s);
- soil classification and distribution;
- where the facility will require soil monitoring under the Approval, current results from soil monitoring conducted;
- assess anthropogenic effects on the soil, including previous disturbances, contamination issues, quality and quantity of soil;
- for mine sites include overburden characterization;
- local and regional vegetation types, include:
 - types of vegetation,
 - rare vegetation,
 - weeds (named under the *Weed Control Act*), and
 - health or anthropogenic effects on vegetation due to previous disturbances, air deposition, logging and clearing, etc.; and
- for mine sites and in-situ developments, estimate the volume and describe the type of timber.

12.5 Pre-Disturbance Setting and Condition

If development or disturbance occurred on the location prior to this activity, what was the setting and environmental condition prior to this residential, commercial, or industrial development?

12.5. For the situations identified above, where the end land use is likely to return to a natural, agricultural or forested land, describe the soil and vegetation for the site prior to the previous development or disturbance considering the factors listed in 12.4. This information will guide efforts to monitor and salvage soil material for future reclamation of the site.

12.6. Describe changes over the last approval period to the nature and conditions of wildlife in the area, include the species and their habitats, and identify any sensitive species and special habitats.

12.7. Provide an assessment of the potential impact of substance release on the groundwater quality at the site based on current groundwater monitoring results.

12.8. Describe and evaluate the current setting and condition of on-site and receiving watercourse(s) for the various environmental influences, effects and trends, and highlight any changes over the last approval period. Include:

- associated geological considerations and other pressures;
- local area meteorology, including precipitation;
- runoff coefficients and infiltration rates;
- any collected ambient water quality (characterization) data and their collection location in the receiving watercourse;
- any collected water quantity data and their collection location in the receiving environment;
- any collected biological data to evaluate anthropogenic effects on the aquatic ecosystem and their collection location in the receiving environment;
- any changes to influences or environmental pressures in the area (for example, due to cumulative releases or water use); and
- any changes to constraints or limiting factors in the receiving environment, such as:
 - parameters or locations of concern,
 - requirements for protection,
 - setback distance requirements,
 - water quality, quantity interactions, or
 - any frequency, season, or timing restrictions.

12.9 and 12.10 Irrigation Evaluation and Suitability Pre-Assessment

If waste application or wastewater irrigation has occurred in areas remote to the proposed plant location, were the environmental risks managed and environmental objectives achieved?

For future waste application or wastewater irrigation proposed for areas remote to the plant location, what is the setting for these application or irrigation locations, and what are the factors in these settings that will influence the design and operation of application or irrigation activities?

What environmental risks must be addressed for these additional locations and how will environmental objectives be achieved?

12.9. If waste application or wastewater irrigation has occurred, assess changes to the land, soil, water and groundwater in the application area(s) over the previous approval period.

12.10. For future proposed application locations, describe and evaluate the current properties and suitability of the receiving soil for irrigation/ land application, using applicable guidance, and should include, but not be limited to:

- irrigation classification ratio;
- soil pH and texture;
- water holding field capacity; and

- soil analysis for existing, pre-application, soil concentrations for substances identified in the treated waste or wastewater stream (e.g., salts (EC and SAR), nutrients, metals and major ions).

12.11. For future proposed application locations, describe and evaluate any restrictions to irrigation or land application of waste in the area due to:

- proximity to water wells or high water tables;
- proximity to water bodies, surface drainage areas, or springs;
- proximity to property lines;
- potential public use (e.g., recreational areas, residential developments) exposure;
- potential agricultural use (crop or cattle grazing food consumption) exposure;
- frequency, season, or timing of applications;
- any other identified issues in the area; and
- identify if waivers for setbacks are required and provide signed land owner consent release forms.

12.12. For 12.1 to 12.11, provide the information both aspatially (in tabular form) and spatially in scaled maps, diagrams or annotated aerial photographs. Please identify which information has been sourced from an Airshed organization or Watershed Planning and Advisory Council, and from which monitoring locations.

12.13. For all government regional initiatives or plans identified in 11.1, approved or under development, identify and describe changes over the last approval period to any terms, conditions or commitments that relate to the environment.

12.14. For all government regional initiatives or plans identified in 11.1, approved or under development, describe and highlight any changes to the plant or facility's environmental obligations, potential obligations or opportunities.

13. Design and Equipment Performance Evaluation

What equipment is used at the plant or facility, and highlight modifications over the approval period? What is its condition (i.e. what maintenance or repairs have been completed or are required)?

How effective is the performance of the pollution prevention or control equipment? What performance issues have been identified requiring design resolutions? What equipment or design improvements were completed in the last approval timeframe?

What changes in technology benchmarks must the design now address? What new opportunities for design optimization exist?

The Design and Equipment Performance Evaluation Section assures that an applicant has evaluated the design of a plant or facility for its ability to achieve desired environmental outcomes and meet requirements, as well as evaluates opportunities to improve the design and performance. This assessment includes information regarding:

- the potential environmental risks of the activity due to the activity's processes, materials and substances, layout, and disturbance;
- the effectiveness of the mitigation measures to prevent adverse effects; and
- the ability contribute to meeting required environmental objectives in light of changes to environmental conditions or commitments.

Discussions in this section can highlight efforts such as whether and how:

- current regulatory benchmarks for design requirements are fulfilled or exceeded;
- potential risks or objectives identified in the local environment are anticipated and addressed through design;
- opportunities for improved design and operation are identified and maximized; and
- opportunities or requirements to coordinate management actions are identified and fulfilled.

If current design information cannot be sourced from public government records, staff may request its submission.

Update Equipment Information

13.1. For 13.2 through 13.13, regarding equipment:

- identify changes to equipment and process approved during the last approval period, highlighting both new installations and removed or abandoned equipment; and
- compare the equipment to current technology benchmarks.

13.2. Describe the plant or facility's process and provide a process flow diagram of the specific industrial processes related to the industrial activity. Include both the processing operations (e.g., reactors, distillation, cooling towers, steam generation, compression, sulphur forming.) and the control processes (e.g., landfills, storage infrastructure, surface water runoff controls, industrial wastewater treatment facilities, particulate removal). Include:

- raw materials, products and by-products. Include maximum and normal operating and upset design quantities used or produced per unit of time. Provide all other pertinent capacity measurements for the site;
- major equipment and unit capacities; and
- mass balances.

13.3. Describe the substances that are generated in a typical operating day at the plant or facility. Include:

- for each process stream, examine the substances contained within and:
 - their characterization, including their nature, fate and transport (physical, chemical or biological properties or characteristics), and potential effects on the environment,
 - their quantity used or generated (note range variation in production or due to upsets). Tables in Appendix D and Appendix E can be used as examples for the types of sources of substances,
 - their source of introduction, and
 - the process streams' range of variation due to production changes or upsets;
- from on-site operations, identify the types and quantities of waste that are generated during operation including the type and nature of the waste (including designated hazardous waste) and potential effects on the environment;
- for waste that is accepted at this site, identify:
 - the type and nature of the waste (including designated hazardous waste) and potential effects on the environment,
 - the origin of the waste (i.e., in or out of the province), the sector (domestic, commercial, or industrial), and
 - the anticipated quantity and duration of the storage.

13.4. Provide scale diagrams of the plant or facility site. On the diagrams, identify pollution prevention and control infrastructure and equipment associated with collection and storage of product or feedstock, waste, wastewater, or runoff or permanent disposal (e.g., landfill), and highlight any modification. Include:

- types of buildings and their locations;
- names and locations of all equipment used in manufacturing, processing, storage, and other units;
- location of all aboveground or underground tanks and type of service (e.g., product, feedstock, or waste);
- location of any equipment (e.g., piping) that will be installed subsurface;
- location of all waste management areas (e.g., containment, transfer and acceptance, and processing or treatment areas);
- location of all wastewater or runoff collection control infrastructure, pre-treatment and post-treatment storage areas; and

Compare the performance to that of design.

Materials Storage

13.5. Provide design and specification details (not engineering blueprints) of the control systems.

- For each materials storage, waste management, transfer, or disposal area, include:
 - primary containment method (e.g., tanks, containers),
 - berms, dykes and/or other secondary containment structures (e.g., waste storage liners),
 - special handling or storage methods for hazardous materials,
 - run on/run off controls, and
 - leak detection systems.
- For all aboveground and underground tanks complete Appendix C Form, and identify:
 - tank locations,
 - type of service (e.g., produced water),
 - capacity (m³),
 - material type,
 - type of corrosion protection,
 - foundation or basepad preparation,
 - type and capacity of secondary containment,
 - measures planned to prevent overfilling of tanks (e.g., automatic shutoff valves, or high-level alarms),
 - method of leak detection.
- For each runoff or wastewater management system, identify:
 - collection and control berms, dykes and/or piping and any lining systems,
 - primary containment method (e.g., tanks, ponds),
 - secondary containment structures such as liners, and
 - leak detection systems.

Wastewater and Runoff Treatment and Control

How are wastewater process streams controlled and treated?

13.6. Describe and provide process flow diagrams for the treatment and release control systems for the substances identified in each wastewater stream, with mass balances and flow directions. Include:

- design (normal and upset) volumes, rates, and amounts of each wastewater or runoff stream;

- design (normal and upset) volumes, rates, and amounts of each substance for each stream supported by recent verification of wastewater characterization;
 - description of the physical size, location, and capacity of wastewater treatment systems; and
 - description of the location and method of release (batch or continuous), and control of release (e.g., valves, diffusers, irrigators).
- 13.7. For 13.6, provide a scale diagram, showing the location of treatment facilities and disposal locations (latitude and longitude coordinates) and any site considerations identified in Section 12.
- 13.8. Update water quality dispersion models, and evaluate the ability to meet applicable ambient objectives, guidelines, or standards.

Air Treatment and Control

How are air process streams and emission sources controlled and treated?
See Appendix E.

- 13.9. Describe the application of process technology, environmental control systems, and management practices that are used to minimize substance release directly or indirectly to the environment. Include:
- design (normal and upset) volumes, rates, and amounts of each air emission stream;
 - design (normal and upset) volumes, rates, and amounts of each substance for each stream;
 - description of the physical size, location, and capacity of environmental control units/operations (e.g., air pollution control units); and
 - diagram(s) of the processes, flows, or operation units including engineered drawings.
- 13.10. Using tables as required, provide the following details for any:
- reciprocating or turbine engines;
 - all fired heaters (including space heaters), treaters, and boilers;
 - incinerators; and
 - flare stacks.

Reciprocating or Turbine Engines	Fired heaters, Treaters and Boilers	Incinerator	Flare Stacks
make and model number			
identification designation of each individual unit used at the plant site			
rated power(kW)			
fuel type			
exhaust stack diameter (m)		diameter (m)	diameter (m)
exhaust stack height above grade (m)		height (m)	height (m)
exhaust gas temperature(°C)		exit temperature (°C)	
		-net heating value of gas to be combusted in the flare under normal and emergency conditions	
		exit velocity (m/s) of the flare, under normal and emergency conditions	
-emission rate of the oxides of nitrogen (grams of NOx)/(kW*hr) -SOX	-NOx emissions for each heater, boiler, steam generator, etc. (ppm and g/GJ) -SOX *NPRI, **COPC, and GHG;	- NOx emissions for each incinerator (ppm and g/GJ) -SOX *NPRI, **COPC, and GHG;	-SOX, NPRI
peak height of the building with which each engine is associated			
confirm the engine meets the low NOx emission requirement and/or emissions standard and by what method	confirm the heater, boiler, or steam generator meets the low NOx emission requirement and/or emissions standards		- method used to control combustion, e.g., assisted by air, steam or non-assisted - flare tip design - type of igniter, pilots, etc
*NPRI- National Pollutant release Inventory **COPC- Chemicals of Potential Concern			

13.11. Provide the following details for any active flare pits on site:

- under what conditions is it used;
- type and condition of liner;
- frequency of use, and what goes into the pit; and
- type of flare design (e.g., igniter, pilot).

- 13.12.** Describe all fugitive emissions related to the site. Include:
- types of substances released;
 - source identification;
 - measured and estimated volumes;
 - method of measuring and estimating fugitive emissions; and
 - management approach.
- 13.13.** Describe all significant area, or non-point, emission sources related to the industrial site (e.g., vehicle fleets, ponds, or onsite incineration). Include:
- types of substance released;
 - source identification;
 - measured and estimated volumes;
 - method of measuring and estimating associated emissions; and
 - management approach.
- 13.14.** Provide updated scale diagrams of the plant, plant site, and the surrounding area (highlighting any changes) with regard to air emissions, and include the location and distance between all:
- air emission point sources, including stacks, exhaust stacks, other major sources of release; and
 - monitoring and sampling equipment.
- 13.15.** Update air dispersion models, and evaluate the ability to meet applicable ambient objectives, guidelines, or standards.

Equipment Performance Evaluation

Process Performance

- 13.16.** Evaluate the performance effectiveness of the overall process systems identified in 13.2 and 13.3 to minimize the release of substances or meet improved efficiency in materials or energy use. Compare the performance to that of design predictions. Identify any failures and repairs or maintenance issues, particularly those required to improve reliability to reduce the release of substances.

Materials Storage

- 13.17.** Evaluate the performance effectiveness and reliability of the collections and containment systems identified in 13.5 and identify any failures and repairs or maintenance issues. Compare the performance to that of design predictions.

Wastewater and Runoff Treatment and Control

- 13.18.** Evaluate the performance effectiveness and reliability of the treatment and release systems identified in 13.6 noting any variations from original design

predictions, and identify any failures and repairs or maintenance issues. Compare the performance to that of design predictions.

Air Treatment and Control

- 13.19. Evaluate the performance effectiveness and reliability of the pollution control, treatment and release systems identified in 13.9 noting any variations from original design predictions, and identify any failures and repairs or maintenance issues. Compare the performance to that of design predictions.

14. Operation

How well has the plant operations performance met the environmental objectives? What operating and environmental management systems have been employed and what improvements have been made to these systems?

In the Renewal Application, the applicant uses the Design Section to demonstrate the performance of the equipment over the last approval period. This section is intended to allow the applicant to demonstrate the performance of the various ongoing monitoring and reporting systems, as well as operating, training, management, and maintenance systems contribute to ensure the designed environmental controls have met the stated goals, requirements and limits.

A groundwater quality monitoring program must be designed and implemented at all approved industrial facilities where there is a risk of impact on groundwater quality from substances released from the activity. Groundwater monitoring is mandatory at facilities listed in Appendix B; however, groundwater monitoring may also be required at other facilities.

These system elements are often identified in Standard Operating Procedures, Emergency Response Plans, Maintenance Plans, Monitoring Plans, and Contingency Plans.

Substance History Summary

- 14.1. For 14.2 through 14.4, regarding substance release or acceptance, identify changes in substances of concern during the last approval period.

Waste Handling and Acceptance

- 14.2. For waste previously accepted or generated at this site, provide a summary of:
- the nature of the waste (including designated hazardous waste) and any changes from waste types previously proposed;
 - the origin of the waste (i.e. in or out of the province), the sector (domestic, commercial, or industrial); and
 - the quantity and duration of the storage onsite.

Wastewater and Runoff Treatment and Control

- 14.3. For the previous approval period, using tables and time-series plots, provide a summary of:
- volumes, rates, and amounts of each wastewater or runoff stream; and
 - volumes, rates, and amounts of each substance in each stream.

Air Treatment and Control

- 14.4. For the previous approval period, using tables and time-series plots, provide a summary of:
- volumes, rates, and amounts of each air emission stream including auxiliary or standby equipment; and
 - volumes, rates, and amounts of each substance from each source.

Monitoring Evaluation

- 14.5. For 14.6 through 14.18 regarding monitoring, in addition to evaluating the monitoring effectiveness and reliability during the last approval period, identify changes to monitoring equipment, methods, locations, or quality control.
- 14.6. Evaluate the plant or facility procedures for waste characterization for the ability to satisfy applicable standard methods.
- 14.7. Describe and evaluate the monitoring to assess the performance of collection and storage elements, and any leak detection systems, that has been used for each containment area or tank identified in 13.5.
- 14.8. If the plant or facility continues to accept third-party waste, evaluate the procedures for:
- acceptance of waste;
 - safe waste transfer at the plant or facility, including procedures for tank hook up, loading, and unloading;
 - labelling of waste drums and prevention of incompatible wastes mixing;
 - completing and tracking storage volumes with respect to capacity (maintaining waste inventory);
 - inspecting secondary containment (leaks), tank integrity, and liner integrity, including a description of the contingency plan for corrective actions;
 - control of contaminants, dust, odours, noise, vectors, vibration, and truck traffic to protect offsite neighbours; and
 - control of site access for the safety of staff and potential trespassers.
- 14.9. In addition to the monitoring programs referenced in 14.7 and 14.8, evaluate the effectiveness of other programs in identifying, controlling, managing, monitoring, and reporting on points of known and potential substance release to the groundwater.

- 14.10. Evaluate other release monitoring systems from other media to soil, such as:
- air deposition, such as acid deposition (if any monitoring has been completed under the *Air Monitoring Directive*, provide a summary of the results); and
 - groundwater discharge.
- 14.11. Further to 14.9, provide the rationale for why groundwater monitoring will not be conducted if the facility is not listed in Appendix B or required by the previous approval.
- 14.12. Describe and evaluate monitoring for performance of the treatment, reuse, and wastewater minimization elements identified in 13.6.
- 14.13. Describe and assess the frequency of periodic wastewater characterization for its adequacy to identify changes in each stream.
- 14.14. Identify, describe and evaluate monitoring locations, and the monitoring and assessment systems for the release of treated wastewater (quality, quantity (rates/volumes/amounts) and whole effluent toxicity), identified in 12.8, 13.6 and 13.18.
- 14.15. Describe and evaluate monitoring systems for performance of the treatment and control equipment (source) systems for air substance releases identified in 12.3, 13.9 through 13.14, 13.16 and 13.19.
- 14.16. Describe the maintenance and quality management (operating procedures) used for release monitoring and performance evaluation identified in 14.14 and 14.15.
- 14.17. In relation to releases identified in 14.14, describe and evaluate the effectiveness of ambient monitoring of the receiving environment (e.g., watercourse) and operating procedures in meeting applicable ambient environmental requirements. Include:
- confirmatory ambient water quality sampling and analysis, including frequency;
 - toxicity, biologic, or sediment quality monitoring and analysis, including frequency;
 - quality assurance processes;
 - the monitoring locations; and
 - notification and contingency plans in the event access becomes restricted.
- 14.18. Describe and evaluate the effectiveness of proposed ambient air-monitoring network and associated operating procedures to meet approval requirements. Include:
- location of monitoring;
 - parameters to be monitored;
 - monitoring frequency;
 - monitoring methodology; and
 - quality assurance processes for the equipment.

- 14.19. For monitoring identified in 14.17 and 14.18, if this monitoring is proposed to be jointly delivered, identify the agency or group that will be performing the work (e.g., an airshed zone). Provide the pertinent evaluation information regarding their monitoring network. Highlight any changes in the facility's obligations to the agency or group.

Operating or Maintenance Plans and Reporting Systems and their Record Keeping Systems

- 14.20. Confirm and update the record keeping procedures to maintain copies of the application and correspondence with the AER.
- 14.21. For 14.22 through 14.27 regarding plans, identify changes to plans for record keeping or reporting systems in addition to evaluating their effectiveness and reliability during the last approval period.
- 14.22. For the identified monitoring systems describe and evaluate record keeping procedures and requirements.
- 14.23. For the identified monitoring systems describe and evaluate reporting procedures.
- 14.24. Confirm the use of and evaluate the effectiveness of the spill response and reporting plan for the plant or facility.
- 14.25. Confirm the use of and evaluate the performance of operating and maintenance procedures for storage, treatment, and monitoring systems related to wastewater, runoff, and sludge. Include:
- operation and maintenance procedure; and
 - contingency plans for upset, repair, and maintenance periods.
- 14.26. Confirm the use of and evaluate the performance of the air emission control equipment maintenance surveillance and repair schedules. Include:
- contingency plans for upset, repair, and maintenance periods.
- 14.27. For soil storage locations, evaluate on-going protection approaches for contamination and erosion prevention.
- 14.28. If operator certification is required by the legislation for an activity taking place on the site (e.g., landfill operator) or by an industry standard, provide evidence how that requirement is met.

15. Approval Condition Review and Modifications Proposal

Do approval terms and conditions accurately reflect the requirements for the facility or plant for the next approval period?

Do changes in the Setting and Current Environmental Conditions (Section 12), or environmental objectives (Section 11 and 12); technology benchmarks or performance for equipment (Section 13); or operations (Section 14) warrant changes to the facility's or plant's design or operation?

Are changes required of the plant's design or operation to effectively manage any new substances of concern identified as used in the plant or of concern in the area?

Are changes required of the plant's design or operation to effectively manage any new substances of concern identified as used in the plant or of concern in the area?

Are there new opportunities in the area, or new technologies available?

Is an Amendment application required?

Changes or modifications to the facility or plant's design or equipment (beyond standard performance improvements or corrections) require an amendment. This section of the application should identify the need for any changes and proposes the approach. The applicant then must complete Part 3: Amendment in order to fully describe the proposed amendment, but both elements of the application will be processed together if submitted concurrently.

- 15.1. Describe any alternatives examined in the overall plant or facility processes to optimize efficiency and minimize anticipated substance releases or energy or water consumption and criteria used in selection. Include supporting mass or energy balances.
- 15.2. If operation requires repeated surface disturbances, describe how the footprint on the land will be minimized during continued development (e.g., shared infrastructure and right-of ways, and /or collaborative land management practices, especially on the boundary of the site).
- 15.3. Identify any proposed changes to waste to be accepted at this site, include:
 - the type and nature of the waste (including designated hazardous waste) and potential effects on the environment;
 - the origin of the waste (i.e., in or out of the province), the sector (domestic, commercial, or industrial);
 - the quantity and duration of the storage; and
 evaluate and describe any modifications if required.
- 15.4. Identify any new substances over the previous approval period that are generated in a typical operating day at the plant or facility, and assess new substances of concern. Include:
 - for each process stream, examine the substances contained within:
 - their characterization, including their nature, fate and transport (physical, chemical or biological properties or characteristics), and potential effects on the environment;

- the quantity used or generated (note range variation in production or due to upsets). Tables in Appendix D and Appendix E can be used as examples for the types of sources of substances;
- their source of introduction; and
- the process streams' range of variation due to production changes or upsets.

Wastewater and Runoff Treatment and Control

15.5. Assess, using approaches outlined in Part 1, the suitability and capacity of any proposed changes to treatment and release control systems for any new substances or changed characteristics from original design, for the chosen disposal alternative:

- the method of treatment or control, and method of release or application;
- the effectiveness of the treatment for that substance;
- a modelling run to show the ambient substance concentration both normal operating conditions, and upset conditions; and
- a comparison to applicable guidelines, objectives, or criteria and describe any temporary or permanent environmental effect(s) that may, or will, result from the substances being released.

15.6. For 16.5, provide pertinent data, calculations, and model results.

Air Treatment and Control

15.7. Assess, using approaches in Part 1, the suitability and capacity of the proposed treatment and release control systems for any new substances or changed characteristics from original design to be directly or indirectly released to the air in a typical operating day at the plant or facility. Include:

- the method of treatment or control, and method of release;
- a dispersion-modelling run to show the maximum ground level concentration for substances of concern under both normal operating conditions, and upset conditions;
- a dispersion-modelling run to show the maximum ground level concentration for substances of concern for emergency flaring scenarios, including:
 - rates and composition of flared streams (e.g., inlet stream, acid gas before sulphur recovery unit, tail gas after sulphur recovery unit); and
 - dispersion-modelling run depicting the maximum ground level concentration;

and describe any temporary or permanent environmental effects that may, or will, result from the substances being released to air, include:

- consideration of any unique situations arising from the plant location, size, or capacity; and

- comparison to applicable ambient objectives, guidelines, or standards.

15.8. For air emissions, provide data, calculations, models, and reliable literature sources for each waste stream you propose to release for the associated release or disposal method. Include:

- the volume(s), generated per unit of time, of the release substance;
- concentration of substance(s), and their physical or biological characteristics;
- fate and transport and potential environmental effect(s) of the substance(s);
- discharge rate per unit of time and per unit of production;
- maximum emission rates based on the design of the industrial site;
- typical emission rates based on current operations and throughput of the industrial site;
- whether the discharge or emissions are continuous or intermittent, and the frequency (if intermittent); and
- estimates of seasonal and/or monthly variability for each stream.

16. Reclamation

For Reclamation Completed to Date:

Where, when, how, and to what extent were locations on the site returned to equivalent land capability?

What, and how successfully were, environmental risks or objectives addressed during this reclamation phase?

For Future Reclamation:

When, how, and to what extent is the site going to be returned to equivalent land capability?

What environmental risks or objectives must be addressed solely during the project's reclamation phase?

How will they be addressed or achieved?

In order to fulfil the goals identified in the Environmental Protection and Enhancement Act for pollution prevention, mitigating environment impacts, and not impairing future use of the environment, a facility must be planned, designed, constructed, and operated with final reclamation in mind, and with a view to reclaiming parts of the site, whenever possible, throughout the life of the plant or facility.

This section requires the applicant to address reclamation and decommissioning of the plant or facility and associated active areas, referring to all three components dismantling, remediation of contamination, and reclamation of the surface of the land.

Applicants need to consider their setting and case specific situation in evaluating which portions of this section to fill out and how much detail to provide. For example, some

questions may be less relevant for urban versus rural locations, or for agricultural situations versus commercial forestry locations with complex terrains.

For most sites, such as chemical plants or landfills, substantive reclamation occurs at the end of the plant or facility's lifecycle. In these circumstances, submission of the **Conceptual Reclamation Plan** outlines the applicant's future strategy regarding considerations specified in this section to identify the current land use and capability and return the site to equivalent land capability. If a previous Conceptual Reclamation Plan cannot be sourced from public government records, staff may request its submission. If one has not been previously submitted, prepare one in accordance with Part 1, Section 8 of this Guide. Otherwise, applicants should use this section to update the conceptual reclamation plan at the time of approval renewal.

In circumstances where areas of the site will be reclaimed in an on-going manner, such as mining operations, a **Progressive Reclamation Plan** is required to propose the applicant's reclamation approach for review in order to develop appropriate approval conditions. Applicants should use this section to prepare a summary of the reclamation to date, and update their Progressive Reclamation Plan.

When all, or substantial portions of, a facility or plant site stops operating and needs to be reclaimed, an amendment to the approval to include reclamation requirements is required for the terminated portion of the operation. In the amendment, prepare a **Final Reclamation Plan** in accordance with Part 3, Section 24 of this Guide. In circumstances where part of the plant continues operating, although complete reclamation may be difficult to achieve, reclamation should proceed as far as possible.

Where the land is not owned by the Applicant, such as on public lands, it is particularly important that the applicant consult with affected parties to inform requirements.

For the closure and post-closure of landfills, the AER has specific requirements referenced in Appendix A.

Update Conceptual Reclamation Plan

- 16.1. Confirm or update the end land-use and land capability ratings. Include:
 - the long-term, end land-use for the site and the surrounding lands, and where applicable, the municipal zoning category (note: where the long term land use is proposed to be restricted and different than the long term land-use in the area, for example, restricting to a commercial or industrial use, the applicant must obtain a written acceptance of the restriction from the municipality before finalizing the reclamation plans);
 - how the land capability ratings of the reclaimed site will be made equivalent to that of the preconstruction state; and
 - implications to wildlife and/or fish habitat.
- 16.2. Confirm or update the description of the proposed reclamation of landform, drainage, and watercourse(s). Include:
 - how they will be integrated with adjacent land use;
 - a plan for re-contouring (post-reclamation topography and landform design); and
 - the stability of slopes and lakes.

- 16.3. Confirm or update the plan for replacing reclaimed soil and highlight its ability to meet with current applicable approaches. Include:
- the practices and principles that will be used;
 - method to achieve acceptable soil quantity;
 - depth and volume of the replaced soil, and the soil/materials balance, required to achieve reclamation goals;
 - method to achieve acceptable chemical and physical soil quality;
 - how and where de-compaction will occur (e.g., roads); and
 - erosion control methods.
- 16.4. Confirm or update the plan for revegetating the site and highlight its ability to meet with current applicable approaches. Include:
- type of vegetation and species list;
 - seed/seedling source and quality;
 - seeding rates, stocking rates (reforestation), and methods;
 - weed management;
 - fertilization rates and methods;
 - wetlands (e.g., establishment of riparian species);
 - wildlife habitat;
 - time to achieve revegetation; and
 - method for measuring revegetation success.
- 16.5. For releases of wastewater and runoff during and after the reclamation phase, update the following, as appropriate:
- substances of concern and how their potential effects on the environment will be prevented or limited;
 - method of release or disposal;
 - process flow diagrams with mass balances and flow directions;
 - anticipated volumes, rates, and amounts during both normal and upset conditions;
 - pertinent calculations and models used;
 - support from the literature for innovative treatment systems; and
 - monitoring programs for evaluating the performance of the treatment and release systems.
- 16.6. Confirm or update the description of how all wastes generated during reclamation will be managed.
- 16.7. Confirm or update the description of how dust, odours, contaminants, and noise will be controlled and monitored to protect offsite neighbours.
- 16.8. Confirm or update the description of how vapours from any remedial treatment systems will be controlled and monitored.

- 16.9. Update the location of existing and planned infrastructure for environmental monitoring during reclamation.
- 16.10. Confirm or update the description of stakeholder involvement, including who will be involved, at what point(s), and in what manner.
- 16.11. Provide the contact information and means for which questions or concerns may be directed to the facility prior to, and during, reclamation activities.

For 16.12 and 16.13,

What environmental risks or objectives must be addressed in circumstances where releases to, or reconstruction of, watercourses during and after reclamation?

How will they be addressed or achieved?

How, and to what extent will the watercourses be returned to previous conditions?

- 16.12. Describe and assess the effectiveness of any new alternatives for any proposed “engineered” watercourses (e.g., streams, lakes, wetlands). Include:
 - policy or regulatory requirements;
 - prevention or mitigation of interactions between material with adverse chemical properties and proposed watercourse (e.g., leaching into the subsurface, lined ponds);
 - flow regimes;
 - contingencies for failures;
 - contingency treatment;
 - monitoring systems; and
 - the viability of a sustained healthy aquatic ecosystem if proposed as a “compensation” watercourse.
- 16.13. Update the evaluation of the short and long-term effects of reclamation and recontouring to watercourses to:
 - onsite surface water quality and quantity and the viability of sustained healthy aquatic ecosystem if proposed as a “compensation” watercourse;
 - nearby watercourses (quality and quantity);
 - onsite and offsite groundwater quality and quantity; and
 - implications to people and ecology in the area.

Evaluate Progressive Reclamation to Date

Where, when, how, and to what extent were locations on the site returned to equivalent land capability?

What, and how successfully were, environmental risks or objectives addressed during this reclamation phase?

- 16.14. Provide a plan that shows the footprint of reclaimed land to date.
- 16.15. Evaluate the performance effectiveness of the reclamation methods and control systems in 16.14, noting any variations from original plans and approvals for these changes. Identify any failures or changes to respond to issues.

Update Progressive Reclamation Plan

For Future Reclamation:

When, how, and to what extent is the site going to be returned to equivalent land capability?

What environmental risks or objectives must be addressed solely during the project's reclamation phase?

How will they be addressed or achieved?

- 16.16. Update the plan that shows the footprint of disturbed land, presenting each proposed reclamation footprint section, and highlighting its phase of reclamation. Note: on large sites it can be helpful to divide the site into different geographic areas and undertake a phased approach.
- 16.17. Provide an approximate timeline for each future phase of reclamation and note any changes from those previously proposed.
- 16.18. For 16.19 through 16.22 regarding progressive reclamation, identify proposed changes to equipment, methods, or end points from the previous Progressive Reclamation Plan.
- 16.19. Update how progressive reclamation will be maximized to reduce cumulative impact to the site, adjacent lands, and other associated environmental media.
- 16.20. Confirm or update how reclamation materials will be salvaged and handled during progressive reclamation and highlight the ability to meet with current applicable approaches. Include:
- protocols and equipment that will be used to ensure optimal soil salvage during construction (e.g., suspending and recommencing topsoil salvage when field conditions will result in the mixing, loss, degradation, or compaction of topsoil);
 - depths and horizons of soil planned for salvage;
 - special procedures that will be used to address any problem soils/subsoil/spoil; and
 - quality control measures that will be employed during construction. An example might be the use of Professional Agrologists or Foresters.

- 16.21. Confirm or update how reclamation materials will be stored and highlight the ability to meet with current applicable approaches. Include:
- storage methods (e.g., direct placement, stockpiles, or windrows);
 - storage locations, provided on a map;
 - method for maintaining access (e.g., separation distances from other objects and stockpiles; preventing encroachment by future activities);
 - types of material (e.g., topsoil, subsoil, or spoil); and
 - methods to control erosion and prevent degradation of the stored material (e.g., seeding, vegetation, and weed control).
- 16.22. Address 16.1 to 16.13 for progressive reclamation.

Part 3: Amendments

An amendment application is required when an applicant proposes to change the activity and therefore its classification, or proposes to change the processes, and/or the equipment used for the activity. It must evaluate:

- the potential risks to achieving environmental outcomes, and of contributing to potential environmental adverse effects due to changing substances, or quantities of substances, and their potential release to the environment;
- any change in mitigation requirements; and
- new opportunities to improve performance or work with others.

In general an amendment is required for modifications to the activity such as a product change, an expansion of the activity, or a change in processing equipment that alters the composition of or the point of releases to air, land, or water.

In circumstances where proposed changes or additions coincide with the expiry of an approval, an application using *Part 2: Renewals*, augmented with the articles of *Part 3: Amendments* to further describe and evaluate the proposed changes in order to make appropriate amendments to the approval. Where the Part 3 articles duplicate requirements of Part 2, only a single response is required.

In circumstances where proposed changes or additions to the site are of sizeable magnitude, and significant new elements or environmental considerations must be reviewed, an application using *Part 1: New Plants and Facilities* may be more appropriate than using this Part of the Guide.

Amendment Applications to Transfer Responsibility for the Approval

In the event of a transfer of an activity from one corporate entity to another, an amendment is required by legislation to be completed, which can be accomplished using the form contained in Appendix A. However both parties involved in the transfer of responsibility should review all the applicable authorizations, licences, and approvals to ensure requirements have been considered in the transfer of responsibilities. It is the new approval holder's responsibility to maintain records and supporting information for the plant or facility that will be expected in approval conditions and future applications.

Amendment Applications to Change from Operating Phase to Reclamation Phase

The amendment required to initiate the final reclamation phase of an activity includes submitting the Final Reclamation Plan. This phase usually takes place at the end of the lifecycle for the activity. This plan covers dismantling, remediation, and surface feature reclamation. The approval for this activity phase changes focus from operating to a return to an equivalent land capability, restoring the site to pre-construction state or to that of its next use.

17. Confirm Applicant Identification

Who is the person legally responsible for the activity?
Who is authorized to represent the person responsible?
How can Alberta Environment and Sustainable Resource Development contact the applicant and any representatives?

- 17.1. Provide the applicant's name using the Authorization of Application for Approval Form (Appendix A). If an agent is authorized to represent person responsible, also provide this full name. If the person responsible or agent is a corporation, provide the full Alberta registered name of the corporation.
- 17.2. Provide the mailing address of the person responsible; and the agent's office mailing address, if different.
- 17.3. Confirm the mailing address of the plant or facility where the activity is conducted, and the regional office of the person responsible, if different.
- 17.4. For each contact on the application, provide the following information:
 - name and signature;
 - title and corporate department;
 - telephone number;
 - fax number; and
 - email address.
- 17.5. For amendments that are solely for the transfer of responsibility of the approval holder to a new entity fill out the special form in Appendix A.

18. Confirm Plant or Facility Identification

What is the activity and where is it occurring?

- 18.1. Describe the main activities of the plant or facility with the most suitable classification referenced in the *Activities Designation Regulation*. If additional activities at the site are also classified as regulated activities, provide this description. Highlight if the proposed changes to the facility affect the classification of the plant or facility.
- 18.2. Provide the location of the plant or facility. Include:
 - legal land description; and
 - latitude and longitude coordinates.
- 18.3. Provide a map showing the direction and distance of the plant or facility to nearby towns, cities, villages, or residences and special areas (e.g., recreation areas, camps or protected areas), other plants and facilities, and wetlands or watercourses or other potential locations of receptors.

- 18.4. Provide information about the physical size and capacity of the plant or facility site and the area that has been, or has a reasonable potential to be affected by the activity. Provide maps and scaled diagrams.

19. Project Background for the Proposed Changes

What new or changes in regional initiatives, plans, or management frameworks will the project need to consider?

What other regulatory decisions and authorizations are required for this proposed project? What is the current status of these decision processes?

What environmental issues or requirements have been identified these other decisions and authorizations?

Update Plans, Public Interest Decisions, and Regulatory Authorizations (Leases, Licences, Approvals and Permits) In Relation to the Proposed Changes

- 19.1. Identify all government approved regional initiatives or plans that pertain to the area with requirements that relate to environment and resource management for the proposed changes to the activity, such as Land Use Framework Regional Plans and Management Frameworks, Integrated Resource Plans, Water Management Plans, or Municipal Development Plans.
- 19.2. Related to the proposed changes identified in this application, identify any Hearing results or decisions which set or modify the environmental requirements by:
- the Alberta Energy Regulator (AER);
 - the Alberta Utilities Commission (AUC);
 - the Natural Resources Conservation Board (NRCB);
 - the local Regional Authority or Municipality; or
 - the Canadian Environmental Assessment Agency (CEAA)
- and identify and reference any of these terms, conditions or commitments for this project that relate to the environment. Staff may request the submission of this information if it cannot be sourced from public records.
- 19.3. Specify the date an Environmental Impact Assessment (EIA) report was accepted by the Director for the purposes of a Hearing identified in 19.2.
- 19.4. Identify any authorizations related to the proposed changes identified in this application and their date of issuance, such as Leases, Permits or Approvals and their amendments by:
- the Alberta Energy Regulator (AER);
 - the Alberta Utilities Commission (AUC);
 - the Natural Resources Conservation Board (NRCB);
 - the local Regional Authority or Municipality; or

- Alberta Environment and Sustainable Resource Development (ESRD) or the AER for authorizations under the *Environmental Protection and Enhancement Act* (including on-site potable water treatment and use and stormwater runoff), the *Water Act*, the *Climate Change and Emissions Management Act*, the *Public Lands Act*, and the *Forests Act*;

and identify and reference any terms, conditions or commitments for this project that relate to the environment. Staff may request the submission of this information if it cannot be sourced from public records.

Changes to Financial Security due to the Proposed Changes

Is your financial security sufficient?

- 19.5. For activities that require financial security, identify if the amount is affected by the proposed change. Provide an updated calculation for security, and include the assumptions and justification for their use in the calculation. For more information on determining if financial security is required and how to calculate the amount, refer to Appendix A.

Project Timelines and Consultation for the Proposed Changes

When does this proposed project commence, and how long does this proposed project to modify the activity occur?

Have you consulted the public regarding the proposed changes?

- 19.6. Provide proposed project or estimate timelines and major milestones for the proposed changes. Highlight any significant schedule constraints or considerations. Include:
- project duration from initial site preparation through to estimated time of operations ceasing and final closure;
 - proposed or actual dates for commencement and completion of construction;
 - proposed or actual dates for commencement of operation;
 - expected impacts on the overall activity lifespan; and
 - proposed or actual dates for public consultation.
- 19.7. If public consultation or stakeholder engagement has been, or will be, conducted outside of this approval amendment process for the proposed changes, provide the following information:
- target audience(s);
 - type, purpose, and frequency of consultation or engagement; and
 - identified environmental concerns and how they were, or will be, addressed in the project design.

20. Update Applicable Elements of the Current Setting and its Environmental Condition

What is the setting for the activity and what has changed in the setting?

What are the factors in this setting that will influence the proposed changes to the design, construction, operation or reclamation of the facility or plant?

What changes to, or new, environmental risks or objectives will the proposed changes to the design and operation of the plant or facility need to mitigate or address?

Information and assessment of risks and issues presented in this section provides the basis for considerations for evaluation and requirements in Sections 23 through 25, ensuring that the proponent is considering the broader implications of the activity in the area throughout its full life cycle.

Updating the activity's geographical setting and its condition, as well as human and biological receptors with information and considerations applicable to the nature of the proposed changes, informs the nature of current and future environmental issues in the area. This reflects the effects from previous operations, the effectiveness of mitigation measures employed at the facility. The information supports evaluation in Sections 23 through 25 regarding the potential effects from the proposed changes to the activity, the required mitigation measures, and the likely long-term, end land use after the site is reclaimed.

This section's assessment also must identify and assess the consequence of other existing and emerging influences and environmental pressures to environmental conditions in the area, such as other activities and land or water uses, focused on information applicable to the nature of the proposed changes.

The applicant can use the questions in this Guide's Part 1, Section 4: Current State of the Environment to ascertain, in light of the proposed changes, what new information or updated information will be required to inform the evaluation of potential effects.

If a description cannot be sourced from previous public government records regarding the setting and environmental condition of the area prior to the influence of the plant or facility, or from the previous approval operating period, staff may request its submission.

For all requested descriptions, pertinent data and analysed information must be supplied electronically and sources referenced.

- 20.1. Identify which aspects of the setting or environmental conditions require updating based on the proposed changes to the activity (for example, new substance of concern, or nature of release).
- 20.2. Describe the current setting and current environmental conditions for these aspects.
- 20.3. For all government regional initiatives or plans identified in 19.1, approved or under development, identify and comment on changes over the last approval period to any terms, conditions or commitments that relate to the environment.
- 20.4. For all government regional initiatives or plans identified in 19.1, approved or under development, describe and highlight any changes to the plant or facility's obligations, potential obligations or opportunities.

21. Proposed Changes to Design and Operation

What environmental risks must the design of the proposed changes address and how will environmental objectives be achieved?

What performance issues have been identified requiring design resolutions? What equipment or system design improvements are required?

What changes in technology benchmarks must the design now address? What new opportunities for design optimization exist?

The Design Section assures that an applicant has evaluated the design its ability to achieve desired environmental outcomes and meet requirements in light of the modification proposed to the plant or facility, as well as evaluates opportunities to improve the design and performance. This assessment includes information regarding:

- the potential environmental risks of the activity due to modifications to or expansion of the activity's processes, materials and substances, layout, and disturbance;
- the effectiveness of the proposed mitigation measures to prevent adverse effects; and
- the ability contribute to meeting required environmental objectives, or changes environmental conditions or commitments.

This review shall include changes in existing treatment or control processes even if the physical structure of these release points does not change. For example, if a modified process uses a new chemical and the flow from that process enters the wastewater treatment system, the impact on the treatment process and the effect of the treated wastewater release shall be evaluated.

Discussions in this section can highlight efforts such as whether and how:

- current regulatory benchmarks for design requirements are fulfilled or exceeded;
- potential risks or objectives identified in the local environment are anticipated and addressed through design;
- opportunities for improved design and operation are identified and maximized; and
- opportunities or requirements to coordinate management actions are identified and fulfilled.

If current design information cannot be sourced from public government records, staff may request its submission.

- 21.1.** Highlight and describe the proposed changes to the plant or facility's process and provide a process flow diagram of the specific industrial processes related to the proposed change in industrial activity. Include both the processing operations (e.g., distillation, cooling towers, steam generation, compression, sulphur forming) and the control processes (e.g., landfills, storage infrastructure, surface water runoff controls, industrial wastewater treatment facilities, particulate

removal). The changes need to be described as both the incremental changes and resulting total releases from the previous application and shall include:

- raw materials, products and by-products. Include maximum and normal operating and upset design quantities used or produced per unit of time. Provide all other pertinent capacity measurements for the site;
- major equipment and unit capacities; and
- mass balances.

21.2. Describe the proposed changes in the nature or type of substances that will be generated in a typical operating day at the plant or facility, and explain both the incremental change and the projected totals. Include:

- for each process stream affected, examine the substances contained within and:
 - their characterization, including their nature, fate and transport (physical, chemical or biological properties or characteristics), and potential effects on the environment,
 - their quantity used or generated (note range variation in production or due to upsets). Tables in Appendix D and Appendix E can be used as examples for the types of sources of substances,
 - their source of introduction, and
 - the process streams' range of variation due to production changes or upsets;
- from on-site operations, the types and quantities of waste that will be generated during operation including the type and nature of the waste (including designated hazardous waste) and potential effects on the environment;
- for waste that will be accepted at this site, identify:
 - the type and nature of the waste (including designated hazardous waste) and potential effects on the environment,
 - the origin of the waste (i.e., in or out of the province), the sector (domestic, commercial, or industrial), and
 - the anticipated quantity and duration of the storage.

21.3. Describe any alternatives examined in the proposed changes to the overall plant or facility processes to optimize efficiency and minimize anticipated substance releases and/or waste generation and criteria used in selection. Include supporting or energy balances.

21.4. Describe how the proposed project's overall footprint on the land will be minimized (e.g., shared infrastructure and right-of ways, and /or collaborative land management practices, especially on the boundary of the site and/or waste minimization).

- 21.5. Provide scale diagrams of the plant or facility site and highlight changes required for this amendment application. On the diagrams, identify changes to pollution prevention and control infrastructure and equipment associated with collection and storage of product or feedstock, waste, wastewater, or runoff or permanent disposal (e.g., landfill). Include:
- types of buildings and their locations;
 - names and locations of all equipment used in manufacturing, processing, storage, and other units;
 - location of all aboveground or underground tanks and type of service (e.g., product, feedstock, or waste);
 - location of any equipment (e.g., piping) that will be installed subsurface;
 - location of all waste management areas (e.g., containment, transfer and acceptance, and processing or treatment areas); and
 - location of all wastewater or runoff collection control infrastructure, pre-treatment and post-treatment storage areas.

Proposed Changes to Materials Storage

- 21.6. Provide and assess design and specification details (not engineering blueprints) of the proposed changes to control systems.
- For each materials storage, waste management, transfer, or disposal area, include:
 - primary containment method (e.g., tanks, containers),
 - berms, dykes and/or other secondary containment structures (e.g., waste storage liners),
 - special handling or storage methods for hazardous materials,
 - run on/run off controls, and
 - leak detection systems;
- and assess the suitability for the quantity and characterization of waste, and identify any design features to manage incompatibility of substances, such as segregation.
- For all aboveground and underground tanks, complete Appendix C Form, and identify:
 - tank locations,
 - type of service (e.g., produced water),
 - capacity (m³),
 - material type,
 - type of corrosion protection,
 - foundation or basepad preparation,
 - type and capacity of secondary containment,

- measures planned to prevent overfilling of tanks (e.g., automatic shutoff valves, or high-level alarms), and
- method of leak detection;

and assess the suitability of each tank and associated control systems for its content.

- For each runoff or wastewater management system, identify:
 - collection and control berms, dykes and/or piping and any lining systems,
 - primary containment method (e.g., tanks, ponds),
 - secondary containment structures such as liners, and
 - leak detection systems;

and assess the suitability for the volume and rate of each wastewater generated during normal and upset conditions (or runoff events), as well as the suitability for each wastewater stream's characterization.

- 21.7.** Describe any proposed changes to the monitoring to evaluate the performance of collection and storage elements, and any leak detection systems, that will be used for each containment area or tank identified in 21.6. Include both new and impacted existing areas.

Proposed Changes to Wastewater and Runoff Treatment and Control

What changes in substances or treatment processes are proposed to existing wastewater treatment systems?

What new wastewater process streams (including runoff and domestic wastewater) are proposed and how will they be minimized or treated to meet release requirements?

What new wastewater treatment processes are proposed?

For runoff see Appendix F.

- 21.8.** Describe and provide process flow diagrams for the proposed changes to the existing treatment and release control systems for the substances identified in each wastewater stream, with mass balances and flow directions. Explain both the incremental change and the projected totals. Include:

- wastewater reuse or minimization opportunities;
- anticipated volumes, rates, and amounts of each wastewater or runoff stream during:
 - predicted normal conditions (average daily/monthly volumes) and upset conditions,
 - predicted rainfall events (maximum daily/monthly volumes),
 - substances for each wastewater stream, their normal and maximum concentrations per unit of time and per unit of production, and the predicted duration of maximum concentrations, and

- substance fate and transport (physical, chemical or biological properties or characteristics), and potential effects on the environment;
- description of the physical size, location, and capacity of wastewater treatment systems along with:
 - explored alternatives and proposed method of treatment (including batch or continuous) and considerations for both normal and upset conditions, and
 - proposed location and method of release (batch or continuous), and control of release (e.g., valves, diffusers, irrigators).

21.9. Assess the suitability and capacity of the proposed changes to the existing treatment and release control systems for the substances identified in each wastewater stream, and for each proposed disposal alternative:

a) For releases to watercourses,

- use approved models to evaluate the potential effects in the environment for the following watercourse scenarios:
 - normal and maximum concentrations of substances in, and volumes of, wastewater to be released,
 - low and normal watercourse flow conditions, and normal and maximum background concentrations of substances as identified in the evaluations in Section 20,
 - if runoff or wastewater re-use is proposed, model the effect of the reduced return flow on the quantity and quality of the receiving environment, and
 - use benchmark or bench scale testing to establish the anticipated chronic and acute whole effluent toxicity for normal and maximum resulting modelled concentrations;
- discuss proposed responses to potential implications identified in Section 20:
 - of all substances of concern in the area, and/or identify any needs for conditional limits (e.g., for low flows or upset conditions),
 - to upstream and downstream releases (effects due to cumulative loads), potential impacts on the nearest water users, and implications to any identified areas of ecological sensitivity or public concern,
 - any additional research, ambient or biological monitoring, treatment optimization, or modifications to the release location, that are necessary to ensure that environmental objectives can be met, and
 - propose contingency plans for treated wastewater streams that do not meet applicable receiving environment condition requirements;

and describe how compliance with the applicable technology benchmarks and methods for watercourse policies, criteria, objectives, restrictions, environmental guidelines and any applicable regional outcomes will be achieved.

- b) For proposed wastewater, runoff or sludge releases to land,
 - using the treated wastewater or sludge characterization, calculate the required application rates and describe the technologies to manage considerations identified in Section 20 in accordance with applicable policy and soil criteria; and
 - assess how locations will be rotated to achieve application frequency restrictions.
 - c) For wastewater or runoff disposal by deepwell injection,
 - assess wastewater treatment alternatives, and specify reasons for selecting deepwell injection; and
 - identify the proposed deepwell disposal receiving site and confirm they are authorized to receive this type of wastewater.
 - d) For wastewater or runoff release to municipal facilities or sludges to landfills,
 - provide information regarding the proposed receiving municipal wastewater or stormwater system or landfill, including:
 - their acceptance letter and any requirements imposed,
 - their *EPEA* approval number, and
 - a screening assessment of their treatment system's ability to treat and monitor for the substances identified in the proposed industrial activity.
- 21.10. For the systems identified in 21.8 and 21.9, provide a scale diagram, showing any proposed changes to the location of treatment facilities and disposal locations (latitude and longitude coordinates) with consideration of factors identified in Section 20.
- 21.11. For the systems identified in 21.8 and 21.9, describe any proposed changes to monitoring for performance evaluation of the treatment, reuse, and wastewater minimization elements.
- 21.12. For 21.8 to 21.10, identify any changes in locations and describe any proposed changes to monitoring and evaluation of the quality, quantity (rates/volumes/amounts) and whole effluent toxicity, for the release of treated wastewater.
- 21.13. Identify and describe any proposed changes to the location or to the monitoring and evaluation of any ambient monitoring (ambient water quality, biological, or soil).
- 21.14. For the systems identified in 21.8 and 21.9, provide data, calculations, models, and reliable literature sources for each wastewater stream proposed for release and the associated release or disposal method.

Proposed Changes to Air Treatment and Control

What changes in substances or treatment processes or control systems are proposed for air process streams and emission sources?

See Appendix E.

21.15. Referencing 21.1 and 21.2, describe the proposed changes in the nature or types of substances that will be directly or indirectly released to the air in a typical operating day at the plant or facility, and include:

- the source of each substance, and its change in quantity and total quantity, to any component streams that will contribute to the air emission streams, including auxiliary or standby process equipment;
- each substance's physical, chemical or biological characteristics, fate and transport and potential environmental effect(s); and
- the proposed method of treatment or control, and method of release.

21.16. For each air emission stream that is proposed in this application to change, identify:

- the volume(s) and concentrations generated, per unit time, of the release substance;
- normal and maximum emission rate per unit time and per unit of production based on the design and throughput of the industrial site;
- whether the emissions are continuous or intermittent, and the frequency (if intermittent); and
- estimates of seasonal and/or monthly variability for each stream.

21.17. Describe proposed modifications to the application of process technology, environmental control systems, and management practices that will be used to minimize substance release to the environment, and include:

- description of the physical size, location, and capacity of environmental control units/operations (e.g., air pollution control units);
- diagram(s) of the processes, flows, or operation units including engineered drawings, see and update Appendix E;
- alternative processes and technologies for the release of substances that have been evaluated, and a rationale for their exclusion;
- all applicable industry standards, guidelines, and practices, as well as the manner in which the design and operation will achieve these; and
- examples of similar, or typical, environmental approvals that have been issued either locally or in other jurisdictions.

21.18. Using tables as required, provide the update the following details for all:

- reciprocating or turbine engines;
- all fired heaters (including space heaters), treaters, and boilers;
- incinerators; and
- flare stacks.

Reciprocating or Turbine Engines	Fired heaters, Treaters and Boilers	Incinerator	Flare Stacks
make and model number			
identification designation of each individual unit used at the plant site			
rated power(kW)			
fuel type			
exhaust stack diameter (m)		diameter (m)	diameter (m)
exhaust stack height above grade (m)		height (m)	height (m)
exhaust gas temperature(°C)		exit temperature (°C)	
			-net heating value of gas to be combusted in the flare under normal and emergency conditions
exhaust gas velocity (m/s)			exit velocity (m/s) of the flare, under normal and emergency conditions
-emission rate of the oxides of nitrogen (grams of NOx)/(kW*hr) -SOX	-NOx emissions for each heater, boiler, steam generator, etc. (ppm and g/GJ) -SOX *NPRI, **COPC, and GHG;	- NOx emissions for each incinerator (ppm and g/GJ) -SOX *NPRI, **COPC, and GHG;	-SOX, NPRI
peak height of the building with which each engine is associated			
confirm the engine meets the low NOx emission requirement and/or emissions standard and by what method	confirm the heater, boiler, or steam generator meets the low NOx emission requirement and/or emissions standards		- method used to control combustion, e.g., assisted by air, steam or non-assisted - flare tip design - type of igniter, pilots, etc
*NPRI- National Pollutant release Inventory **COPC- Chemicals of Potential Concern			

21.19. Provide the following details for any changes to flare pits on site:

- under what conditions is it used;
- type of proposed liner;
- frequency of use, and what goes into the pit; and
- type of flare design (e.g., igniter, pilot).

- 21.20. Describe all proposed changes in fugitive emissions related to the site. Include:
- types of substances released;
 - source identification;
 - measured and estimated volumes;
 - method of measuring and estimating fugitive emissions; and
 - management approach.
- 21.21. Describe all changes in area, or non-point, emission sources related to the industrial site (e.g., vehicle fleets, ponds, or onsite incineration). Include:
- types of substance released;
 - source identification;
 - measured and estimated volumes;
 - method of measuring and estimating associated emissions; and
 - management approach.
- 21.22. Assess the suitability and capacity of the proposed changes to treatment and release control systems using a dispersion-modelling run to show the maximum ground level concentration:
- for substances of concern under both normal operating conditions, and upset conditions;
 - for emergency flaring scenarios, including:
 - rates and composition of flared streams (e.g., inlet stream, acid gas before sulphur recovery unit, tail gas after sulphur recovery unit), and
 - dispersion-modelling run depicting the maximum ground level concentration;
 and describe any temporary or permanent environmental effects that may, or will, result from the substances being released to air, include:
 - consideration of any unique situations arising from the plant location, size, or capacity, and
 - comparison to applicable ambient objectives, guidelines, or standards.
- 21.23. Provide updated scale diagrams of the plant, plant site, and the surrounding area (highlighting changes) with regard to air emissions, and include the location and distance between all:
- air emission point sources, including stacks, exhaust stacks, all other discharge points; and
 - monitoring and sampling equipment.
- 21.24. For 21.17 to 21.22, describe proposed changes to the existing monitoring or proposal for new monitoring for performance evaluation of the modified or new treatment and control equipment (source) systems.
- 21.25. Identify and describe any proposed changes to the location or to the monitoring and evaluation of the ambient air quality.

21.26. For air emissions, provide data, calculations, models, and reliable literature sources for each wastewater stream you propose to release for the associated release or disposal method. Include:

- the volume(s), generated per unit of time, of the release substance;
- concentration of substance(s), and their physical or biological characteristics;
- fate and transport and potential environmental effect(s) of the substance(s);
- discharge rate per unit of time and per unit of production;
- maximum emission rates based on the design of the industrial site;
- typical emission rates based on current operations and throughput of the industrial site;
- whether the discharge or emissions are continuous or intermittent, and the frequency (if intermittent); and
- estimates of seasonal and/or monthly variability for each stream.

Assessment of Proposed Construction Considerations

What environmental risks or objectives must be addressed solely during project's construction phase?

How will they be addressed or achieved?

How will reclamation materials be conserved and stored for future reclamation of the site?

Information submitted in this section is intended to identify and evaluate pollution prevention and environmental management requirements during the construction phase of the project, as well as describe the conservation or preservation of reclamation materials.

Smaller operations often do not have extended construction operations, therefore requirements concerning wastewater or air releases during this phase may not be substantial.

Proposed Changes to Operations

What new, or changes to existing, operating and environmental management systems are proposed?

This section requires the applicant to evaluate the need for, and propose changes to, the various on-going monitoring and reporting systems, as well as operating, training, management, and maintenance systems because they contribute to ensure the designed environmental controls have met the stated environmental goals, requirements and limits.

A groundwater quality monitoring program must be designed and implemented at all approved industrial facilities where there is a risk of impact on groundwater quality from substances released from the activity. Groundwater monitoring is mandatory at facilities listed in Appendix B; however, groundwater monitoring may also be required at other facilities.

These system elements are often identified in Standard Operating Procedures, Emergency Response Plans, Maintenance Plans, Monitoring Plans, and Contingency Plans.

Staff may request the submission of this information if it cannot be sourced from public records.

- 21.27. Describe and evaluate proposed changes to be made to the identified existing monitoring programs, operating procedures, management systems, emergency preparation, and contingency plans.
- 21.28. Describe and evaluate any new proposed monitoring programs, operating procedures, management systems, emergency preparation, and contingency plans.

22. Amended or Final Reclamation Plan

When, how, and to what extent is the site going to be returned to equivalent land capability?

What environmental risks or objectives must be addressed solely during the project's reclamation phase?

How will they be addressed or achieved?

In circumstances where proposed changes as part of a renewal or amendment transition substantial land footprint area to reclamation phases, the applicant should consider additional articles below, for dismantling and decontamination in particular, in amending and updating their Conceptual or Progressive Plan.

When preparing the Final Reclamation Plan, utilize existing information as much as possible. In some cases, considerable knowledge of the soil and groundwater conditions may have been built up during the operating life of the facility, which will help to develop a comprehensive Final Reclamation Plan. In cases where information regarding the conditions may not be known on all, or part, of the site, the reclamation plan must include a strategy to obtain this information. It is important to report the status of reclamation, including work that is completed, in progress, and planned for the future.

Staff may request the submission of this information if it cannot be sourced from public records.

Unless ongoing operations are to continue at a facility or plant, it is uncommon for reclamation activities to maintain ongoing point source releases to air or water, therefore few questions are related to this subject in this section of the Guide. However, if ongoing releases are proposed to continue to be associated with this site, or unresolved issues for air and/or water remain from the operating stage, then the application must address and include a description of these factors. Pertinent questions from the Part 3 of this Guide can be used to assist evaluating these releases.

- 22.1. Provide a plan that shows the footprint of disturbed land, presenting each proposed reclamation footprint section, and highlighting its phase of reclamation. Note: on large sites it can be helpful to divide the site into different geographic areas and undertake a phased approach.
- 22.2. Provide an approximate timeline for each phase of reclamation.

- 22.3. Provide a plan for dismantling. Include:
- removal of surface infrastructure, such as buildings, roads, and culverts;
 - removal of underground infrastructure; and
 - method for decontaminating and managing any infrastructure proposed to remain in place. Note: the subsequent landowner must provide a signoff for any remaining infrastructure.
- 22.4. Provide a plan for decontamination. Include:
- a historical summary of operations as they relate to areas of known or potential contamination, and a summary of any results of past soil and groundwater monitoring programs(e.g., *Soil Monitoring Directive*);
 - describe how impacted lands, on and offsite, will be assessed (nature, degree, and extent of contamination), monitored, and remediated to meet applicable soil and groundwater criteria;
 - describe how monitoring locations and monitoring equipment will be protected during reclamation;
 - describe how risk will be assessed, monitored, and managed in cases where land cannot be completely remediated immediately. Note: where there is ongoing risk management, regulatory closure cannot be obtained. Normally, an Approval remains in place as long as there is ongoing monitoring;
 - describe and provide plans for any treatment systems that may be built (e.g., wetlands, biopiles) and describe the performance criteria for these systems; and
 - an *Occupational Health and Safety* plan for how onsite workers will be protected from emission of contaminants to the air.
- 22.5. Describe how all wastes generated during reclamation will be managed.
- 22.6. Describe how dust, odours, contaminants, and noise will be controlled to protect offsite neighbours.
- 22.7. Describe how runoff will be managed during reclamation, and identify any changes from the current methods for managing runoff.
- 22.8. Describe any land reclamation that has already taken place. Include:
- the status; and
 - results achieved compared to standards required.
- 22.9. Identify and describe the end land-use and land capability ratings. Include:
- the long-term, end land-use for the site and the surrounding lands, and where applicable, the municipal zoning category, (note: where long term land use is proposed to be restricted and different than the long term land-use in the area, for example, restricting to a commercial or industrial use, the applicant must obtain a written acceptance of the restriction from the municipality);

- how the land capability ratings of the reclaimed site will be made equivalent to that of the preconstruction state; and
- how the ecosite class will be consistent with the end land-use, how this compares to the preconstruction state, and implications to wildlife and/or fish habitat.

22.10. Describe the proposed reclamation of landform, drainage, and watercourse(s). Include:

- how they will be integrated with adjacent land use;
- a plan for re-contouring (post-reclamation topography and landform design);
- how reclamation will affect nearby watercourses, in the short and long-term, including:
 - effects on onsite and offsite, surface and groundwater quality and quantity,
 - prevention of interactions between water and material with adverse chemical properties (e.g., leaching into the subsurface, lined ponds), and
 - the stability of slopes and lakes; and
- implications to people and the ecology in the area.

22.11. Describe and assess the effectiveness of any new alternatives for any proposed “engineered” watercourses (e.g., streams, lakes, wetlands). Include:

- policy or regulatory requirements;
- prevention or mitigation of interactions between material with adverse chemical properties and proposed watercourse (e.g., leaching into the subsurface, lined ponds);
- flow regimes;
- contingencies for failures;
- contingency treatment;
- monitoring systems; and
- the viability of a sustained healthy aquatic ecosystem if proposed as a “compensation” watercourse.

22.12. Provide a plan for replacing reclaimed soil that is compatible with the proposed end land use. Include:

- the practices and principles that will be used;
- method to achieve acceptable soil quantity;
- depth and volume of the replaced soil, and the soil/materials balance, required to achieve reclamation goals;
- method to achieve acceptable chemical and physical soil quality;
- how and where de-compaction will occur (e.g., roads); and
- erosion control methods.

- 22.13. Provide a plan for revegetating the site. Include:
- type of vegetation and species list;
 - seed/seedling source and quality;
 - seeding rates, stocking rates (reforestation), and methods;
 - weed management;
 - fertilization rates and methods;
 - wetlands (e.g., establishment of riparian species);
 - wildlife habitat;
 - time to achieve revegetation; and
 - method for measuring revegetation success.
- 22.14. Describe stakeholder involvement, including who will be involved, at what point(s), and in what manner.
- 22.15. Provide the contact information and means for which questions or concerns may be directed to the facility prior to or during reclamation activities.

Appendices

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Appendix A: Administrative

Authorization Process

Diagram of Approval process see Figure 1.

Filing

Any required Financial Security is sent to:

Alberta Energy Regulator,
EPEA and WA Applications Centre
Twin Atria Building, 4th Floor
4999 – 98 Avenue
Edmonton AB T6B 2X3

Or via email to:

EPEA.Reports@aer.ca

Applications on CD or Memory Stick are also sent to the above address. Financial Security must be received before an Approval can be issued. For an approval amendment or a change to the amount of security required, security must be provided within 30 days of a request by the Director.

Applications in a pdf format can be emailed to EPEA.WA.Applications@aer.ca.

An approval can be transferred with the prior written consent of the Director. Applications to Transfer an approval should be sent to the Regulatory Approvals Centre (see address above). There is no fee for a transfer.

Notice requirements

Public involvement is a key component of the approval process: the Act says the public must be notified of all approval applications. The Director will provide written direction for how to provide notice. Anyone directly affected by an application may submit a written statement to the Director outlining concerns, and may appeal a decision to issue an approval.

Review

The review determines whether the activity's general and overall impact on the environment is in accordance with the Act and regulations. The review may address design plans, site suitability, proposed monitoring programs, and methods of minimizing the generation, use, and release of substances. An initial review and Director's decision for application completeness is required, ensuring any application deficiencies are addressed prior to providing public notice. Following notice, the Director may request additional information and ask the applicant to hold public information meetings or address public statements of concern.

Decision

The Director decides whether an approval will be issued and under what conditions, weighing the results of any related public hearings of the Alberta Energy Regulator, the Alberta Utilities Commission, or the Natural Resources Conservation Board, government referral requirements, or statements of concern.

Following the decision, notice is provided to the applicant (or approval holder) and to those who filed statements of concern of the decision.

Appeals

The Responsible *Energy Development Act (REDA)* permits the filing of a request for a regulatory appeal by an eligible person in regards to an appealable decision as defined in section 36 of *REDA*.

If you are eligible to file a request for a regulatory appeal and you wish to do so, you must submit your request in the form and manner and within the timeframe required by the AER. Filing requirements are set out in section 30 of the *Alberta Energy Regulator Rules of Practice*, available on the AER website, www.aer.ca, under Rules & Directives > Acts, Regulations and Rules. Regulatory appeal requests should be e-mailed to RegulatoryAppeal@aer.ca.

Figure 1: EPEA Approval Diagram (to be provided later)

Please contact your approvals coordinator or the EPEA and WA Applications Centre at EPEA.WA.Applications@aer.ca.

Environmental Impact Assessments

As part of the application screening process the Director may refer the application to Alberta Environment and Sustainable Resource Development to confirm that an Environmental Impact Assessment if required has been done or to confirm if one is required. This assessment is required where the complexity and scale of a proposed project, technology, resource allocation, or siting considerations:

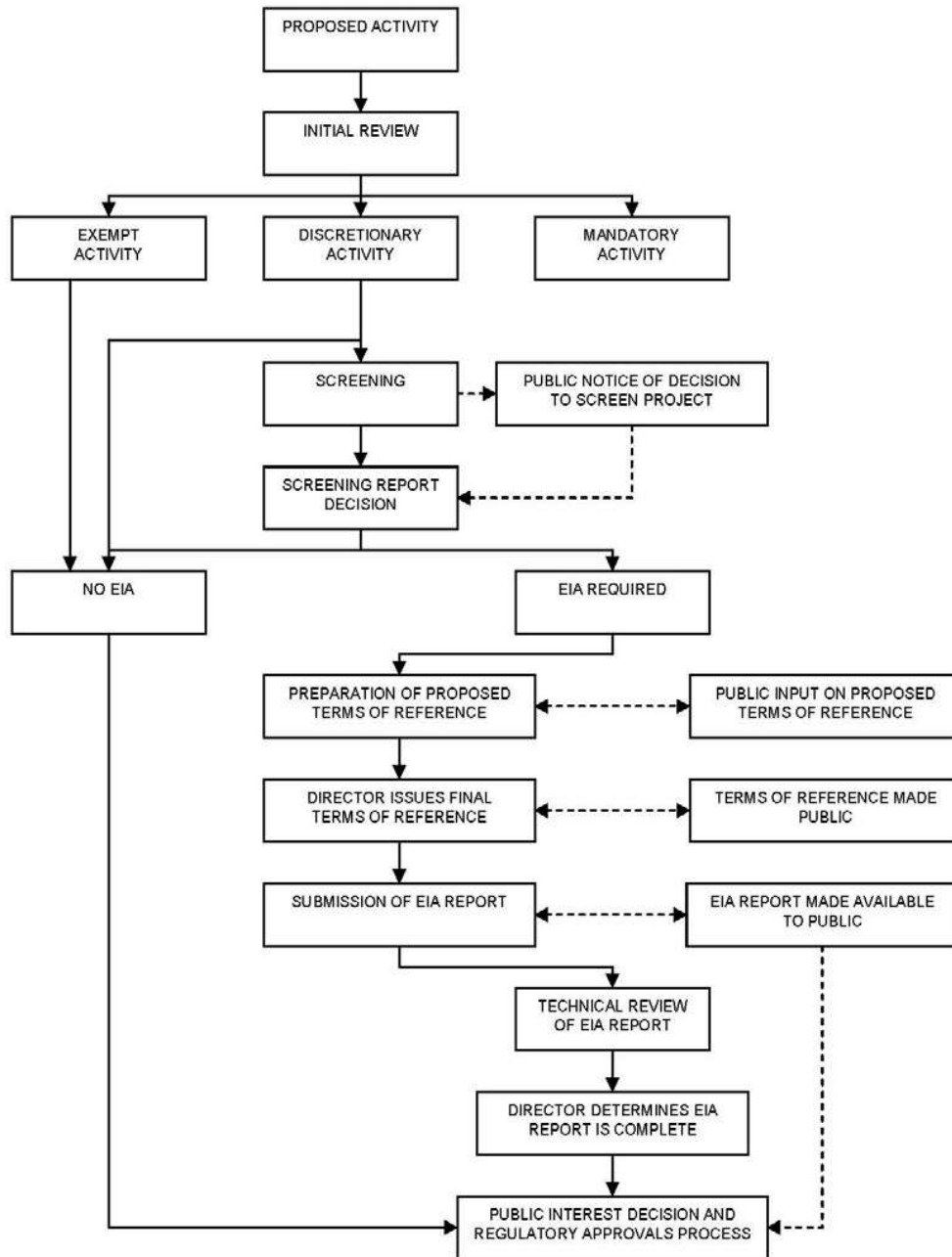
- create uncertainty about the exact nature of environmental effects, or
- result in a potential for significant adverse environmental effects.

The *Environmental Assessment (Mandatory and Exempted Activities) Regulation* lists those activities that must undergo environmental impact assessments.

Diagram of Environmental Assessment process see Figure 2.

For more information on the Environmental Impact Assessment process go to the ESRD website (<http://esrd.alberta.ca/lands-forests/land-industrial/programs-and-services/environmental-assessment/default.aspx>).

Figure 2: Alberta's Environmental Assessment Process Diagram



Forms

Authorization of Application for Approval By Owner/Agent

This application must be submitted in accordance with the Environmental Protection and Enhancement Act.

An application for an Approval shall not be deemed to be filed until all the information, documents, and authorizations referenced in the application submission, has been received by the EPEA and WA Applications Centre, Alberta Energy Regulator.

The application must be complete before review and processing of the application takes place.

The application **MUST** be signed by the owner or his agent, using the following signature block.

(Date)

(Signature)

(Title of Applicant)

Approvals Transfer

WHEREAS the Director has issued Approval Number (the “Approval”) to CURRENT APPROVAL HOLDER to undertake the activity described in the Approval.

AND WHEREAS CURRENT APPROVAL HOLDER pursuant to section 75 of the *Environmental Protection and Enhancement Act* of Alberta, has requested the Director to consent to the transfer of the Approval to NEW APPROVAL HOLDER.

NOW THEREFORE pursuant to section 11 of the *Approvals Procedure Regulation*, I, the Designated Director under the *Act*, consent to the transfer of the Approval from CURRENT APPROVAL HOLDER to NEW APPROVAL HOLDER.

IN CONSIDERATION of the Designated Director consenting to the transfer of the Approval from CURRENT APPROVAL HOLDER to NEW APPROVAL HOLDER, NEW APPROVAL HOLDER covenants and agrees with the Designated Director to comply with and to be bound by all the terms of the Approval as if the Approval had been issued by the Director to NEW APPROVAL HOLDER.

CURRENT APPROVAL HOLDER

Witness (if not under corporate seal)

NEW APPROVAL HOLDER

Witness (if not under corporate seal)

Designated Director under the Act

Date

Financial Security

Financial security is a deposit retained to cover the cost to complete conservation and reclamation associated with Division 1 and Division 3 activities identified in the *Activities Designation Regulation* or the Mine Security Program Standards, in case the proponent goes into receivership. Regulations require the Approval Holder to submit security in an amount that the Director determines to be sufficient. Security must be maintained over the life of the activity at a level that covers the costs, and therefore the cost is adjusted periodically. The security may be returned in whole or in part once reclamation has been completed.

Types of Operations Requiring Financial Security

Facilities which require financial security generally fit into the following categories:

- Waste management facilities, with the exception of on-site facilities;
- Division 3 activities listed in the Activities Designation Regulation;
- Facilities listed under the Mine Financial Security Program.

Calculating the Amount of Financial Security

Estimates of financial security are based on the cost for closure and post-closure care. This estimate must include the cost for the government to hire a third party to manage and carry out the work, rather than being based on the applicant's cost to do the work.

Guidance on the factors considered in calculating security is provided below.

Waste Management Facilities

Facilities that store and/or process waste will devote a significant portion of the financial security to the costs for the removal and disposal or recycling of any remaining inventory at the site. Normally they will not require a large component of the financial security to be allocated to post-closure care.

Generally the security is based on the source, volume, characteristics, and classification of waste/recyclable streams that will be accepted for storage. The estimate must consider the following:

- inventory removal and disposal costs: require financial security for the total on-site storage limit identified in the approval. Consider the disposal costs of the waste type with the highest disposal cost. For existing facilities, the monthly inventory reports are a useful check on the types and amounts of wastes being stored. In addition to liquids, consider the cost to dispose of sludges, such as sludges from tank bottoms.

- identify and evaluate waste management contractors: who will receive the inventory of waste. Take the following into account:
 - whether there is an approval to operate from the applicable jurisdiction; and
 - the technical capability to process or dispose of the wastes properly.
- transportation costs: from the facility to the waste disposal contractor.
- decommissioning costs: at a minimum, estimate the costs to conduct soil and groundwater monitoring to confirm that the site is not contaminated following closure of the facility. For existing facilities, evaluate the soil and groundwater monitoring reports to ensure that the site is being properly managed. If these reports indicate that contamination is present, then the security for site closure must be increased accordingly.
- saleable resources: it is not permissible to use estimates of the value of saleable resources on the site to reduce the amount of the security. This is because it is difficult to: estimate the value for these various components, track the total value of such an asset over its operational life, and ensure that the assets remain on-site.

Often, each facility has unique characteristics that factor into the calculations. For this reason, before providing an estimate, applicants should contact the regional office and discuss their case-specific circumstances with the Approval Coordinator.

Landfills

Landfills have two categories of costs; the cost to close the landfill and the cost for post-closure maintenance and monitoring. Liability concerns will remain long after the facility has been decommissioned. Post-closure costs then, will be a significant portion of the security due to the length of the monitoring period involved, normally a minimum of 25-years after final closure. The following components are assessed:

Closure costs

These include the costs of implementing and managing the following:

- final cover system for active landfill cells; the closure requirements are outlined in Section 9 of the Code of Practice for Landfills;
- landfill gas management system;
- leachate management system, including leak detection;
- run-on/run-off control system; and
- engineering costs.

Post-closure costs

These are generally based on estimates of annual maintenance and monitoring per unit area, and include costs for the following:

- inspections;
- maintenance of:
 - final cover system
 - surface water management system
 - landfill gas system; and

- environmental monitoring of groundwater, landfill gas, leachate, and stormwater.

Mines

A new Mine Financial Security Program was implemented in Alberta on April 1, 2011. The program covers the following types of plants and facilities:

- Coal mines (underground and surface);
- Coal processing plants and related infrastructure at coal mine sites;
- Oil sands mines; and
- Oil sand processing plants, and related infrastructure.

The Mine Financial Security Program takes an asset-to-liability approach to managing financial risks. It recognizes that the resource value associated with an approved project is an asset in terms of the cash flow generated by its operations. The program includes:

- Quantification of liabilities for all facilities, as well as the assets dedicated to the management of those liabilities;
- Regular and appropriate reporting and review of that information; and
- A requirement to undertake and report ongoing reclamation.

Approval holders can elect to place full security at any time in the life of the project based on the Mine Financial Security Program liability calculation. In this case, the approval holder would no longer be subject to four separate types of security deposits that are part of the program. The entire coal sector has elected to provide full financial security.

More information is available at <http://www.aer.ca>.

Forms of Security

Acceptable forms of security are listed in section 30 of the Waste Control Regulation and section 21 of the Conservation and Reclamation Regulation. Irrevocable letters of credit and performance or surety bonds are the two most common forms of security currently deposited by approval holders.

Irrevocable letter of credit (ILC) is the type of financial security preferred by the AER. The following information must be included in the irrevocable letter of credit:

- the letter of credit is payable to the Alberta Energy Regulator;
- the gross amount that may be claimed is identified;
- the expiry date;
- the approval number;
- a brief description of the type of operation;
- the bank and branch at which a claim may be filed;
- that a claim must be paid by the financial institution at any time, and from time to time upon written demand from the Director;

- a minimum three year term, or a statement that the ILC shall be deemed to be automatically extended annually without any formal amendment unless sixty days prior to the present expiry date, the
- that the financial institution notifies the Director in writing of its decision not to extend the ILC beyond the expiry date.

Performance bonds/surety bonds are only accepted for hazardous waste facilities. Each performance bond must be tailored to the specific approval to be covered by the bond. The mandatory information that must appear in the bond includes the following:

- the value of the bond;
- the approval number;
- the date the approval becomes valid;
- a statement which designates the Alberta Energy Regulator as the obligee (assigns rights to the bond to the Alberta Energy Regulator);
- a description of the services or purpose of the contract;
- a “Discovery clause” setting an appropriate period of time after the expiry of the bond for remediation of problems found after closure;
- signatures and seals of authorities for the Principal and Surety;
- clauses that obligate the bonding company (or surety) to follow through with the terms and conditions of the closure and/or post-closure plan;
- commitment to arrange for completion of the plans through a contractor.

Contacts for Information on Security and Requests for Forms

For questions on submitting security, the form of security or acceptable forms and formats, contact the application and security coordinator in the EPEA and Water Act Applications Centre via the Customer Contact Centre at 1-800-297-8311.

For questions on calculating the amount of security, contact the approval coordinator who is looking after your application.

Appendix B: Groundwater Monitoring Program

Activities Requiring Mandatory Groundwater Monitoring

Each facility or plant will be assessed for groundwater monitoring program requirements due to the nature and potential risk posed by the activities at the plant or facility and the nature of the potential risk due to local or regional environmental sensitivity considerations. Groundwater monitoring program designs will vary due to the nature of the activity at the facility or plant and any local or regional environmental sensitivity considerations.

A groundwater monitoring program is required for the following facilities or plants identified as requiring approvals in the *Activities Designation Regulation*:

- the manufacture, processing or storage of petroleum products;
- the manufacture or processing of natural gas, its products or its derivatives;
- the manufacture, processing or storage of chemical and allied products;
- the manufacture or processing of pulp and paper products;
- the manufacture or processing of fertilizer products;
- the processing of coal, heavy oil, oil sands or minerals;
- the generation of electrical power (coal, oil, nuclear, alternative fuels);
- the storage, treatment, processing or disposal of hazardous waste;
- the storing and processing of hazardous recyclables;
- the manufacture or processing of explosives;
- the manufacture or processing of sulphur products;
- the processing of brine;
- the storage of brine in a pond; and
- the operation of a waste management facility, including approved landfills.

Facilities or plants undertaking the following processes or practices also require a groundwater monitoring program:

- the processing or mining of salt;
- the surface storage of produced water;
- the blending of chemicals and paints; and
- the preserving of wood.

Assessment Considerations for Plants or Facilities that may require Groundwater Monitoring

For activities other than those listed above, the considerations listed below contribute to assessing the need for and design of a groundwater monitoring program, which may not be based upon groundwater considerations solely. The applicant's discussion within the applicable articles in the main body of the Guide should highlight information for its relevance to groundwater in addition to potential design requirements for other areas of the approval.

The current or previous presence and location of substances and processes that are of notable influence:

- landfills or solid waste storage;
- storage of liquids (liquid impoundment);
- piping and/or transfer of liquids; and
- prior releases requiring remediation of groundwater and/or soil, and degree of remediation completed.

The nature and effectiveness of pollution prevention and control systems:

- storage containment or liner system (above ground or below ground, primary and secondary);
- leak detection and overflow protection systems for storage containment;
- standard operating procedures for integrity testing or inspections of liquid storage facilities and piping;
- spill response plans;
- presence and design of existing or proposed groundwater monitoring programs; and
- presence of an existing or proposed soil monitoring program.

Appendix C: Aboveground and Underground Tanks

Storage Tank Data

Tank Identification	Description	Location	Contents	Tank Size	Placement	Material of Primary Container	Corrosion Control	Secondary Containment	Method of Leak Detection	Maximum True Vapour Pressure	Type of Vents	Fugitive Emission Controls (VR)

The headings in this table are a guide to the nature of information that is to be submitted, along with those identified in the articles in the main body of the Guide.

In responding to the articles in the main body of the Guide, the applicant should detail how groupings of tankage and other containment structures are located to minimize overall footprint and therefore minimize the required extent of mitigation strategies.

In responding to the articles in the main body of the Guide, the applicant should detail that the mitigation strategies to detect and confine container contents are an appropriate match to the risks presented by the overall structure of containment and the nature of material held within.

Containment infrastructure and operation, including leak detection and housekeeping, reduces the risks associated with substances releases; and therefore reduces costs associated with lost product, and with increased management of waste, and remediation of soil and groundwater. Soil and groundwater monitoring frequency and parameter selection on a site must reflect the primary and secondary containment philosophy and infrastructure. Housekeeping procedures also play a role in determining appropriate soil and groundwater monitoring for a site.

Appendix D: Example Liquid and Solid Substance Streams

Example Substance Streams – Raw Materials, Products and By-Products, Wastewater and Waste Process Streams

The following list provides examples of streams that must be identified in the application. These inform assessment for the appropriate method(s) of treatment, the monitoring requirements, and potential release limits. Where the material or waste storage and volume cannot be highlighted in the site map or process flow diagrams, a table indicating the volume used, location stored and disposal method is required.

Liquid

Oils - engine oil, compressor lube oil, transformer oil, capacitor fluids

Chemicals (used and pre-use) – amine, glycol, methanol, other sweeteners, heat medium, other chemicals

Wastewater and Sludge Streams

- Surface runoff water, boiler blowdown water, cooling water blowdown, steam condensate, produced water, vent/flare liquids, water treatment waste, water filter backwash
- Sanitary sewage (septic tank)
- Vessel drains, floor wash, equipment wash, drum (container) wash

Sludges - tank bottoms, reclaimer bottoms, pond bottoms, API separator, pigging waste, pond skimming

Solid

Domestic garbage, construction material, asbestos, Drums (> 20L), diatomaceous earth

Incinerator ash, baghouse dusts

Dirty sulphur, sulphur contaminated soil, sulphur remelt waste

Used filters and filter material - carbon filters, sock filters, cartridge filters, baghouse filters

Catalyst, desiccant, iron sponge or other, ion exchange resin

Other

Waste received from off-site Laboratory wastes

Appendix E: Air

The list of substances released from sources to the air that are given in the main body of the Guide as examples are common substances or classes of substances based on Critical Air Contaminants, National Pollution Release Inventory substances, and Specified Gases.

This list is not intended to limit the applicant's obligations. Site specific chemicals released during processing or storage at plants or facilities throughout the province are too numerous to list them all in the main body of the Guide. The applicant needs to be aware of the chemicals used as well as those released during processing which trigger reporting obligations to the federal or provincial governments and their respective agencies. Although the Alberta Industrial Air Emissions Survey asked for annual totals for the processing aspects of the plant or facility it is important that the major emissions from the site be given in terms of maximum hourly and daily quantities to facilitate adoption into approval conditions based on production maxima. The following tables list the physical properties of the sites as well as examples of some common substances.

Example 1: Plant or Facility Administrative Parameters Table

AAAEI Facility ID	EPEA Approval No	EPEA Approval Holder	NPRI ID	2 nd NPRI ID (if applicable)	AER Approval No	Facility Start up date	Facility Name	Company Name	NAICS (six-digit)	NAICS-6 Description	
2 nd NAICS (six-digit) (if applicable)	2 nd NAICS-6 Description (if applicable)	Industry Class	Industry Subclass	ESRD Facility Type	Activity/Products	Facility Mailing Address	Facility City/District/Municipality	Facility Province	Facility Postal Code	Facility Latitude (in NAD 83)	Facility Longitude (in NAD 83)
Facility UTM Zone	Facility NAD 83 UTM N (m)	Facility NAD 83 UTM E (m)	AER Sector	AER Sector	Airshed Zone (if applicable)	Facility LUF Region	Census Division	Census Sub Division	Census Metropolitan Area (if applicable)		

Example 2: Plant or Facility Point Source Parameter Table

AAEI Facility ID	Point Source No	Point Source Name	Source Type	Source SCC	EPA SCC Description	Source Start up Date	Source Decommissioning Date	Source Latitude in NAD 83	Source Longitude in NAD 83	Source UTM Zone	Source NAD 83 UTM E (m)
Source NAD 83 UTM N (m)	Source Base Elevation (in ASL)	Source Stack Height (m)	Source Stack Diameter (m)	Source Exit Velocity (m/s)	Source Exit Temperature (K)	Source Power Rating (MW)	Nitrogen Oxide (NO)	Nitrogen Dioxide (NO ₂)	Sulphur Dioxide (SO ₂)	Ammonia (NH ₃)	PM _{2.5}
PM10	Total Particulate Matter (TPM)	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)	Arsenic	Cadmium	Chromium	Mercury	Nickel	Selenium	Vanadium	Naphthalene
Benzo(a)pyrene	Acetaldehyde	Acrolein	Formeldehyde	Hexane	Benzene	Hydrogen Sulphide	Carbon Disulphide	Total Reduced Sulphur (TRS)	Carbon Dioxide	Nitrous Oxide	Methane
Other Specified Gases	Other NPRI substances										

Example 3: Plant or Facility Non-point Source Parameter Table

AAAEI Facility ID	Non-point Source No	Non-point Source Name	Source Type	Source SCC	EPA SCC Description	Source Start up Date	Source Decommissioning Date	Source Effective Height (m)	Source Initial Sigma z (m)	Source UTM Zone	
Source NAD 83 NW UTM E (m)	Source NAD 83 NW UTM N (m)	Source NAD 83 NE UTM E (m)	Source NAD 83 NE UTM N (m)	Source NAD 83 SW UTM E (m)	Source NAD 83 SW UTM N (m)	Source NAD 83 SE UTM E (m)	Source NAD 83 SE UTM N (m)	Source Area (m ²)	Source Base Elevation (in ASL)	Nitrogen Oxide (NO)	Nitrogen Dioxide (NO ₂)
Sulphur Dioxide (SO ₂)	Ammonia (NH ₃)	PM _{2.5}	PM10	Total Particulate Matter (TPM)	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)	Arsenic	Cadmium	Chromium	Mercury	Nickel
Selenium	Vanadium	Naphthalene	Benzo(a)pyrene	Acetaldehyde	Acrolein	Formeldehyde	Hexane	Benzene	Hydrogen Sulphide	Carbon Disulphide	Total Reduced Sulphur (TRS)
Carbon Dioxide (CO ₂)	Methane	Other Specified Gases	Other NPRI Substances								

Appendix F: Wastewater (Runoff) Design Considerations

Surface water runoff considerations contribute to design of pollution control and treatment systems as well as groundwater monitoring program considerations. Map submissions in the application must identify factors affecting the proposed design:

- surface water drainage patterns in the local area, both natural and proposed contour changes, and

- areas proposed for control (collection, segregation, treatment and release) due to potential for exposure to contaminants.

The applicant must emphasize in process flow diagrams, and if possible in maps, any unique runoff control and treatments systems (such as storage areas), or where runoff and control systems are combined, particularly with process wastewater streams.

In order to minimize the amount of runoff requiring management, assessment of the ability to segregate contribution from and management of runoff from undeveloped areas (i.e., minimal or no risk for contamination from air or water emissions) should be presented in the application. The applicant must assess the potential quality of runoff collected, both concentrations and loadings.

The application runoff calculations should assess:

- runoff volume from the contributing area(s) from a one-in-ten year storm of 24-hour duration, based on the applicable rainfall data for the area (m^3), and
- peak runoff from a one-in-ten year storm at point of discharge to a treatment facility (m^3/s).

The application should assess each proposed containment area (ponds)' sizing for an effective containment volume for:

- a 1:10 year, 24-hour storm runoff volumes, and

- 1:25 year, 24-hour storm runoff volumes, and

- identify recommended safety factors or considerations (such as freeboard and containment integrity, effective containment volume in true operating conditions, and added safety for larger rainfall events).

Runoff volume calculations: Rational Formula: **$Q = CIA$**

where

Q = runoff flow (m^3/s)

C = rainfall coefficient (see Tables 1 and 2 for a guide)

I = rainfall intensity (m/s)

A = contributing area (m^2)

Rainfall data is available from Environment Canada.

Urban Areas

Table 1: Runoff Coefficients for Urban Areas

Description of Area	Runoff Coefficient (C)
Flat, residential (about 30% of area impervious)	0.40
Moderately steep, residential (about 50% of area impervious)	0.65
Moderately steep, built up (about 70% of area impervious)	0.80

Rural Areas

The runoff coefficient value for rural areas is obtained by subtracting the sum of the three factors (topography, soil and cover) from unity: **$C = 1 - (a + b + d)$**

Table 2: Runoff Coefficient Factors for Rural Areas (Deductions from Unity)

Type of Area	Deduction from Unity	Factor
Topography		
Flat land (average slopes of 1 ft. to 3 ft. per mi.)	0.30	a
Rolling land (average slopes of 15 ft. to 20 ft. per mi.)	0.20	
Hilly land (average slopes of 150 ft. to 250 ft. per mi.)	0.10	
Soil		
Tight impervious clay	0.10	b
Medium combinations of clay and loam	0.20	
Open sandy loam	0.40	
Cover		
Cultivated lands	0.10	c
Woodland	0.20	

Additional information can be obtained from Gray, M. 1970. *Handbook on the principles of hydrology*. Water Information Centre, Inc.