

AER Dam Safety Program 2021 Report

April 2022

Alberta Energy Regulator

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Suite 1000, 250 – 5 Street SW

Calgary, Alberta

T2P 0R4

Telephone: 403-297-8311

Inquiries (toll free): 1-855-297-8311

Email: inquiries@aer.ca

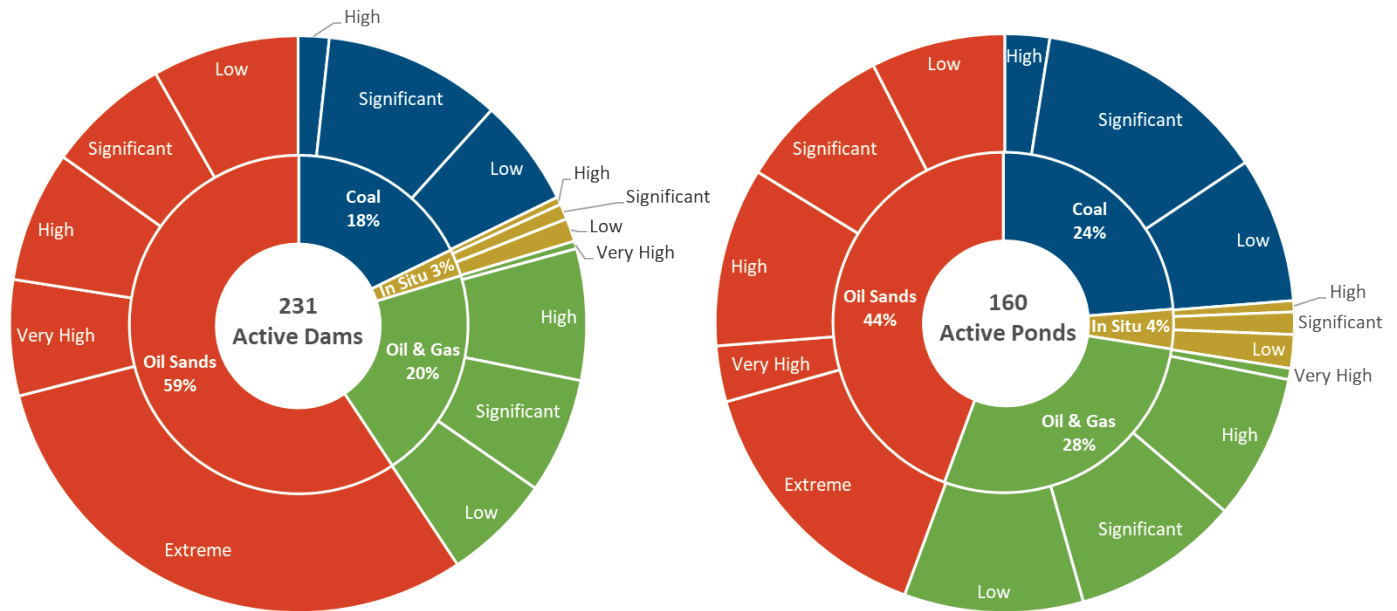
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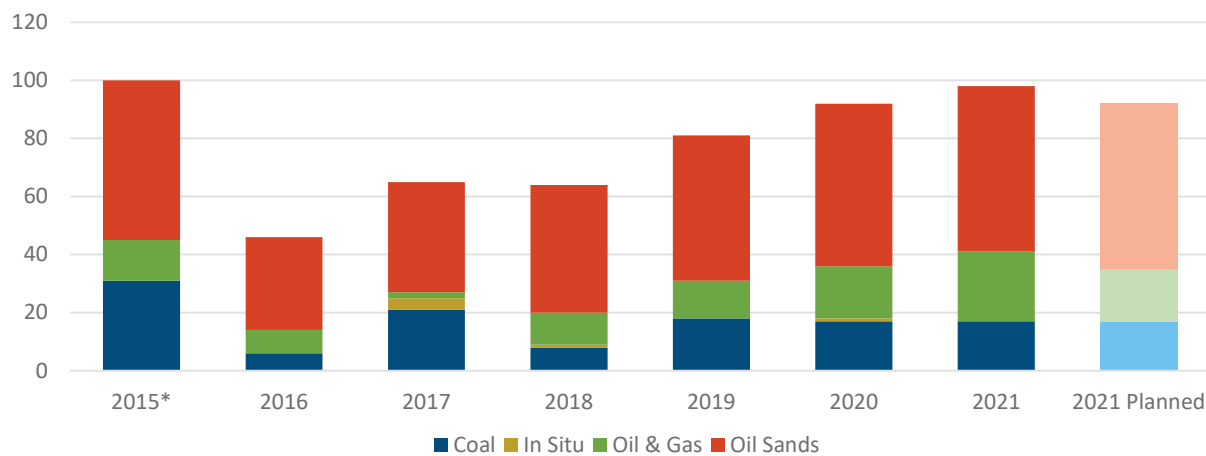
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Executive Summary

The purpose of the AER dam safety program is to ensure that energy dams are compliant throughout their life cycle. This report summarizes the activities and outcomes of the program for 2021. In 2021, the AER received 243 dam-related regulatory submissions (e.g., plans, reports, notifications) and conducted 98 dam inspections. No critical safety deficiencies were identified. Two joint inspections of coal dams were conducted with members of the University of Alberta as part of the creative sentencing for the 2013 Obed Mine dam failure.



Number of Inspections Conducted Annually by Sector



*2015 was the first year of the field inspection program

1 Introduction and Background

In March 2014, the AER assumed responsibility from the Government of Alberta (GoA) for regulating dams used in developing Alberta’s energy resources. We are also responsible for regulating energy resource development under specified enactments. Dams related to energy resource development are regulated under Part 6 of the *Water (Ministerial) Regulation* and the *Alberta Dam and Canal Safety Directive*. These regulatory documents set the requirements dam owners must fulfil to design, construct, operate, manage, decommission, or close, and abandon a dam.

A dam is defined in section 1(1)(h) of the regulation as “a barrier that is designed and is or is to be constructed for the purpose of retaining, storing, or diverting water, including water containing another substance, fluid waste, or flowable tailings...and includes all other works associated with such a barrier.” Section 27(1) of the regulation considers a structure to be a dam if it has a live storage capacity of 30 000 cubic metres or more and is more than 2.5 metres tall. Structures containing flowable tailings or structures with a consequence classification of “significant” or higher are subject to the regulation’s dam safety requirements regardless of their height or storage capacity.

In the context of the AER’s dam safety program, a pond is a storage facility contained by one or more regulated dams, as per section 27(1) of the regulation, and as illustrated in figure 1.

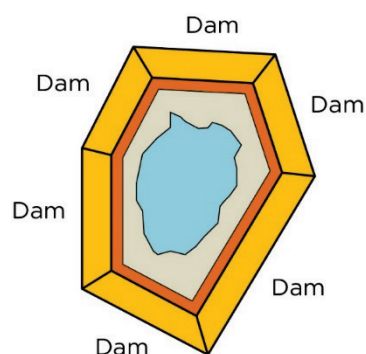


Figure 1. Storage facility (referred to as a pond) and its dams

Dam safety regulatory requirements are based on the “consequence of failure” classification of the dams, which is determined by a qualified professional employed by the dam owner. This consequence classification must be reviewed and accepted by the AER.

The directive specifies five consequence classes—low, significant, high, very high, and extreme—and three categories for incremental consequence—(i) loss of life; (ii) environmental and cultural values; (iii) infrastructure, economics, and other property. Dams are classified based on the most severe potential consequence among these three categories. The overall consequence classification of a pond is based on its highest-consequence dam.

2 Ponds and Dams in Alberta

We regulate 231 dams that form 160 active ponds, as shown in tables 1 and 2. Lower-consequence dams are associated with coal mines and oil and gas development and are mostly located in western Alberta. The majority of the very-high- and extreme-consequence dams are associated with oil sands development and are in the Fort McMurray area. Pond locations province-wide are shown on the map in appendix 1. Additional information for each pond is available on our interactive [Dam and Pond Map Viewer](#).

A breakdown of Alberta's ponds and dams by consequence classification and energy sector are provided in tables 1 and 2. In 2021, a significant-consequence, non-tailings, oil sands dam implemented its AER-accepted closure plan, and a low-consequence coal dam no longer met the minimum storage capacity specified by the regulation. As such, both are no longer regulated as dams and were delisted from the registry. Eighteen ponds were added to the registry—a combination of new developments and existing structures found to meet the criteria for a dam following discussions with the structures' owners. Figure 2 shows a percentage breakdown of the impounded fluid types across all dams.

Table 1. Ponds by sector and consequence classification as of December 31, 2021

Ponds	Low	Significant	High	Very High	Extreme	Total
Coal	13	21	4	0	0	38
In Situ	3	2	1	0	0	6
Oil & Gas	16	15	13	1	0	45
Oil Sands	12	14	16	5	24	71
Totals	44	52	34	6	24	160

Table 2. Dams by sector and consequence classification as of December 31, 2021

Dams	Low	Significant	High	Very High	Extreme	Total
Coal	14	23	4	0	0	41
In Situ	3	2	1	0	0	6
Oil & Gas	14	15	17	1	0	47
Oil Sands	19	16	17	15	70	137
Totals	50	56	39	16	70	231

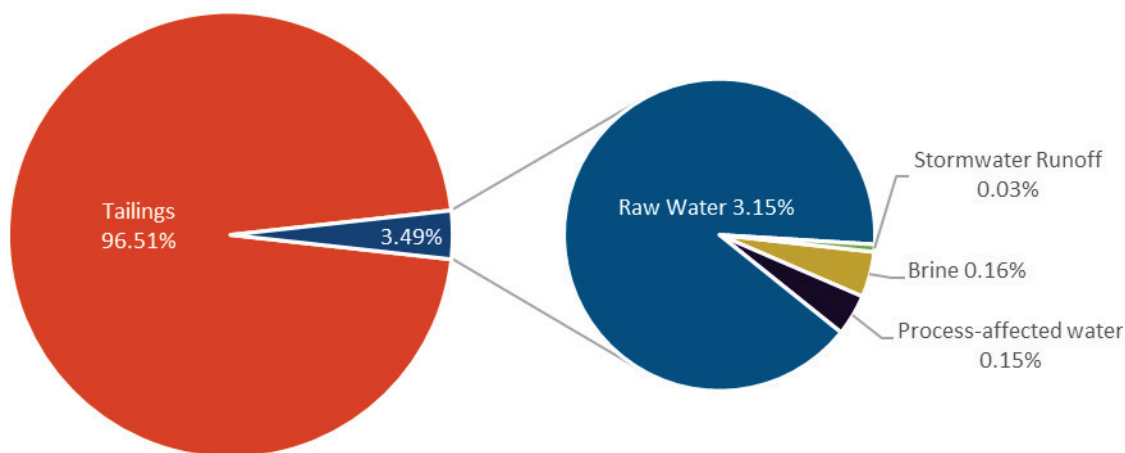


Figure 2. Breakdown of fluid types impounded by all dams

3 Compliance Activities

The dam safety compliance activities include field inspections, review of regulatory submissions, identification and tracking of deficiencies and nonconformances in an internal registry, and reporting. These activities are conducted, and overseen, by our dam safety engineers and field inspectors.

3.1 Field Inspections

An annual surveillance plan is developed that includes inspections according to the scheduled frequencies outlined in table 3. All ponds containing tailings are inspected annually regardless of their consequence classification, as per Alberta Environment and Parks Ministerial Order 10/2019. Additional inspections may be added to the plan based on incident notifications or review of regulatory submissions.

Table 3. Inspection frequency for all dams by classification

Classification	Inspection Frequency
All ponds containing tailings	Every year
Extreme and very high	Every year
High	Every 3 years
Significant and low	Every 5 years

We planned for 92 field inspections based on the required frequencies above and included the two low-consequence pond inspections postponed in 2020 by challenges created by the COVID-19 pandemic. We inspected 6 additional structures after they were identified as AER-regulated dams through proactive discussions with operators, for a total of 98 inspections in 2021. All inspection results, including required follow up actions, were communicated to dam owners.

3.2 Regulatory Submissions

We received 243 dam safety regulatory submissions, summarized in table 4. AER dam safety engineers reviewed these submissions to assess and identify any dam safety deficiencies or critical safety deficiencies.

Table 4. 2021 dam safety regulatory submissions by energy sector

Submission	Coal	In situ	Oil & Gas	Oil sands	Total
Annual performance review report	20	3	36	75	134
Dam safety review report	0	0	1	3	4
Operations, maintenance, and surveillance manual	11	0	10	2	23
Emergency management plan	11	0	1	0	12
Dam safety management plan	0	0	2	1	3
Regulatory notifications	10	4	2	51	67

3.3 Safety Deficiencies

A safety deficiency is a hazardous condition that has the potential to contribute to or develop into a critical safety deficiency over time. A critical safety deficiency has the potential to lead to an imminent failure.

Safety deficiencies and critical safety deficiencies may be identified during our review of a regulatory submission or an AER inspection. They are then tracked in an internal registry and monitored by staff until addressed by the dam owner. Safety deficiencies may result in a notice of noncompliance (see [Manual 013: Compliance and Enforcement Program](#)).

Field inspections and reviews of regulatory submissions can identify safety deficiencies and potentially hazardous conditions, which, if left unattended, could lead to critical dam safety deficiencies. Dam operators risk-assess identified safety deficiencies and provide mitigation plans to manage them. The mitigation plans are subject to AER acceptance. Table 5 summarizes the potentially hazardous conditions identified in 2021 and actions taken to mitigate them.

Most of these conditions have already been addressed by the dam owner, and any remaining conditions are currently being addressed by the dam owner through surveillance activities and action plans.

There were no critical safety deficiencies identified in 2021.

Table 5. Summary of identified potentially hazardous conditions from 2021

Hazardous Condition	Description
Excessive seepage	Sand boils were observed in a water collection ditch. A monitoring program was established and the pore-water pressure conditions in the area have been managed appropriately. Mitigation measures were designed, and implementation was being carried out.
Short beach	Beach development did not achieve the total length required in a limited area. Actions were taken to correct the shortened beach.
Erosion	Multiple erosion features (some significant in size) were identified at dams. Erosion is common and these features are managed as part of the regular operations and maintenance. Lack of stabilizing vegetation was identified as a contributing factor.
Slope instability	Slumping occurred at the downstream face of a dam and the slumping was assessed and repaired. Root cause analyses will be determined if additional measures are necessary. Monitoring of the area is ongoing. A longitudinal crack was observed on the downstream slope of a dam. A qualified professional assessed the issue and determined that it was not an immediate dam safety concern. The crack will be repaired. Monitoring of the area is ongoing.
Blocked spillway	Spillways of a few dams were obstructed with debris, including excessive vegetation. Regular maintenance of spillways is required. AER will follow up with these operators on this issue.
Vegetation issues	AER found excessive vegetation (trees, high shrubs, tall grass, etc.) on multiple dams impeding visual inspections and partially blocking spillways. Owners manage these issues through regular maintenance.

4 Communication and Engagement

Our program includes strategies for communicating and engaging with stakeholders, including the public, dam owners, and the Government of Alberta. Our overall engagement strategy includes hosting awareness and information sessions on dam safety regulation, developing manuals and guidelines, providing information through our webpage, and reporting on our program activities. We also participate in associations and committees specific to dam safety.

4.1 Published Communications

In May 2021, we released the *AER Dam Safety Program: 2020 Report*, summarizing program activities during 2020. [Manual 019: Decommissioning, Closure, and Abandonment of Dams at Energy Projects](#) was issued in 2020, and since then we have received six related applications from dam owners.

4.2 Engagement

Routine communications with industry regarding the regulation of dams continues. Dam owner representatives typically accompany AER staff on inspections, making them prime communication opportunities. Meetings with dam owners are also done on an as-needed basis.

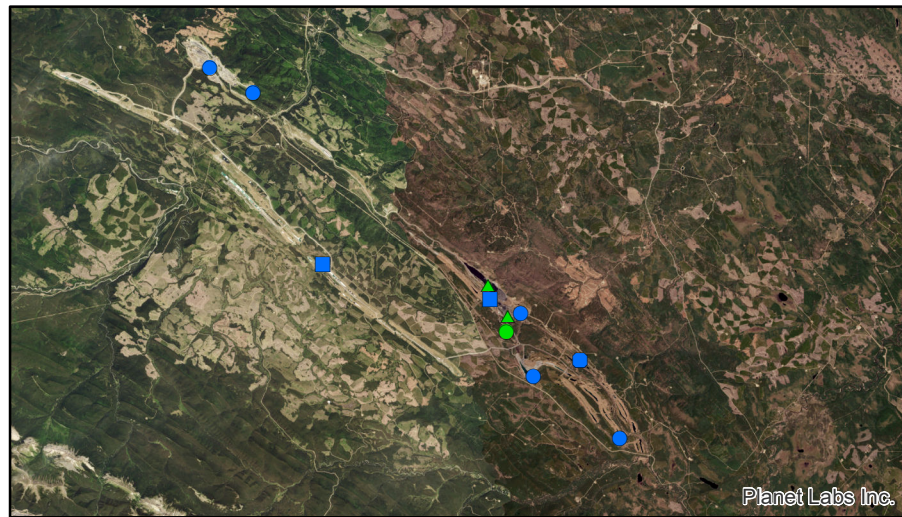
Our dam safety team participates in committees and working groups under the [Canadian Dam Association](#) (CDA). The CDA publishes technical guidelines on best practices for dam safety. AER representatives are included on the CDA's Mining Dams Committee and Regulation of Dams Committee. The team also participates in meetings hosted by the Dam Integrity Advisory Committee (DIAC) of the [Alberta Chamber of Resources](#). DIAC is focused on developing best practices for dams in Alberta, such as defining liquefiable tailings.

In 2021, we facilitated joint inspections with representatives from the University of Alberta (U of A) at select coal dams as part of the dam safety project funded by the Obed Mountain dam failure creative sentencing. As part of their project work, the U of A inspected the dams to gain insight into the changes to the structures since the failure and as they relate to the developed failure mode and effects analysis for long-term closure. The dam safety project will be completed by August 2022.

4.3 Dam Safety Webpage

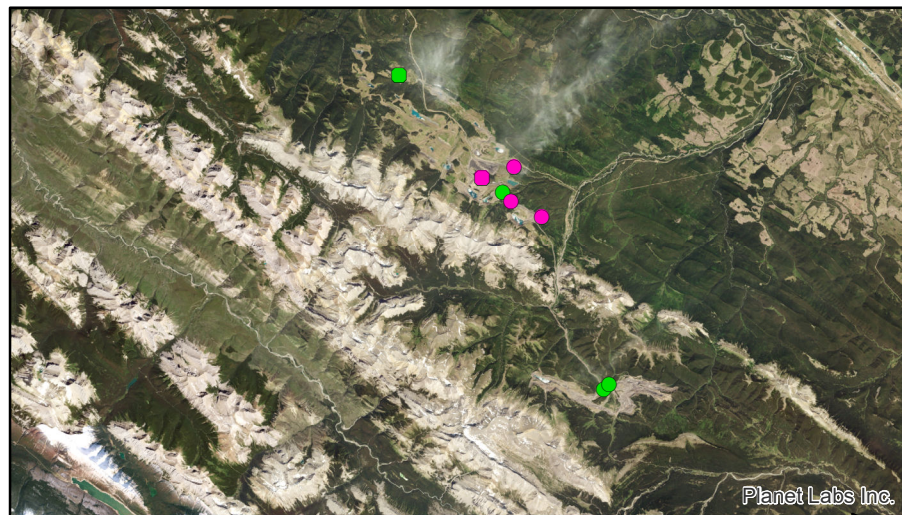
The AER dam safety [webpage](#) provides relevant and timely data and information for stakeholders. Information on dams, the regulation of dams, and AER activities are available. In addition, the AER maintains an [interactive map](#) of dams and ponds related to energy development. The interactive map is available to the public and provides information about ponds, including dam heights, fluid storage volumes, fluid types, and authorization documents.

Appendix 1 Alberta Pond and Dam Consequence Classification Map



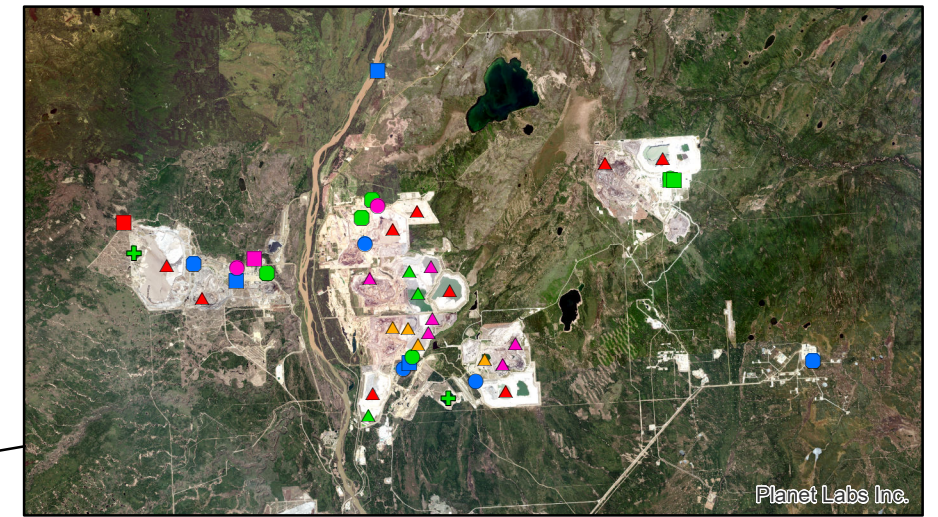
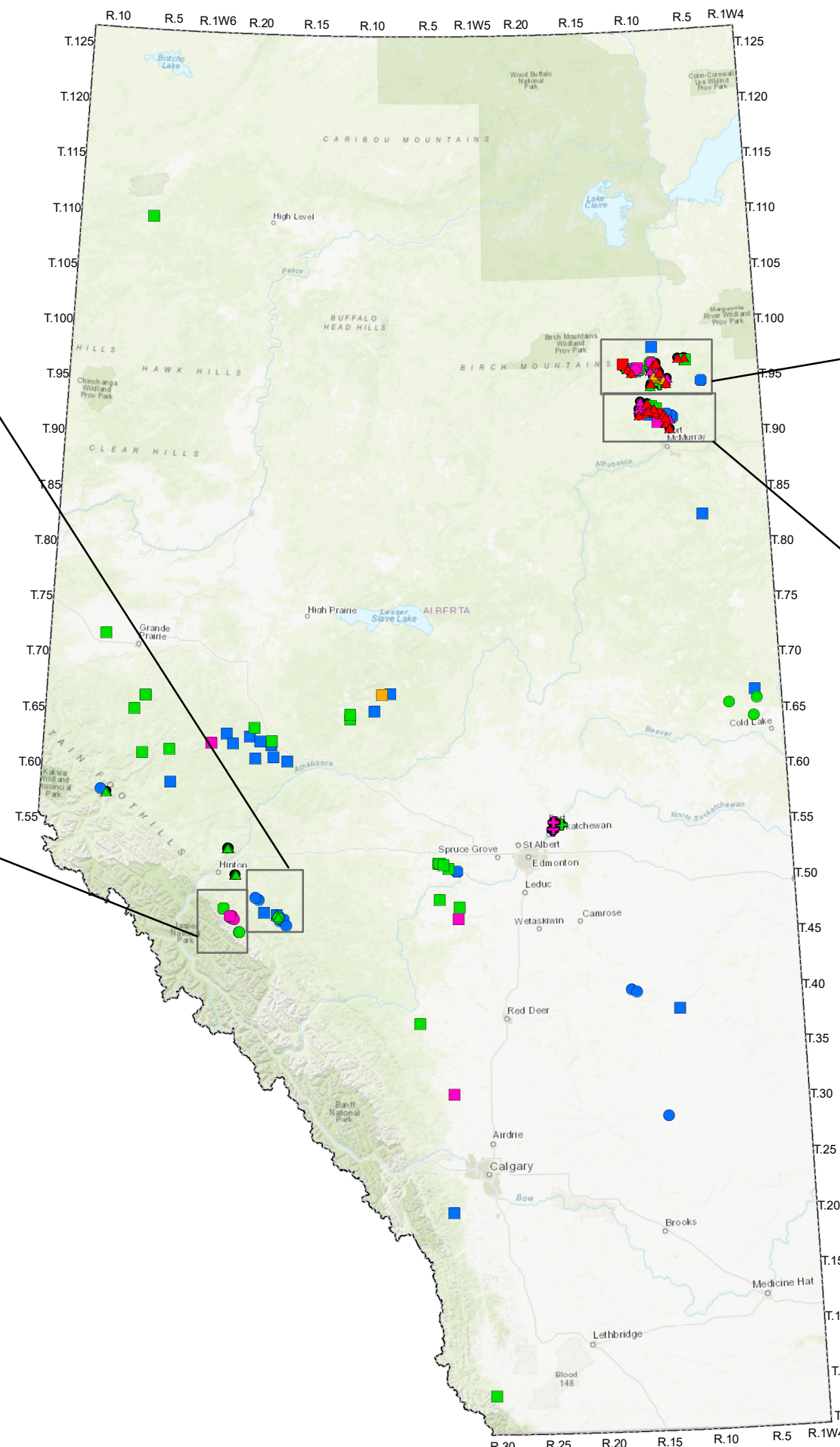
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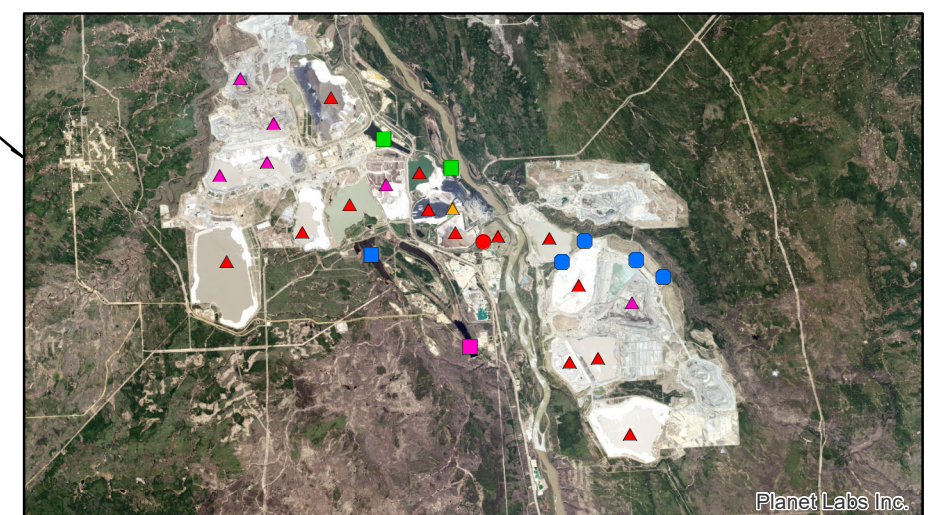
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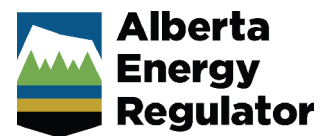
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Consequence and Fluid Type for Regulated Ponds

- | | |
|--|--|
| ■ Extreme | + Brine |
| ■ Very High | ○ Process Affected Water |
| ■ High | □ Raw Water |
| ■ Significant | ○ Storm Water Runoff |
| ■ Low | △ Tailings |

0 95 190 380 Kilometers

1:5,000,000

The AER does not warrant the accuracy or completeness of the information contained in this map and is not responsible for any errors or omissions in its content and accepts no liability for the use of this information.

Date: 3/24/2022

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community