Klohn Crippen Berger

St. Mary River Irrigation District

Chin Reservoir Expansion

Environmental Impact Assessment

Report Summary

A03701E04

July 2024

Klohn Crippen Berger

July 29, 2024

St. Mary River Irrigation District
525 – 40 St. South
Lethbridge, Alberta
T1J 4M1

MPE Engineering Ltd.
#300 714 5th Avenue South
Lethbridge, Alberta
T1J 0V1

Mr. Travis Geremia, P.Eng.
Infrastructure Engineer, St. Mary River Irrigation District

Mr. Jeff Olitch, P.Eng.
Vice President – Water Resource Engineering, MPE Engineering Ltd.

Dear Travis and Jeff:

Chin Reservoir Expansion
Environmental Impact Assessment Report Summary

We are pleased to present the Environmental Impact Assessment Report Summary for the Chin Reservoir Expansion Project. This summary is intended to address the submission requirements for review of the Environmental Impact Assessment.

Yours truly,

KLOHN CRIPPEN BERGER LTD.

Dustin Bailey, P.Biol.
Aquatic Biologist, Associate

CW/DB:bb

Klohn Crippen Berger Ltd.
7315 8 Street NE ▪ Calgary AB T2E 8A2 ▪ Canada
t 403.274.3424 ▪ f 403.274.5349 ▪ www.klohn.com

St. Mary River Irrigation District

Chin Reservoir Expansion

Environmental Impact Assessment

Report Summary

LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Definition
AEPA	Alberta Environment and Protected Areas
AIM	Alberta Irrigation Modernization Program
Alberta Culture	Ministry of Alberta Arts, Culture and Status of Women
ALSA	*Alberta Land Stewardship Act*
ASA	Archaeological Survey of Alberta
CEPA	*Canadian Environmental Protection Act*
DFO	Fisheries and Oceans Canada
DUC	Ducks Unlimited Canada
ECCC	Environment and Climate Change Canada
EDS	Electronic Disposition System
EIA	Environmental Impact Assessment
EPEA	*Environmental Protection and Enhancement Act*
FSL	Full Supply Level
FTEs	Full Time Equivalents
pToR	Proposed Terms of Reference
fToR	Final Terms of Reference
GDP	Gross Domestic Product
GoA	Government of Alberta
GoC	Government of Canada
HRA	*Historical Resources Act*
HRIA	Historical Resources Impact Assessment
HRMB	Historical Resources Management Branch
IAA	*Impact Assessment Act*
IAAC	Impact Assessment Agency of Canada
IRR	Internal Rate of Return
KCB	Klohn Crippen Berger Ltd.
KI	Key Indicator
LSA	Local Study Area
MBCA	*Migratory Birds Convention Act*
MPE	MPE Engineering Ltd.
NGOs	Non-Government Organizations
NRCB	Natural Resources Conservation Board
NRCBA	*Natural Resources Conservation Board Act*
Project	Chin Reservoir Expansion Project
PA	Project Area
RID	Raymond Irrigation District
RSA	Regional Study Area
SAGE	Southern Alberta Group for the Environment
SARA	*Species at Risk Act*
SMRID	St. Mary River Irrigation District
TID	Taber Irrigation District
VC	Valued Component

TABLE OF CONTENTS

TABLE OF CONTENTS

(continued)

List of Tables

List of Figures

CLARIFICATIONS REGARDING THIS REPORT

This report is an instrument of service of Klohn Crippen Berger (KCB). The report has been prepared for the use of the St. Mary River Irrigation District (SMRID) for the specific application to the Chin Reservoir Expansion Project, and may be published or disclosed by the SMRID to Alberta Environment and Protected Areas (AEPA), and the Natural Resources Conservation Board (NRCB).

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered; however, the use of this report will be at the user's sole risk absolutely and in all respects, and KCB makes no warranty, express or implied. This report may not be relied upon by any person other than the Client or AEPA or the NRCB without KCB's written consent.

Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
2. The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
3. The report is based on information provided to KCB by the Client or by other parties on behalf of the client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.
4. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.
5. This report is electronically signed and sealed and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

1 INTRODUCTION

1.1 Proposed Project

Chin Reservoir is an off-stream storage reservoir that is located roughly in the middle of the St. Mary River Irrigation District (SMRID) system approximately 10 km southeast of the Town of Coaldale (Figure 1). Chin Reservoir is the largest off-stream reservoir within the SMRID and has a current storage volume of 217,679 dam^3 (176,475 ac-ft) and live volume of 190,350 dam^3 (154,320 ac-ft) at an operating Full Supply Level (FSL) of 861.36 m. Chin Reservoir is currently impounded by two dams: the West Dam and the Existing East Dam (Figure 2). The dams were completed in 1955 and no major modifications have been undertaken since construction. Water enters Chin Reservoir from the main canal through the Chin Hydro Plant and/or Chin Chute. The only outlet on the reservoir is the irrigation outlet structure on West Dam which discharges into Stafford Reservoir (Figure 2). SMRID proposes to expand the reservoir by moving the Existing East Dam approximately 10 km downstream (Figure 3) and raising the design FSL to 864.00 m. With the dam relocation and the rise in FSL, the total estimated storage would increase to 257,820 ac-ft and add 1,000 acres to the reservoir's footprint.

The construction of the project is proposed to occur in three phases: construction of the New East Dam, reservoir filling, and decommissioning of the Existing East Dam (the Project). The water level within the expanded reservoir will be raised to a new FSL of 864.0 m. It should be noted that the New East Dam will include a structure for flood management. The expansion area is located on privately owned land.

Given the potential for the enhancement of regional drought resiliency and flood mitigation, the SMRID believes the Project is in the public interest and seeks Project Approval under the *Environmental Protection and Enhancement Act* (*EPEA*) (R.S.A. 2000, c. E-12) and the *Natural Resources Conservation Board Act* (*NRCBA*) (R.S.A. 2000, c. N-3).

1.2 Construction Components

1.2.1 New East Dam Construction

The construction of the new East Dam will be done in dry conditions. The construction of the east dam includes the excavation and construction of the Auxiliary Spillway. Riprap erosion protection will be installed on the reservoir side of the dam. A gravel road will be installed to reach the top of the dam. The majority of dam fill material will be sourced from the excavation of the Auxiliary Spillway. A contingency borrow area has been allocated within the Expanded Reservoir footprint. Unlike at the Existing East Dam where fill was used from borrows east of the dam, dam fill will not be extracted from the coulee bottom east of the New East Dam footprint. Visible borrow pits will not be a remnant of the construction of the New East Dam. Specific materials such as riprap and gravel will be obtained from off-site sources.

1.2.2 Reservoir Filling

The Reservoir Expansion Area will be filled via a temporary gated outlet structure that will be installed near the north abutment of the Existing East Dam. A three-year schedule for filling with seasonal timing constraints has been proposed to minimize the potential for effects on fish spawning and migratory bird nesting. An earthen cofferdam will be constructed to isolate the upstream face of the Existing East Dam for installation of a temporary gated outlet through the embankment. The work will be scheduled to occur during a period of relatively low water level to limit the required height of the cofferdam. The outer face of the cofferdam will be armoured with riprap to limit the potential for wave erosion. Once the temporary outlet is installed, the cofferdam will be removed. The temporary outlet will extend through the dam embankment from the gatewell and extend beyond the downstream toe of the New East Dam. Water will be conveyed in an armoured channel into an existing borrow pit within the coulee bottom. Discharging water in this manner will avoid the requirement for protecting the downstream dam face from erosion and will reduce the potential for erosion at the discharge location by dissipating energy within the borrow pit. From the borrow pit, water will be conveyed into the existing channel that runs down the midline of the coulee. The temporary outlet will be removed during the decommissioning of the existing east dam.

1.2.3 Existing East Dam Decommissioning

With the completion of the New East Dam, the existing East Dam will be decommissioned. Complete dam removal will not be conducted. The entire length of the dam is to be removed down to the top of the existing toe berms (857.1 m). The north portion of the dam will be excavated to a minimum elevation of 850.0 m (Figure 3).

1.2.4 Operation of the Expanded Reservoir

The Expanded Reservoir will be operated at a higher FSL of 864.0 m (2.64 m higher than the existing FSL). The range of water level fluctuation during operation is expected to be broader than the existing condition, but will follow a similar seasonal operating regime.

1.3 Project Rationale

Key benefits of additional storage to southern Alberta irrigation include:

- Increased storage of water during high river flows would assist with balancing water supply when river flows are low. The additional stored water will enable water managers to more effectively and efficiently allocate water throughout the irrigation season, benefiting both irrigators and other users.
- Storing additional water during prolonged periods of low water supply may decrease the need for an irrigation district to prioritize its license or mandate water rationing among district irrigators.
- Currently, a significant number of irrigated acres across multiple districts lack support from a storage reservoir. This lack of storage means that water security for these acres is compromised during periods of low supply. Expanded storage would provide support for

these acres, and enhance water security for agricultural producers, industry, and municipalities.
- The increased storage capacity would make the South Saskatchewan River Basin more resilient to drought and flood events. Such events incur costs for residents, businesses, and governments at all levels. Additional storage may lessen the risk of these events and subsequently lower response and recovery costs.

In 2020, a historic modernization plan was announced by the Government of Canada (GoC) and the Province of Alberta, along with 10 of the irrigation districts. A financial investment of $933 million from all three levels has been provided towards infrastructure rehabilitation projects and the construction or enlargement of up to four off-stream irrigation storage reservoirs.

The rehabilitation projects, managed by the irrigation districts, aim to increase water conveyance efficiency and enable more acres to be irrigated with the same water allocation.

Modernizing and building new irrigation infrastructure is intended to:

- increase irrigated acreage;
- increase primary crop production;
- improve water use efficiency;
- increase water storage capacity;
- enhance water security;
- provide flood protection; and
- support long-term value-added agricultural processing activity.

The expansion of Chin Reservoir is one of the strategies proposed by the SMRID to contribute towards a regional increase in storage capacity. The intent of the SMRID Chin Expansion (in addition to other strategies) is to boost the level of resilience of the agricultural sector, municipal water supply, and the environment against the effects of climate change and extreme drought events.

2 REGULATORY REQUIREMENTS

The SMRID was advised that the proposed expansion of the Chin Reservoir qualified as a mandatory activity pursuant to Schedule 1(c) of the Environmental Assessment (Mandatory and Exempted Activities) Regulation. Pursuant to Section 44(1)(a) of the *Environmental Protection and Enhancement Act* (*EPEA*) (R.S.A. 2000, c. E-12), the SMRID was required to submit an Environmental Impact Assessment (EIA) for the project. The EIA report was to be prepared in accordance with the provisions of Division 1 of Part 2 of *EPEA*. The format of the EIA is based on the Government of Alberta's (GoA) *Guide to Preparing Environmental Impact Assessment Reports in Alberta* (GoA 2013). The EIA is to address the Final Terms of Reference (fToR) prepared for the Project.

The Natural Resources Conservation Board (NRCB) is the provincial agency that administers the *NRCBA*. The function of the Board is to make balanced decisions regarding the sustainable and responsible use of Alberta's natural resources (R.S.A. 2000, c. N-3).

The purpose of the *NRCBA* is to provide:

> *An impartial process to review projects that will or may affect the natural resources of Alberta in order to determine whether, in the Board's opinion, the projects are in the public interest, having regard to the social and economic effects of the projects and the effect of the projects on the environment*.

Federal regulatory agencies that will be consulted regarding approvals required for the Project include Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO), Transport Canada, and the Impact Assessment Agency of Canada (IAAC).

In addition to abiding by the EPEA (R.S.A. 2000, c. E-12) and the NRCBA (R.S.A. 2000, c. N-3), the SMRID is aware of the regulatory framework of Alberta and Canada. The Provincial and Federal Acts and Regulations that potentially apply to the Project are summarized in Table 2.1.

Table 2.1 Summary of Regulatory Requirements

Legislation	Administering Agency	Potential Requirements for Project
Provincial		
Water Act (R.S.A. 2000, c. W-3))	AEPA	Regulates the allocation, protection, and conservation of water and applies to the proposed construction, operation, and maintenance of the reservoir, dam facilities, canals, alteration of wetland habitat, and any loss or alteration of fish habitat. The *Act* regulates activities conducted in water bodies, as defined by the *Act*, that may: alter flow, level, or location of water; cause erosion of the bed and banks or mobilization and transport of sediment; or cause an effect on water quality of the aquatic environment.
Public Lands Act (*PLA*) (R.S.A. 2000, P-40)	AEPA	Prohibits the disturbance of the bed and shore of water bodies and other public lands administered by the Minister of AEPA. Components of the Project will require a formal application and written authorization from the Minister prior to construction.
Wildlife Act (R.S.A. 2000, c. W-10)	AEPA	Prohibits the disturbance of wildlife and wildlife habitat as administered by the Fish and Wildlife Branch of AEPA.
Soil Conservation Act (R.S.A. 2000, c. S-15)	AEPA	Imposes a duty to take appropriate measures to prevent soil loss or deterioration.
Weed Control Act (S.A. 2008, c. W-5.1)	AEPA	Specifies measures to prevent the spread of invasive and noxious weed seeds and propagules.
Historical Resources Act (*HRA*) (R.S.A. 2000, c. H-9)	Alberta Arts, Culture and Status of Women	Enacted to preserve, protect, and present historical and archaeological resources of provincial, national, and international significance. A component of the EIA for the Project will be a Historical Resources Impact Assessment (HRIA) as required by Alberta Arts, Culture and Status of Women (Alberta Culture).
Alberta Land Stewardship Act (*ALSA*) (S.A. 2009, c. A-26.8)	GoA	Authorizes the provincial Cabinet to establish planning regions and adopt a statutory plan for each region. The South Saskatchewan River Regional Plan was a result of the *ALSA*.
Federal		
Species at Risk Act (*SARA*) (S.C. 2002, c. 29)	ECCC and DFO	States that it is prohibited to kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species. In addition, no person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada
Migratory Birds Convention Act (*MBCA*) (S.C. 1994, c. 22)	ECCC	States that it is prohibited to disturb, destroy or take a nest, egg or nest shelter of a migratory bird or deposit or permit to be deposited oil, oil wastes or any other substances harmful to migratory birds in any waters or any area frequented by migratory birds.

Legislation	Administering Agency	Potential Requirements for Project
Canadian Environmental Protection Act (*CEPA*) (S.C. 1999, c. 33)	DFO	An Act respecting pollution prevention and the protection of the environment and human health in order to contribute to sustainable development. *CEPA* is administered by DFO and provides the legislative basis for a range of federal environmental and health protection programs. Although the *Fisheries Act* is also administered by DFO, *CEPA* covers the sections of the Act that deal with water pollution.
Canadian Navigable Waters Act (R.S.C. 1985, c. N-22)	Transport Canada	Regulates activities that may cause the restriction of the public right to navigation.
Fisheries Act (R.S.C. 1985, c. F-14)	DFO	Prohibits works that could cause death of fish by means other than fishing (Section 34) or harmful alteration, disruption, or destruction of fish habitat (Section 35). It is anticipated that a Request for Review application will be submitted to engage DFO regarding permitting implications under the *Fisheries Act*. Authorization under the *Fisheries Act* could potentially be required. Given that a large net increase in habitat quantity and productive capacity are predicted, it is anticipated that offsetting measures would not be required to support Authorization of the proposed works.

3 CONSULTATIONS AND PUBLIC ENGAGEMENT

3.1 Government Agency Consultation

3.1.1 Government of Alberta

Consultation with AEPA (Regulatory Assurance Division) was initiated in 2021, prior to when the regulatory framework for the Project had been fully developed.

3.1.1.1 Alberta Environment and Protected Areas

A discussion of the work required under Alberta's *Water Act* (2000) was the initial step in the consultation process. Consultation was held with S. Mathyk, Lethbridge Regulatory Assurance Manager and J. Cayford, Water Administration Engineer. Modifications and maintenance to the Chin Chute and West Dam components of the Chin Reservoir infrastructure would be covered under existing licencing held by SMRID. The construction of the New East Dam and the expansion of the reservoir would need to be submitted to the GoA's environmental impact assessment process, starting with the submission of a Project Summary to the Regulatory Assurance Division's Approvals Unit.

A Project Summary was submitted to the Regulatory Assurance Division's Approvals Unit on November 5, 2021, under the *EPEA* and a letter outlining the requirement for an EIA was provided by the Approvals Unit to SMRID on February 23, 2022.

A draft proposed Terms of Reference (pToR) was submitted to the Approvals Unit for initial review on April 4, 2022. The pToR was finalized through consultation with AEPA and was submitted for public review and comment on November 16, 2022. Public notices to announce the availability of the pToR for public review were posted on the SMRID website and across the SMRID system in the following newspapers:

- Alberta Native News;
- Lethbridge Herald;
- Medicine Hat News; and
- Taber Times.

On January 23, 2023, AEPA confirmed that the public review period had closed. AEPA would then review and compile the public review comments and comments from subject matter experts. AEPA provided draft final Terms of Reference (fToR) for review by SMRID on July 17, 2023. SMRID completed a review of the draft fToR and provided comments to AEPA on September 11, 2023. AEPA finalized the fToR and provided them to SMRID on November 15, 2023. The SMRID posted the official fToR for the Project on the SMRID's website.

The expansion site plan was provided to the GoA Public Lands on September 10, 2021. Initially, it was thought that a historical dam site was located on public lands. On May 23, 2023, the government noted that the public lands noted in maps was a mapping error. A teleconference meeting was held

between SMRID and GoA Public Lands on June 6, 2023, to discuss potential impacts to the Chin Coulee Provincial Recreation Area in 8-35-7-17-W4.

3.1.1.2 Alberta Forestry and Parks

With consideration of the proposed increase in the FSL of the reservoir, SMRID formally requested Alberta Forestry and Parks to refrain from entering long-term dispositions for lands adjacent to Chin Reservoir on July 17, 2023. The SMRID is in ongoing negotiations with Alberta Forestry and Parks to develop a solution to the impacts to the Chin Coulee Provincial Recreation Area including a land swap, a purchase of the land, or the acquisition of a disposition.

3.1.1.3 Natural Resources Conservation Board

With the expected participation of the NRCB, initial contact was made with L. Friend on March 28, 2022, to discuss any requirements during the early development of the ToR and EIA content. Subsequent consultation occurred on November 14, 2022 to outline eventual EIA submission requirements.

3.1.1.4 Aboriginal Consultation Office

A Pre-Consultation Assessment request was submitted through the GoA's Electronic Disposition System (EDS) on March 22, 2022. An Adequate Decision was provided for works falling under the Alberta *Water Act* (FNC202202151). No consultation was required under *EPEA* or the *Water Act*.

3.1.1.5 Alberta Culture, and the Status of Women

An initial Historical Resources Application was submitted to the Historical Resources Management Branch (HRMB) by Bison Historical Services Ltd., on behalf of the SMRID, on August 8, 2021. The HRMB reviewed the application and issued a *HRA* Requirements document for the Project on September 10, 2021 that required both an archaeological HRIA and paleontological Historical Resources Impact Assessment (pHRIA). The HRMB required the assessment for:

- The proposed expansion footprint;
- Areas around the existing West Dam;
- Areas around the footprint of the proposed New East Dam;
- Areas around the Existing Reservoir that may be affected by a raise in reservoir levels;
- Along proposed construction access roads; and
- At the locations of potential borrow pits.

On May 16, 2022 a permit application was submitted by Bison Historical Services Ltd. for the Project HRIA. The HRMB reviewed the HRIA permit application and issued Archaeological Survey of Alberta (ASA) permit 22-047 for the HRIA on May 17, 2022. Fieldwork for the HRIA was conducted between May 26 to October 31, 2023. The final report for the HRIA was submitted to the HRMB on September 25, 2023.

3.1.2 Impact Assessment Agency of Canada

As suggested in the *Guide to Preparing an Initial Project Description and a Detailed Project Description*, a high-level project description of the proposed Project was provided to the Impact Assessment Agency of Canada (IAAC) on March 7, 2022. The letter outlined the project components and requested feedback regarding the interpretation of Section 2, subsections 58-61 of the *Physical Activities Regulations* under the *Impact Assessment Act* (*IAA*) (S.C. 2019, c. 28, s. 1) with respect to the proposed Project. The letter outlined how the Project should not trigger an Impact Assessment given no new diversion is required, no increase of allocation under the existing licences is required, and no dams are to be constructed on a natural waterbody (as defined in Section 2, subsections 58-61). The Project is to expand an existing reservoir, and the expansion will not overprint an existing natural waterbody.

The IAAC determined that:

> *Based on the current information provided regarding the Project, it does not appear to meet the definition of a designated project as described in the Physical Activities Regulations under the Impact Assessment Act (the IAA). As such, the Agency has determined that the Project, as presented, is not a designated project under the IAA. However, please note that subsection 9(1) of the IAA gives the Minister of Environment and Climate Change Canada the authority to designate the Project if, in the Minister's opinion, the carrying out of Project activities may cause adverse environmental effects or public concerns related to those effects warrant the designation.*

On April 12, 2022, the IAAC received a letter requesting the Project be designated under the *IAA*. The request was made to the Minister by Ecojustice, on behalf of numerous members of non-government organizations (NGOs) and the public. A review of the request did not change the determination that the Project did not qualify as a Physical Activity under the *IAA*. The Project was notified of the second and final decision on June 29, 2022. In the response, the IAAC noted:

> *The Minister took into consideration the information provided by St. Mary River Irrigation District (the Proponent), advice from federal authorities, input from Alberta Environment and Parks, concerns expressed in the requester's letter, and the concerns from Indigenous groups and the public that are known to the Impact Assessment Agency of Canada (the Agency).*

It was understood that the provincial EIA process was sufficiently robust to effectively assess the potential effects of the Project. The Project was still required to meet federal regulations as outlined in Section 2.4.

3.1.3 Municipal Government

SMRID contacted and provided notification packages of the Project to the nearby municipalities. Consultations with the municipalities were conducted individually.

3.1.3.1 County of Warner

SMRID presented at a council meeting of the County of Warner on September 20, 2022. The meeting was in Council Chambers and was attended by Reeve R. Taylor. SMRID presented information regarding the proposed expansion of Chin Reservoir including a discussion of the New East Dam, improvements to additional SMRID infrastructure, potential impacts to recreation including Chin Park, and outlined the general timeline for the Project.

3.1.3.2 Municipal District of Taber

SMRID presented at a council meeting of the Municipal District of Taber on October 11, 2022. The meeting was in Council Chambers and was attended by Reeve M. Harris. The SMRID presented during a closed session as per Section 197(2) of the *Municipal Government Act* (R.S.A. 2000, c. M-26).

3.1.3.3 Lethbridge County

SMRID held an in-person meeting with Lethbridge County on November 30, 2022. The agenda of the meeting included a Project Overview, Regulatory Permitting, Project Schedule, and Upcoming Work Planned.

3.1.3.4 Town of Taber

SMRID has plans to discuss the Project with the Town of Taber - Water/Wastewater group regarding the Town of Taber water intake design.

3.1.3.5 County of Forty Mile

A meeting was held on September 15, 2021 with county administrators. The discussion focused on the location of the Project relative to the County. It was determined that the Project is outside of their limits, and the discussion did not meet the criteria for a meeting with their council.

3.2 Stakeholder Engagement

Direct benefits of the Project are expected for citizens of Lethbridge, Coaldale, Hamlet of Chin, Barnwell, Taber, Grassy Lake, Burdett, Bow Island, Winnifred, Seven Persons, and Medicine Hat. Indirect effects of the anticipated economic boost are also expected beyond the SMRID's service area. In addition to irrigation, the SMRID maintains agreements to provide water for other uses such as municipal water supply, stock watering, commercial and industrial use, wildlife habitat maintenance and enhancement, and recreation (Table 3.1). In addition, the SMRID has support agreements with 1,536 households to supply domestic water from the irrigation portion of the annual licensed volume.

Table 3.1 Non-Irrigation Water Supply Agreements

Agreement Type	Typical Annual Quantity of Agreements
Agriculture (e.g., stock watering, feedlots, greenhouses)	229
Municipal (e.g., communities, water coops, recreation)	111
Commercial / Industrial (e.g., processing plants, gravel pits)	17
Fish and Wildlife Habitat	3

The SMRID leases grassland parcels out to livestock and has a partnership with Ducks Unlimited Canada (DUC). The partnership with DUC includes supplying water and lease land for wetland conservation projects. The SMRID also leases land to Alberta Conservation Association for conservation projects involving riparian restoration and grassland management. The SMRID works directly with the South East Alberta Watershed Alliance on wildlife habitat conservation. Under the standard of the Alliance for Water Stewardship (AWS 2019), the SMRID supports sustainable communities, the environment, and agriculture through water stewardship projects such as the West Site Water Stewardship Plan developed for Agriculture's Water Future Phase III. The project is a demonstration of how the SMRID supports sustainable communities and agriculture within the Oldman River Watershed. The SMRID's water stewardship efforts are intended to address the challenges of future water reliability (WaterSMART 2023). Additional participation in watershed stewardship includes SMRID participation as a member organization in the Oldman Watershed Council and supplies a board member to the Canadian Water Resource Association.

Potential interest in the Project by citizens and non-government organizations across southern Alberta is expected. Information distribution to date has included public engagement and stakeholder consultation through in-person meetings, virtual meetings, and multiple types of media.

3.2.1 Stakeholder Meetings

Stakeholder consultation was initiated with a meeting held in Taber, Alberta on March 11, 2022. In attendance were 17 landowners affected by the Project, four representatives from the SMRID, a representative from the Taber Irrigation District (TID), and the SMRID consultants from MPE Engineering Ltd. (MPE) and Klohn Crippen Berger Ltd. (KCB). The agenda for the initial meeting included a briefing on the proposed Project, the regulatory framework for the Project, and a question-and-answer period. Attendees were provided additional time to review the Project and ask additional questions during a poster session held after the presentation.

The SMRID outlined the proposed expansion to irrigators within the SMRID in the form of a plebiscite vote conducted on November 28, 2022. The result of the votes was 91% in favour of expansion (SMRID 2022a).

The SMRID held four Irrigation Expansion Plebiscite meetings which were open to the public and landowners to discuss changes to the expansion within the SMRID at the following times and places (SMRID 2022b):

- Taber Heritage Inn, 4830 46 Ave, Taber, AB on November 22, 2022.
- Bow Island Legion Hall, 202 5 Ave E, Bow Island, AB on November 23, 2022.

- Seven Persons Community Hall, Mildred St, Seven Persons, AB on November 24, 2022.
- Readymade Community Hall, Township Rd 90, Cranford, AB on November 25, 2022.

At the meetings, information regarding the proposed expansion of Chin Reservoir were provided for discussion. Topics discussed during the meetings included, but were not limited to, modeling and potential effects of climate change within, upstream, and downstream of the SMRID; flood mitigation; process and potential timeline for the expansion of acres; reservoir operations; and the process for qualifying for expansion acres. It was noted during the meeting at Bow Island that the SMRID was not applying for an increase in water allotment. The goal of the expansion is to store more of the current allotment for increased ability to spread the existing allotment across the SMRID system.

3.2.2 Southern Alberta Group for the Environment

On March 31, 2021, the SMRID received an email outlining concerns with the Project from the Southern Alberta Group for the Environment (SAGE). Copied on the email were representatives from AEPA, Alberta Agriculture and Irrigation, Alberta Infrastructure and Communities, and the federal ministry of ECCC. Organizations represented by SAGE included Trout Unlimited Canada, Nature Alberta, Bow Valley Naturalists, Alberta Wilderness Society, and the Water Conservation Trust.

An in-person meeting was hosted by the Irrigation Districts of Alberta in Lethbridge, Alberta on May 12, 2022. In attendance were representatives from Irrigating Alberta Inc., SMRID, TID, United Irrigation District (UID), Eastern Irrigation District (EID), Raymond Irrigation District (RID), Bow River Irrigation District (BRID), Western Irrigation District (WID), Alberta Agriculture and Irrigation, AEPA, Canadian Parks and Wilderness Society, and members of SAGE. Topics discussed included, but were not limited to, an overview of the Alberta Irrigation Modernization Program (AIM) and Modernization Projects, the potential for expansion of irrigated acres, a discussion of reservoirs, and EIAs.

Meeting notes from the May 12, 2022 meeting were emailed to SAGE on May 23, 2022. SAGE requested shapefiles of the boundaries of the irrigation districts for a presentation to the AIM Program and to estimate grassland areas within the districts. SAGE notified SMRID that they had registered to receive updates on the EIA decisions from AEPA and the NRCB.

3.2.3 Public Disclosure

An information package regarding the proposed changes and expansion was provided for public viewing at the SMRID office in Lethbridge, Alberta on October 13, 2022. An information guide was provided online on the SMRID website on October 25, 2022 (SMRID 2022c). As noted in Section 3.1.1.1, public notifications regarding the pToR for the EIA were published on November 15 and 16, 2022. The publication initiated a 50-day public review period for the pToR as set by AEPA, with an end date of January 3, 2023. The public notice of the pToR was published in the following newspapers:

- Alberta Native News;
- Lethbridge Herald;

- Medicine Hat News; and
- Taber Times.

3.3 Indigenous Consultation

As noted in Section 3.1.1.4, an Adequate Decision was provided for the Project, and a "Level 0" Indigenous Consultation was determined by GoA under both *EPEA* and the *Water Act* (FNC202202151). In addition, as the Project was deemed not to be a designated project as described in the Physical Activities Regulations under the federal IAA, consultation was not required by IAAC under the IAA review process. A federal duty to consult may yet be triggered during federal approvals reviews as outlined in Section **Error! Reference source not found.**.

While Indigenous Consultation has not yet been required by regulators, the SMRID has volunteered to proceed with Indigenous Consultation with the Blood Tribe. The Blood Tribe is a near-neighbour of the SMRID and the developer of the Blood Tribe Agricultural Project which utilizes the same headworks system. The St. Mary Reservoir was constructed on the Blood Reserve and was a collaborative project, with the Chief Shot Both Sides participating in the opening ceremony in 1951.

Indigenous Consultation was initiated with Mike Oka of the Blood Tribe on October 12, 2022. Due to various circumstances, a site meeting was delayed until December 15, 2022. The meeting was attended by three members of the Blood Tribe and three representatives of SMRID. At the meeting, the Blood Tribe were provided with the background, purpose, and schedule for the Project. The background information included a site plan identifying the expanded area and other critical components and a slide show showing the HRIA work done to date.

The Blood Tribe requested access the inundation area prior to flooding to conduct a site walk-through with elders. An agreement on access was reached, though access would depend on landownership status at the time of flooding. At the time of the meeting, the land was privately owned. SMRID committed to keep the Blood Tribe informed of the status of landownership and of the Project as a whole. The SMRID provided an invitation to the Blood Tribe for participation in an ongoing dialogue and discussions of Project-related issues or concerns.

Approval requirements under the federal *Fisheries Act* (1985) and *Canadian Navigable Waters Act* (1985) may trigger consultation. Transport Canada and DFO will determine if the requirements of duty to consult have been met.

4 ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT ASSESSMENT

The assessment of potential effects is a multistep process which was applied to identified Valued Components (VC). VCs provide a means to focus the evaluation of potential Project effects and assess the significance for residual adverse environmental effects on representative components that have the most relevance to decision-making processes. VCs were chosen for the assessment in accordance with regulatory concerns, guidelines, and requirements. In complex systems, VCs can be further represented by Key Indicators (KIs) to provide increased granularity to assess the baseline condition of VCs and potential for effects.

Three scales of assessment were defined for the Project. The Project Area (PA) is the footprint of the proposed project and is used to assess the potential effects of changes within the footprint. A Local Study Area (LSA) incorporates potential effects that may occur beyond the footprint of a project, either directly or indirectly. A Regional Study Area (RSA) is used to provide context to the environmental conditions at the PA and LSA scales, and is used to evaluate potential regional, cumulative effects.

The effects assessment process included:

- Establishment of existing baseline conditions.
- Identification of potential Project-related impacts and effects.
- Recommendation of mitigation measures and best management practices to reduce the potential for effects.
- Identification and characterization of residual effects expected to occur after mitigation measures have been applied.
- Description of anticipated monitoring activities.
- Description of the regulatory implications of the Project.

If a potential effect could be avoided or reduced to a negligible magnitude through the successful application of design considerations or mitigation measures, a residual effect was not anticipated. When residual effects were not predicted, the potential effect was not carried forward in the evaluation process. If a residual effect was identified, it was characterized to determine the significance of the potential effect.

The objective of the environmental assessment was to determine if residual effects were predicted after the application of mitigation strategies and industry standard practices. Where mitigation measures were expected to be effectively implemented, and no or negligible changes to the environment were predicted, the potential effects were not carried forward to characterization. Project impacts predicted to have uncertain effects to the environment after mitigation were characterized to assign a final significance. The significance of residual effects was characterized in terms of Direction, Magnitude, Geographic Extent, Duration, and Reversibility (Table 4.1).

Significance was determined through a cumulative evaluation of the characterizations. Residual effects were classified as either significant (S) or not-significant (NS). A significant effect was one that meets any of the following criteria:

- an effect predicted to critically imperil individuals and/or critical habitat of species of conservation concern ('Endangered' or 'Threatened' species);
- an effect predicted to substantially impede access to species of management concern (e.g., important socio-economic and traditional use species);
- an effect predicted to affect species currently protected under an emergency protection order;
- an effect predicted to adversely affect the sustainability of or substantially enhance regional populations of fish, wildlife, native plants, or native plant communities; and/or
- an adverse, unmitigable effect on existing socio-economic conditions, historical resources, air quality, groundwater, geomorphology, undisturbed soils, or natural surface water bodies or watercourses that are characterized as high magnitude, regional extent, far-future in duration, and is not reversible.

Residual effects predicted for each VC are described in the following sections and a tabular summary of the residual effects characterization is provided in Table 4.2.

Table 4.1 Residual Effect Characterization Descriptors

Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence
Positive (P): The anticipated effect will be positive	**Negligible (N):** No detectable change from the baseline condition of a resource predicted	**Local (L):** Effect is limited to the Project Area or Local Study Area	**Short-Term (ST):** Effect is removed with the completion of construction	**One Time (OT):** Effect is confined to one discrete occurrence	**Short-Term (ST):** Effect can be reversed within 10 years	**Predictable (P):** Scientific certainty in effect characterization based on available data
Neutral (Ne): The anticipated effect is neutral	**Low (L):** A detectable change from the baseline condition of a resource, but within the range of plausible natural variability[1], and/or does not result in population-level effects or effects on sensitive environmental elements	**Regional (R):** Effect extends to the boundaries of the South Saskatchewan River Basin	**Medium-Term (MT):** An effect that is present after construction but diminishes during the lifespan of a project	**Sporadic (S):** Effect occurs rarely and at sporadic intervals	**Medium-Term (MT):** Effect can be reversed between 10 to 25 years	**Uncertain (U):** Insufficient information exists, and effect characterization is based on assumptions
Negative (N): The anticipated effect will be negative	**Moderate (M):** A detectable change from the baseline condition of a resource approaching the range of plausible natural variability and/or indirect effects on sensitive environmental elements	**Far Reaching (FR):** Effect extends beyond the South Saskatchewan River Basin, affecting adjacent river basins or beyond.	**Long-Term (LT):** Effect lasts the lifespan of a project	**Regular (R):** Effect occurs on a regular basis	**Long-Term (LT):** Effect can be reversed within between 25 to 100 years	
Unknown (Unk): Insufficient information to determine direction	**High (H)**: A detectable change from the baseline condition of a resource beyond the range of plausible natural variability, exceedance of a published guideline or threshold value, and/or measurable population-level effects on a species of conservation concern		**Far Future (FF):** An effect predicted to be present after the lifespan of the project	**Continuous (C):** Effect occurs constantly during, and potentially beyond, the construction phase	**Irreversible (IR):** Effect cannot be reversed	

1 Where study conditions allow for quantification, natural variability is the distribution of data points relative to a mean that is observed without manipulation or introduced, experimental variables. Where study conditions do not allow for quantification, plausible natural variability is the qualitative assumption that some variability in a system can be attributed to natural randomness.

4.1 Aquatic Environment

4.1.1 Hydrogeology

Increased reservoir water levels are expected to lead to an increased rate of groundwater flow to the Milk River Aquifer through the existing submerged Milk River Aquifer wells, as well as increased seepage of reservoir water to the Milk River Aquifer through the footprint of the reservoir. The magnitude of the increase in groundwater quantity is expected to be low as permeability of the underlying soils is low. Increased seepage is expected to lead to a low magnitude change in groundwater quality through transport of salts.

4.1.2 Hydrology

Increasing the FSL, extent, and capacity of the reservoir is expected to result in significant positive effects, in line with the overall objectives of the Project. The proposed changes will provide increased flood mitigation capacity for the irrigation system, designed to meet dam safety requirements. A key objective of the Project is to provide additional water storage capacity to increase water security in the region during low flow events and droughts.

4.1.3 Surface Water Quality

The change in reservoir volume and operation is not predicted to result in a residual change in surface water chemistry. There is expected to be an increase in suspended sediment concentrations in response to increased shoreline erosion potential, particularly during initial operation of the expanded reservoir.

4.1.4 Aquatic Ecology

Potential construction-related effects on aquatic ecology can be mitigated through application of standard measures. Fish will be excluded from the expanded reservoir during initial filling, which will avoid exposure to sediment during the period of highest potential for mobilization. However, exposure to increased suspended sediment concentration is anticipated during initial operation of the expanded reservoir. Increasing the FSL and extent of the reservoir will result in an Increase in aquatic habitat quantity due to more wetted area and increased reservoir volume. There are expected to be changes in habitat suitability and accessibility during establishment of coarse substrates, vegetation and benthic invertebrate populations in response to new operating levels, as well as a short-term increase in availability of Northern Pike spawning habitat. There will be increased fish movement potential within the expanded extent of the reservoir. The increase in habitat quantity is expected to lead to increases in fish, benthic invertebrate and plankton populations. Inundation of soils within the expanded reservoir area is expected to result in increased fish tissue mercury concentrations. Please see section 4.3.2 below for further discussion on mercury.

4.2 Terrestrial Environment

4.2.1 Soils and Terrain

Direct disturbance of soils and inundation through expansion of the reservoir will result in loss of access to soils, reduced diversity of soil types, reduced agricultural land capability, and loss of carbon sequestration potential. Increased shoreline erosion Future operation of the expanded reservoir at a higher FSL and within the expanded reservoir area is expected to result in increased potential for shoreline erosion, which could lead to loss of soils, mass wasting, and potential reactivation of landslides. Loss or alteration of unique landforms is expected due to inundation of coulee terrain features.

4.2.2 Vegetation and Wetlands

Development of permanent project infrastructure and filling of the expanded reservoir will result in a decrease in vegetation habitat quantity, including loss of native grassland vegetation communities, traditional use plants, rare plants and rare plant communities, and increased fragmentation of vegetation communities. Areas of temporary disturbance will be restored; however, a temporary reduction of ecological function is expected in reclaimed areas. The change in water levels at the perimeter of the existing Chin Reservoir will cause a shift of vegetation zones and temporary loss of vegetation within the Drawdown Zone. Likewise, there will be a temporary reduction in rare plant populations and wetland habitat during the shift within the Expanded Reservoir Drawdown Zone. Further loss of plant habitat could occur adjacent to the Expanded Chin Reservoir due to erosion of soils and reactivation of landslides during future operation. Introduction and spread of invasive species, undesirable non-native plants, and weeds is expected through dispersion within the irrigation system. However, the multi-year filling process is expected to limit the potential for viable weed seed to be available for dispersal within the irrigation system and active management of weeds is occurring at the farm level.

4.2.3 Wildlife and Wildlife Habitat

Residual effects on wildlife are anticipated as a result of direct disturbance of existing habitat within the footprint of infrastructure, temporary disturbance and avoidance within areas of construction access and laydown, reduced habitat suitability within areas of reservoir inundation, a shift in habitat within riparian shoreline areas and the Expanded Reservoir Drawdown Zone, and increased habitat fragmentation due to the presence of water. Effects on habitat for key indicator species groups will include: effects on highly suitable habitat for avian biodiversity; breeding and overwintering habitat for Plains Spadefoot Toad; rock outcrop habitat within close proximity to a Prairie Rattlesnake hibernaculum; native grassland habitat of varying suitability for Pronghorn; and temporary reduction in the availability of vertical bank and bluff nesting habitat for Bank Swallow, with a net increase over time. Direct mortality could occur through impact with hibernating Plains Spadefoot during excavation or during reservoir filling, despite application of amphibian exclusion and rescue efforts.

4.3 Human Environment

4.3.1 Air Quality

Air emissions from the Project would be limited to the construction phase only, as no air emissions will be associated with the operation of the Project. Once completed, the reservoir infrastructure is not expected to cause mechanically or chemically generated emissions.

Based on the findings of air quality assessments of similar projects, the construction emissions from the Project are not expected to result in adverse health effects.

4.3.2 Fish Tissue Mercury Content

The expansion of Chin Reservoir is expected to result in an increase in mercury concentrations in fish tissue. Existing mercury concentrations in lake whitefish, walleye and northern pike caught from Chin Reservoir are generally within the range reported for other lakes and reservoirs in the South Saskatchewan land use region of Alberta. Based on limitations of predicting mercury and methylmercury concentration post-inundation and the fact that the baseline total mercury levels measured in walleye and northern pike from Chin Reservoir meet Alberta Health's criteria for issuing fish consumption advisories, the establishment of an environmental monitoring program after the expansion of the reservoir is expected to be the most effective way to determine the evolution of mercury concentrations in sportfish in Chin Reservoir. It is proposed that mercury concentrations in fish from the Chin Reservoir will be monitored during operation. A methylmercury monitoring plan will be developed in consultation with AEPA and Alberta Health, including identifying responsibilities for data collection and follow up. Alberta Health will consider the results of fish tissue sampling collected during the monitoring program in managing the provincial fish consumption advisory program.

4.3.3 Noise

Residual effects of Project noise are not expected. With mitigation strategies in place, the potential effects of excessive noise of the Project would be expected to be localized, short in duration, and temporary.

4.3.4 Land Use and Management

The Project's greatest effect on land use will be the conversion of grazed land into open water (reservoir). The Project is expected to reduce the availability of grazing lands by approximately 18% relative to baseline conditions documented within the LSA. Conversely, the areal extent of open water of the reservoir is expected to increase by close to 30% relative to baseline conditions within the LSA. Other than compensation, there are no mitigation strategies possible for the change from grazed lands to open water. Local and regional support for the Project has been noted during the consultation process.

4.3.5 Historical Resources

Filing of the expanded reservoir area is expected to result in inundation and erosion of archaeological sites. Construction of the New East Dam and associated infrastructure and decommissioning of the Existing East Dam could result in impact to archaeological sites on landforms adjacent to the reservoir. Future reservoir operation could likewise result in impacts due to inundation in the fluctuating reservoir, or erosion of adjacent shoreline areas. Pre-disturbance archaeological mitigative recording and excavations at previously recorded significant archaeological sites will be conducted to mitigate the magnitude of residual effects in accordance with regulatory determinations.

4.3.6 Socio-economics

The 3-year construction period impacts of the Project are expected to increase the provincial Gross Domestic Product (GDP) by about $163.7 million, labour income by about $61.4 million, and create 1,528 full time equivalents (FTEs). Irrigated crop and livestock production, and their associated backward and forward linkages, are expected to increase the provincial GDP by about $180 million annually, create about $96.7 million in labour income, and create 1,618 FTEs. Increased investment in farm machinery and equipment by irrigation producers, increased irrigation income during the drought periods, and increased protection of farm and non-farm properties during overland flood events are estimated to increase the provincial GDP by about $143 million, generate about $107 million in labour income, and about 956 FTEs. The Chin Reservoir Expansion Project, during the 50-year project life, is estimated to increase the provincial GDP by about $487 million, generate about $265 million in labour income, and create 4,102 FTEs.

The Chin Reservoir Expansion Project is expected to annually generate about $121.9 million to the GoA and GoC, and this includes about $12.6 million in transfer payments from the GoC to the GoA. About 45% ($54.9 million) of the total fiscal revenue will be generated each year after the project comes to full operation, and the remaining 55% ($67.0 million) will be generated only during specified years during the 50-year life of the project.

The Benefit-Cost Ratio related to direct benefits is estimated to be 2.16, and increases to 4.78 if direct, indirect, and induced benefits are considered. The Benefit-Cost Ratio indicates that undertaking the Chin Reservoir Expansion Project is economically positive. The internal rate of return (IRR) increases from 10.5% (direct benefits) to 19.6% (direct, indirect, and induced benefits). The payback period shows that Alberta society will realize the benefits of this investment within 14 years (if direct benefits are included) or 9 years (if all benefits are included).

Table 4.2 Summary of the Assessment of Potential Residual Project Effects

Activity	Effect Description	Evaluation Criteria for Assessing Residual Effects							
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence	Significance
Hydrogeology									
Operation									
Increasing the FSL, extent, and capacity of the reservoir	Increased reservoir water level on existing submerged Milk River Aquifer wells with an increased rate of flow to the Milk River Aquifer through the wells.	Positive	Low	Local	Long-Term	Continuous	Irreversible	Uncertain	Not Significant
	Seepage of reservoir water to the Milk River Aquifer through the footprint of the reservoir. Assuming the magnitude of the seepage is low given the confining (low permeability) nature of the intervening geology.	Positive	Low	Local	Long-Term	Continuous	Irreversible	Uncertain	Not Significant
	Increased reservoir water level on existing submerged Milk River Aquifer wells with an increased rate of flow to the Milk River Aquifer through the wells.	Neutral	Low	Local	Long-Term	Continuous	Irreversible	Uncertain	Not Significant
	Seepage of reservoir water to the Milk River Aquifer through the footprint of the reservoir. This seepage could acquire salts from the intervening strata and carry the salts down to the Milk River Aquifer. Assuming the magnitude is low given the confining (low permeability) nature of the intervening geology.	Negative	Low	Local	Long-Term	Continuous	Irreversible	Uncertain	Not Significant
Hydrology									
Operation									
Increasing the FSL, extent, and capacity of the reservoir	Increased flood mitigation capacity.	Positive	Major	Regional	Long-Term	Rare	Reversible	Predictable	Significant
	Extra storage for increased water security during low flow events and droughts.	Positive	Major	Regional	Long-Term	Rare	Reversible	Predictable	Significant
Surface Water Quality									
Operation									
Increasing the FSL, extent, and capacity of the reservoir	Introduction of sediment	Negative	Minor	Local	Long-Term	Frequent	Irreversible	Predictable	Not Significant
Aquatic Ecology									
Operation									
Increasing the FSL, extent, and capacity of the reservoir	Mobilization of sediment into the water due to erosion of bed and shoreline not previously exposed to wave erosion. ▪ Fish will be excluded from the expanded reservoir during initial filling, which will avoid exposure to sediment during the period of highest potential for mobilization.	Negative	Low	Local	Short-Term	One time	Reversible Short-Term	Predictable	Not Significant
	Increase in aquatic habitat quantity due to more wetted area and increased reservoir volume	Positive	High	Local	Far Future	Continuous	Reversible Short-Term	Predictable	Not Significant
	Changes in aquatic habitat suitability and accessibility during establishment of coarse substrates, vegetation and benthic invertebrate populations in response to new operating levels	Negative	Low	Local	Short-Term	One time	Reversible Short-Term	Predictable	Not Significant
	Short-term increase in the availability of suitable spawning habitat for northern pike	Positive	Low	Local	Short-Term	One time	Reversible Short-Term	Predictable	Not Significant

Activity	Effect Description	Evaluation Criteria for Assessing Residual Effects							
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence	Significance
	Direct harm to fish by increasing mercury bioavailability through flooding of land	Negative	Low	Local	Medium-Term	Regular	Reversible Short-Term	Predictable	Not Significant
Decommissioning of the Existing East Dam	Increased fish movement potential within the local area, but no change at a regional scale	Positive	Moderate	Local	Far Future	Continuous	Reversible Short-Term	Predictable	Not Significant
Operation of Expanded Reservoir at new operating levels	Increase in benthic invertebrate populations associated with increased quantity of habitat	Positive	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
	Increase in plankton populations associated with increased quantity of habitat	Positive	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
	Increase in key indicator fish species populations associated with expanded habitat and increase in benthic invertebrate and plankton production	Positive	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
Soils and Terrain									
Construction									
Development of permanent Project infrastructure and reservoir filling	Loss of access to soils, reduced soil diversity (distribution of soil type), reduced agricultural land capability, and loss of carbon sequestration potential	Negative	Moderate	Local	Far Future	One Time	Long-Term	Predictable	Not Significant
Operation									
Reservoir operation at the new FSL and at fluctuating water levels	Increased shoreline erosion leading to loss of soils, mass wasting, and potential reactivation of landslides. ▪ SMRID to purchase a setback around Chin Reservoir.	Negative	Moderate	Local	Far Future	Sporadic	Irreversible	Uncertain	Not Significant
	Loss or alteration of unique landforms	Negative	Moderate	Local	Far Future	One Time	Irreversible	Predictable	Not Significant
Vegetation and Wetlands									
Construction									
Development of permanent project infrastructure and filling of the expanded reservoir	Decrease in vegetation habitat quantity including loss of native grassland vegetation communities	Negative	High	Local	Far Future	One Time	Long-Term	Predictable	Not Significant
	Loss of traditional use plants	Negative	Moderate	Local	Far Future	One Time	Long-Term	Predictable	Not Significant
	Increased fragmentation of vegetation communities	Negative	Negligible	Regional	Far Future	One Time	Long-Term	Predictable	Not Significant
	Loss of rare plants and rare plant communities	Negative	Moderate	Local	Far Future	One Time	Long-Term	Uncertain	Not Significant
	Temporary loss of plant habitat in temporary workspaces and reduction of ecological function in reclaimed areas	Negative	Low	Local	Long-Term	One Time	Long-Term	Predictable	Not Significant
Operation									
Annual operation of the Expanded Chin Reservoir	Change in water levels at the perimeter of the existing Chin Reservoir causing a shift of vegetation zones and temporary loss of vegetation within the Drawdown Zone	Negative	Low	Local	Short-Term	One Time	Short-Term	Predictable	Not Significant
	Temporary reduction in rare plant populations during shift of existing and development of new populations within the Expanded Reservoir Drawdown Zone	Negative	Low	Local	Short-Term	One Time	Short-Term	Predictable	Not Significant
	Temporary reduction in wetland habitat during shift and creation of wetlands within the Expanded Reservoir Drawdown Zone	Negative	Low	Local	Short-Term	One Time	Short-Term	Predictable	Not Significant

Activity	Effect Description	Evaluation Criteria for Assessing Residual Effects							
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence	Significance
	Loss of plant habitat adjacent to Expanded Chin Reservoir due to erosion of soils and reactivation of landslides	Negative	Moderate	Local	Far Future	Sporadic	Irreversible	Uncertain	Not Significant
Irrigation system operation	Introduction and spread of invasive species, undesirable non-native plants, and weeds through dispersion within irrigation system. ▪ The multi-year filling process is expected to limit the potential for viable weed seed to be available for dispersal within the irrigation system following connection of the expanded reservoir area. ▪ Active management of weeds is occurring at the farm level throughout the irrigation district.	Negative	Low	Regional	Short-Term	Regular	Short-Term	Predictable	Not Significant
Wildlife and Wildlife Habitat									
Construction									
Major earth-moving activities and construction of structures: ▪ Construction of access roads and site preparation of laydowns, borrow pits, and stockpile areas ▪ Construction of the New East Dam ▪ Construction of the temporary gated culvert outlet structure ▪ Removal of the Existing East Dam ▪ Infilling of the secondary coulee in the Dam Fill Waste Area with excavated dam fill material	**Change in Habitat Suitability and/or Availability**								
	Loss or reduction in the suitability of wildlife habitat used for a varied of life requisites (i.e., breeding, foraging, and migration, etc.) within the footprint of the New East Dam and Auxiliary Spillway.	Negative	Low	Local	Long-Term	One Time	Irreversible	Predictable	Not Significant
	Reduction of Plains Spadefoot breeding habitat and suitable overwintering sites to the footprint of the New East Dam and the Dam Fill Waste Area.	Negative	High	Local	Long-Term	One Time	Irreversible	Predictable	Not Significant
	Reduction in rock outcrop habitat within close proximity to the known snake hibernaculum due to the construction of permanent and temporary construction components.	Negative	Low	Local	Medium-Term	One Time	Short-Term	Predictable	Not Significant
	Temporary reduction of suitable wildlife habitat within temporary infrastructure components including laydown areas, fueling depots, and access roads.	Negative	Moderate	Local	Short-Term	One Time	Short-Term	Predictable	Not Significant
	Temporary reduction of wildlife habitat within the Dam Fill Waste Area until revegetation of the re-contoured coulee slopes can re-establish.	Negative	Low	Local	Short-Term	One Time	Short-Term	Predictable	Not Significant
	Disruption in Habitat Connectivity								
	Habitat fragmentation along the coulee bottom. Construction of the New East Dam may interrupt the migration paths for snakes (i.e., between hibernacula, gestation dens, and foraging sites) and amphibians (i.e., between overwintering sites and breeding ponds).	Negative	Moderate	Local	Long-Term	Sporadic	Irreversible	Predicable	Not Significant
	Direct Mortality								
	Hibernating Plains Spadefoots dug up during construction or buried under new dam material.	Negative	Low	Local	Short-Term	One Time	Irreversible	Uncertain	Not Significant

Activity	Effect Description	Evaluation Criteria for Assessing Residual Effects							
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence	Significance
Filling of the Reservoir Expansion Area (phased reservoir filling schedule)	**Change in Habitat Suitability and/or Availability**								
	Change of baseline terrestrial habitats within the coulee to aquatic habitats leading to a reduction in the suitability of wildlife habitat within the Reservoir Expansion Area.	Negative	High	Local	Long-Term	One Time	Irreversible	Predictable	Not Significant
	Temporary increase in the presence of wetland-like habitat relative to baseline conditions at each filling stage. Wetland habitat is highly suitable for aquatic nesting bird species, or species that nest in emergent vegetation, or on the ground immediately adjacent to the water's edge. Wetlands will support waterfowl, wading shorebirds, and semi-aquatic songbirds. Areas with water depths less than 1 m will likely develop the growth of emergent vegetation.	Positive	High	Local	Short-Term	One Time	Irreversible	Predictable	Not Significant
	Disruption in Habitat Connectivity								
	Habitat fragmentation as a result of the presence of water in the coulee. ▪ Avian species unsuited to landing on water are forced to exert more energy to cross the coulee without rest or cover. ▪ Wildlife species that prefer terrestrial travel routes will be required to travel around the Expanded Reservoir.	Negative	Low	Local	Long-Term	One Time	Irreversible	Predictable	Not Significant
	Direct Mortality								
	Drowning of overwintering Plains Spadefoot. Infiltration of water into the substrate outside of the breeding season may lead to drowning of dormant individuals or emergence into unfavorable conditions (i.e., cold temperatures).	Negative	High	Local	Short-Term	One Time	Irreversible	Uncertain	Not Significant
Operation									
Increasing the FSL, extent, and capacity of the reservoir	**Change in Habitat Suitability and/or Availability**								
	Temporary reduction of riparian habitats along the reservoir shoreline and wetland habitats in the secondary coulees surrounding the Existing Reservoir resulting in a temporary decrease in avian biodiversity (riparian and wetland habitats support more complex communities of birds).	Neutral	High	Local	Medium-Term	One Time	Irreversible	Predictable	Not Significant
	Increase in biodiversity within the re-established riparian and wetland habitats in the secondary coulees around the Expanded Reservoir shoreline.	Positive	Moderate	Local	Long-Term	One Time	Irreversible	Predictable	Not Significant
	Decrease in the availability of grassland and coulee-related habitat types by the replacement with aquatic habitat. Wildlife associated with these habitat types will be displaced to adjacent suitable habitat that is to remain around the Project.	Negative	High	Local	Long-Term	One Time	Irreversible	Predictable	Not Significant

Activity	Effect Description	Evaluation Criteria for Assessing Residual Effects							
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Confidence	Significance
	Reduction of suitable amphibian breeding habitat within the footprint of the Reservoir Expansion Area due to the loss of an ephemeral watercourse that is inhabited by Plains Spadefoot under baseline conditions. The highly suitable habitat is reduced to Nil suitability along the coulee bottom. Additionally, new wetland areas created around the shoreline of the Reservoir Expansion Area that are in surface connectivity with the open water of the Expanded Reservoir will be of lower suitability due to the presence of predatory fish, constant wave action, and fluctuating water levels.	Negative	High	Local	Long-Term	One Time	Irreversible	Predictable	Not Significant
	Increase in the availability of vertical banks and bluffs near open water in the Reservoir Expansion Area for Bank Swallows. The expanded footprint of the reservoir will erode the coulee walls over time and create new vertical banks, increasing the availability of habitat for swallow species.	Positive	High	Regional	Long-Term	One Time	Long-Term	Uncertain	Significant
	Temporary reduction in the availability of suitable vertical banks and bluffs for Bank Swallows on the surrounding coulee walls of the existing reservoir as water levels rise. Over time, erosion will cause some vertical banks to collapse, but expose new vertical banks above the new FSL and suitable, stable habitat will re-establish.	Neutral	High	Local	Short-Term	One Time	Irreversible	Predictable	Not Significant
	Disruption in Habitat Connectivity								
	Habitat fragmentation as a result of the presence of water in the coulee. ▪ Avian species unsuited to landing on water are forced to cross the coulee without protective cover. ▪ Wildlife species that prefer terrestrial travel routes will be required to travel around the Expanded Reservoir.	Negative	Low	Local	Long-Term	One Time	Irreversible	Predictable	Not Significant
	Reduction in the suitability of preferred habitat connectivity routes for Pronghorns. Although Pronghorns and other ungulate species can swim, the preference is to move along dry land. The presence of water in the coulee will require migrating Pronghorns to either swim or travel around the Expanded Reservoir twice a year. Although there is a documented migration pathway for Pronghorns through the Project Area, the majority of Pronghorn migration occurs to the east where larger expanses of Native Grasslands are present.	Negative	Moderate	Local	Long-Term	Sporadic	Irreversible	Predictable	Not Significant
	Indirect Mortality								
	Raising of the FSL will erode and undercut the banks, potentially leading to the destabilization and collapse of nesting substrate and failure of nests.	Negative	Low	Local	Short-Term	Sporadic	Irreversible	Uncertain	Not Significant

Historical Resources									
Construction									
Reservoir filling	Inundation and erosion at archaeological sites in the expansion area.	Negative	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
Existing East Dam decommissioning	Material will be placed in adjacent location that could impact known or unknown archaeological sites.	Negative	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
Machinery working in or near a water body	Impact to significant archaeological sites on landforms adjacent to the reservoir.	Negative	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
Construction of the New East Dam	Impact to significant archaeological sites on landforms adjacent to, and within, the new dam area.	Negative	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
Operation									
Increasing the FSL, extent, and capacity of the reservoir	Previously undisturbed archaeological sites would be flooded/impacted.	Negative	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
	Archaeological sites that were partially impacted by previous reservoir levels would be flooded/impacted further.	Negative	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant
	Archaeological sites located above the new FSL within the coulee could experience and erosion and slumping through time from undercutting.	Negative	Moderate	Local	Far Future	Continuous	Irreversible	Predictable	Not Significant

REFERENCES

Alberta Land Stewardship Act. 2009. Statutes of Alberta, Chapter A-26.8. Edmonton: King's Printer for Alberta.

Canadian Environmental Protection Act. 1999. In Statutes of Canada, 1999, Chapter 33. Ottawa: King's Printer for Canada.

Canadian Navigable Waters Act. In Revised Statutes of Canada, 1985, Chapter N-22. Ottawa: King's Printer for Canada.

Environmental Protection and Enhancement Act. 2000. In Revised Statutes of Alberta, 2000, Chapter E-12. Edmonton: King's Printer for Alberta.

Fisheries Act. 1985. In Revised Statutes of Canada, 1985, Chapter F-14. Ottawa: King's Printer for Canada.

Government of Alberta (GoA). 2013. *Guide to Preparing Environmental Impact Assessment Reports in Alberta*. Alberta Environment and Sustainable Resource Development. Accessed February 2024. https://open.alberta.ca/publications/4903114#summary.

Historical Resources Act. 2000. Revised Statutes of Alberta, 2000, Chapter H-9. Edmonton: King's Printer for Alberta.

Impact Assessment Act. 2019. In *Statutes of Canada*, 2019, Chapter 28, s.1. Ottawa: King's Printer for Canada.

Migratory Birds Convention Act. 1994. In Statutes of Canada, 1994, Chapter 22. Ottawa: King's Printer for Canada.

Municipal Government Act. 2000. In Revised Statutes of Alberta, 2000, Chapter M-26. Edmonton: King's Printer for Alberta.

Natural Resources Conservation Board Act. 2000. In *Revised Statutes of Alberta*, 2008, Chapter N-3. Edmonton: King's Printer for Alberta.

Public Lands Act. 2000. In *Revised Statutes of Alberta*, 2000, Chapter P-40. Edmonton: King's Printer for Alberta.

Soil Conservation Act. 2000. In *Revised Statutes of Alberta*, 2000, Chapter S-15. Edmonton: King's Printer for Alberta.

Species at Risk Act (*SARA*). 2002. In *Revised Statutes of Canada*, 2002, Chapter 29. Ottawa: King's Printer for Canada.

SMRID. 2022a. SMRID Expansion Vote Results. Accessed online November 2022 at: https://smrid.com/smrid-expansion-vote-result/

SMRID. 2022b. Notice of Public Meeting-Change to the Expansion Limit. Accessed online November 2022 at: https://smrid.com/notice-of-public-meeting-change-to-the-expansion-limit/

SMRID. 2022c. SMRID Proposed Irrigation Expansion Information Package. November 2022.

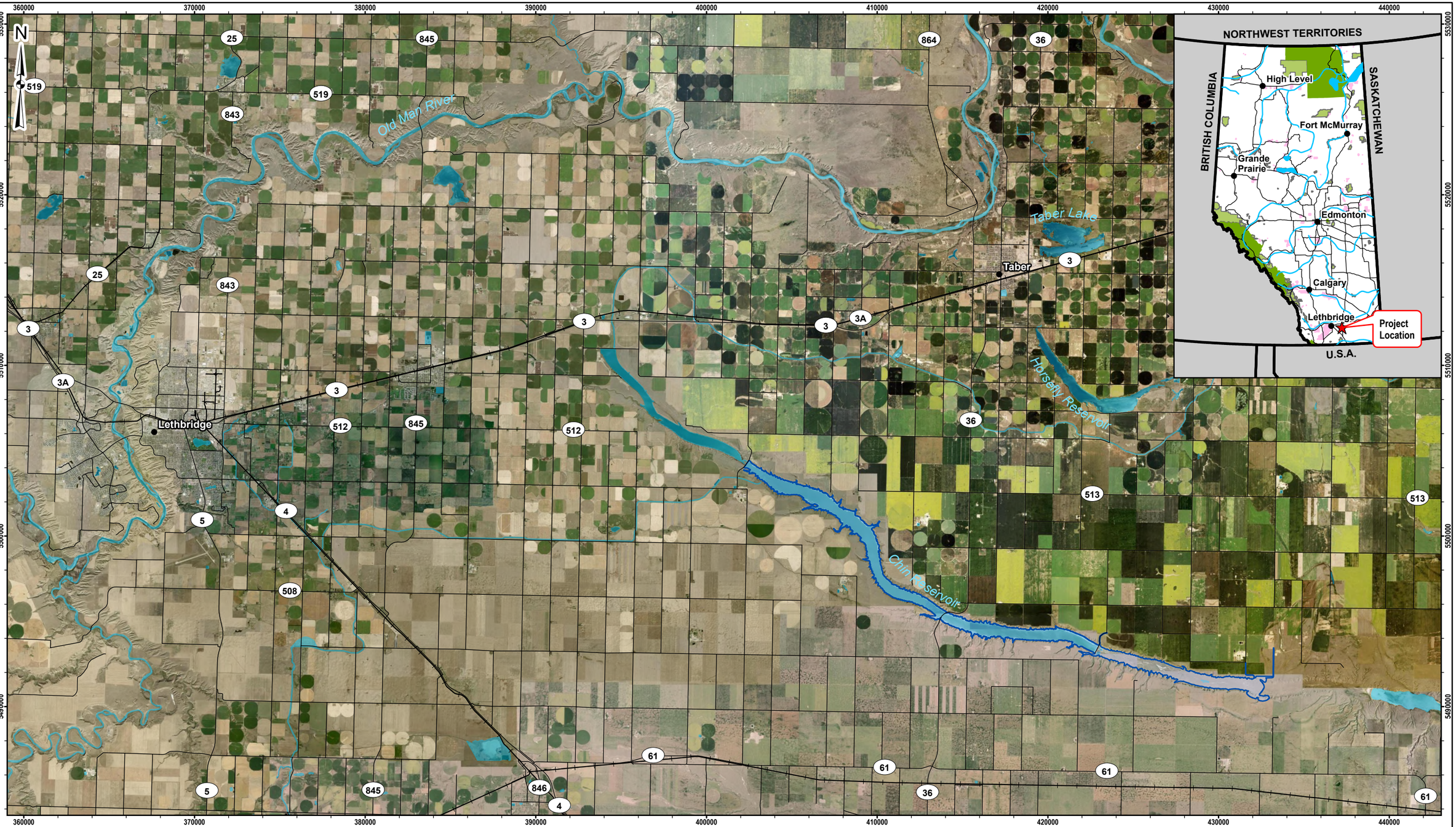
Water Act. 2000. In *Revised Statutes of Alberta*, 2000, Chapter W-3. Edmonton: King's Printer for Alberta.

Weed Control Act. 2008. In *Revised Statutes of Alberta,* 2008, Chapter W-5.1. Edmonton: King's Printer for Alberta.

Wildlife Act. 2000. In *Revised Statutes of Alberta*, 2000, Chapter W-10. Edmonton: King's Printer for Alberta.

WaterSMART. 2023. Hydrological Modelling to Evaluate Changes in Streamflow Availability in the St. Mary River Watershed. Prepared by WaterSMART Wate Management Solutions for St. Mary River Irrigation District. Lethbridge, Alberta.

FIGURES



Legend

- City or Town
- All Weather Road
- Railway
- Water Feature
- Project Area

0 10 Kilometres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: SOUTHERN ALBERTA, EARTHSTAR GEOGRAPHICS

CLIENT: SMRID

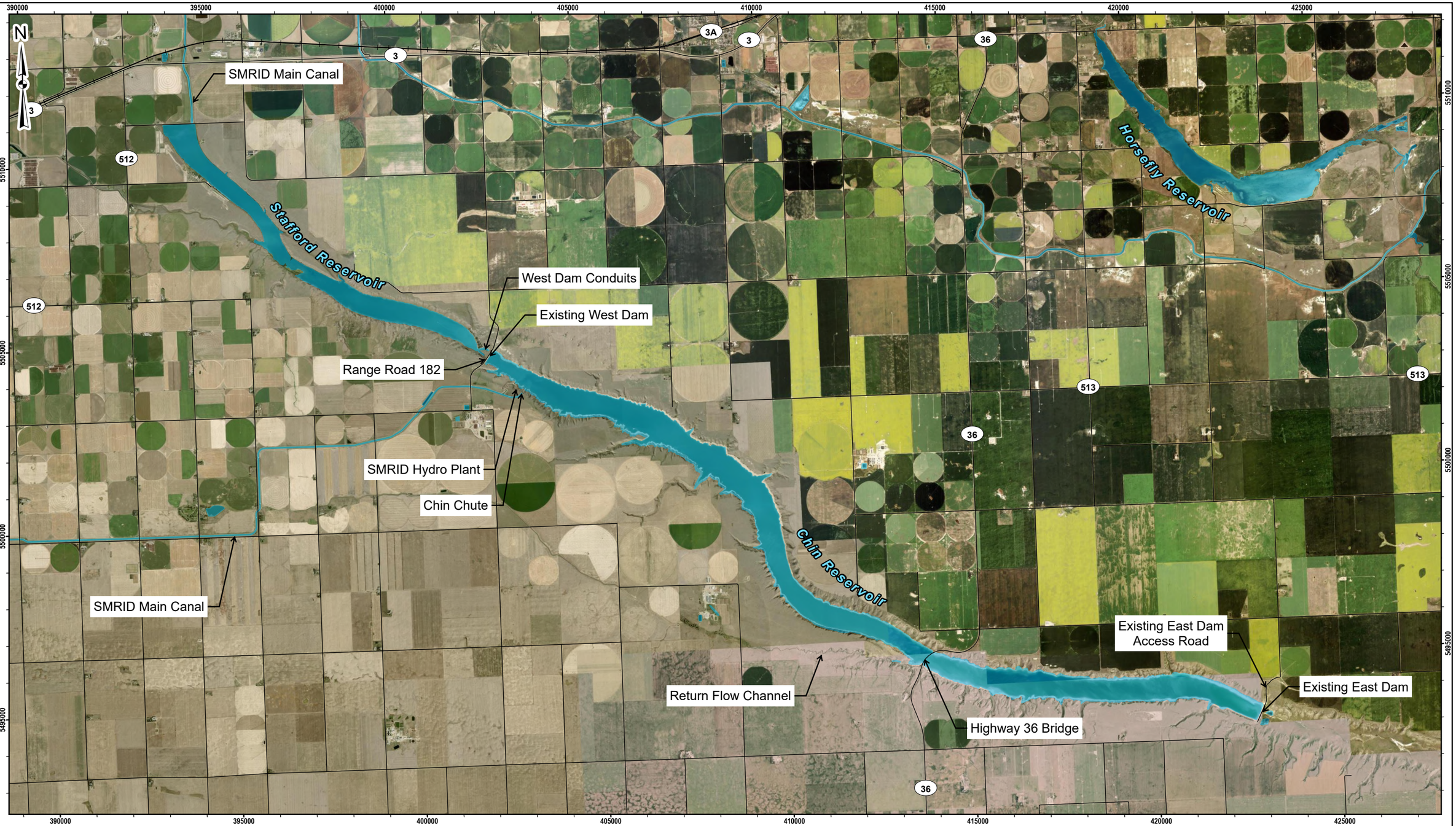
Klohn Crippen Berger

PROJECT: CHIN RESERVOIR EXPANSION PROJECT - ENVIRONMENTAL IMPACT ASSESSMENT

TITLE: REGIONAL LOCATION MAP

SCALE	PROJECT No.	FIG No.
1:215,000	A03701E01	1

File: Z:\AC\GY\Alberta\A03701E01 MPE Chin Res Environmental\400 Drawings\402 GIS\02_Pro_Files\ChinReservoir_EIA_230301\ChinReservoir_EIA_240517.aprx Creator: : AHarrison



Legend

- Railway
- All Weather Road
- Water Feature

0 5 Kilometres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: SOUTHERN ALBERTA, EARTHSTAR GEOGRAPHICS

CLIENT: SMRID

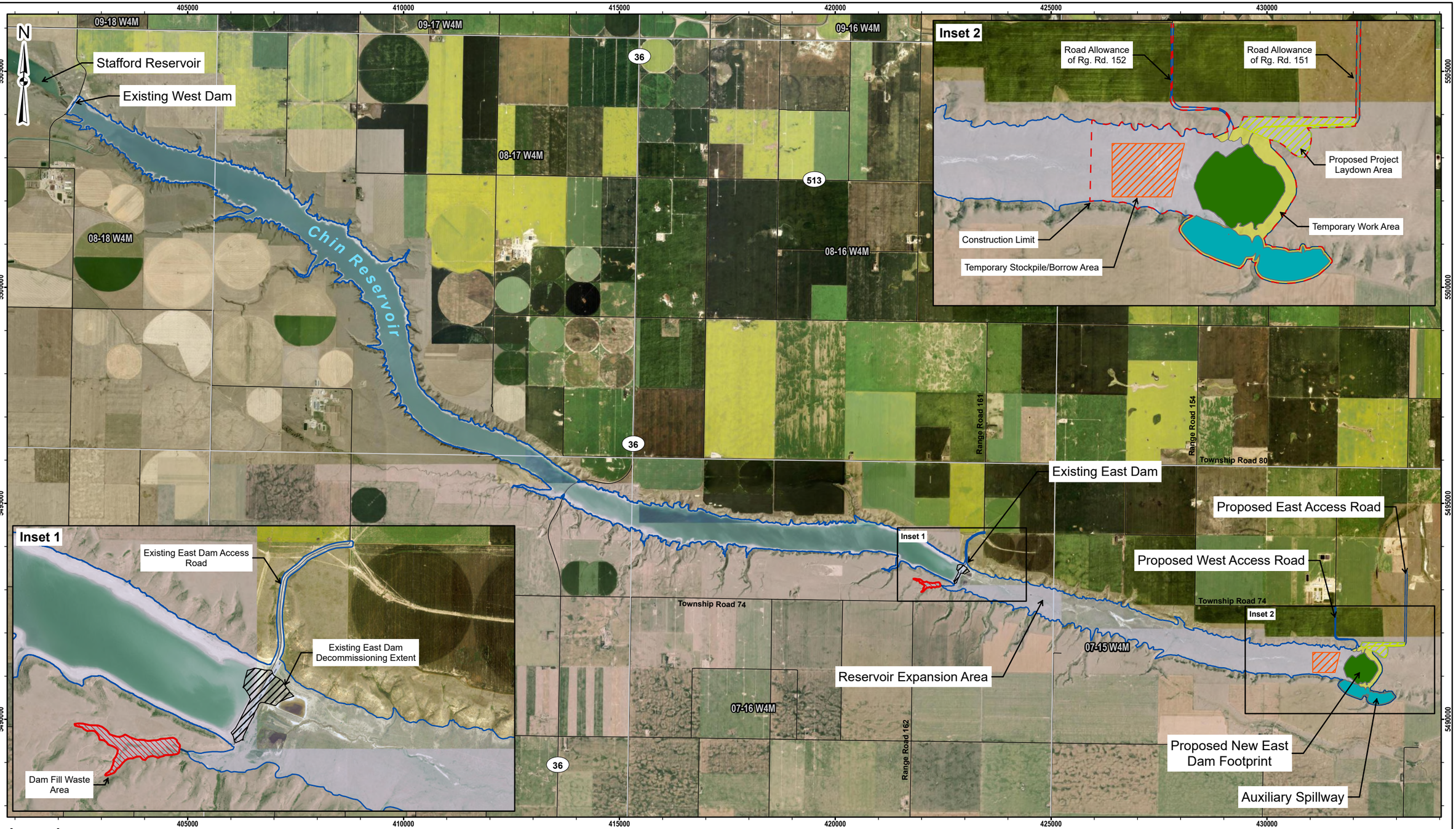
Klohn Crippen Berger

PROJECT: CHIN RESERVOIR EXPANSION PROJECT - ENVIRONMENTAL IMPACT ASSESSMENT

TITLE: EXISTING COMPONENTS

SCALE	PROJECT No.	FIG No.
1:100,000	A03701E01	2

File: Z:\A\CGY\Alberta\A03701E01 MPE Chin Res Environmental\400 Drawings\402 GIS\02_Pro_Files\ChinReservoir_EIA_230301\ChinReservoir_EIA_240517.aprx Creator:: AHarrison



Legend

- All Weather Road
- Existing Dam Decommissioning Extent
- New East Dam Footprint
- New East Dam Auxiliary Spillway
- Dam Fill Waste Area
- Project Area (PA)
- Township Boundary (ATS)
- Temporary Work Areas
- Proposed Project Laydown Area
- Temporary Stockpile/Borrow Area

0 3 Kilometres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: TOWN OF PINCHER CREEK, MAXAR

CLIENT: SMRID

Klohn Crippen Berger

PROJECT: CHIN RESERVOIR EXPANSION PROJECT - ENVIRONMENTAL IMPACT ASSESSMENT

TITLE: PROJECT COMPONENTS OF THE PROJECT AREA

SCALE: 1:85,000 | PROJECT No.: A03701E01 | FIG No.: 3

File: Z:\A\CGY\Alberta\A03701E01 MPE Chin Res Environmental\400 Drawings\402 GIS\02_Pro_Files\ChinReservoir_EIA_230301\ChinReservoir_EIA_240517.aprx Creator: : AHarrison