Ms. Jennifer Howe Project Manager
Proposed Project # 80123-SR1
Calgary – Springbank, Rocky View County

SUBJECT: Information Request Response from STANTEC
RE: CRITIQUE of the May 2019 Stantec ERRORS and OMMISSIONS (ATTACHED)

Greetings;;;

The Email from Stantec Consulting Civil Engineering Vice President Russ Mackenzie P.Eng. is evidence of their Professional P.Eng. performance at the first Public meeting of October 24 2013. It is Cc: to Claire Rosenau who is the Executive Assistant to Allan Markin P.Eng., Chair of the Provincial appointed Flood Mitigation Advisory Panel, which included Stantec Consulting Tino DeManno P.Eng, Vice President, Canada West and Richard Lindseth. My first presentation of my Concept was to Allan Markin at their first public meeting in July 2013 at the Glencoe Club. He was impressed and sent one of his consulting engineers to follow up.

Chair Markin and DeManno presented their initial Stantec Consulting graphically presented Community Flood Mitigation Advisory Panel Mandate on October 4th 2013. Mr Markins dissertation started out by complimenting the knowledgeable public stakeholders. His first announced accolade was personally directed to me; sitting near the front of the first Alberta Flood Mitigation Symposium at the BMO Stampede Grounds. The slide presentation is ATTACHED. He referred to my experience with the US Corps of Engineers on river flooding estimation to identify topographic contours which could establish flood inundation to establish city planning for Flood Zoning Regulations.

At the Symposium break period I approached the Stantec staff. Mr. Mackenzie was occupied with the Panel and General Andre Corbould Chief Assistant Deputy Minister so I spoke to the Stantec Environmental Engineering Project Manager. I showed him copies (as ATTACHED SCANS 3,7 & 8). He was very impressed and asked for me to leave them with him to discuss the MICRO WATERSHED Impounding concept with Civil Engineering Vice President Russ Mackenzie. He also asked for my availability to be included in his environmental flood mitigation analysis. I was very pleased to receive 2 such inclusive accolades that day.

Therefore I submit that Stantec was one of the first to be introduced to the MICRO WATERSHED Concept.

All of what is referred to herein is contained within the ATTACHMENTS of my Submissions to the CEAA Documents. Detailed interpretation of all events are now elucidated.

Respectfully Submitted;;;

Charles Hansen - EKISTICAL URBAN ARCHITECT PLANNER
B ARCH – MAJOR THESES URBAN DESIGN INFRASTRUCTURAL PLANNING

HANSEN REGIONAL COMPREHENSIVE PLANNING CONSULTING
STRATEGIC EKISTICAL CONCEPT EVALUATION----------DYMAXION DEVELOPABILITYURBAN DESIGN
<Personal information removed>

From: Mackenzie, Russ [mailto:russ.mackenzie@stantec.com]
Sent: October-24-13 5:19 PM
To: <Personal information
Cc: Claire Rosenau
Subject: RE: 23 PANEL MEETING - FLOOD FREE CALGARY Master Planning - INVITATION Contribution

Russ Mackenzie, P.Eng.
Vice President

Stantec

Phone: (403) 716-8212
Cell: (403) 585-6673
Fax: (403) 716-8099

russ.mackenzie@stantec.com

Design with community in mind

stantec.com

Charles, I would like an opportunity to speak with you about your ideas. I am advising to the Flood Advisory Panel and look forward to speaking with you.

Russ Mackenzie

403 716-8212

From: Charles Hansen <Personal information
Sent: October-09-13 5:28 PM

To: Claire Rosenau
Subject: FW: 23 PANEL MEETING - FLOOD FREE CALGARY Master Planning - INVITATION Contribution

Well Claire;;;;;;;;;;; I guess I made a mistake on your E:mail address.

It came back to me, as wrong address.

Charles Hansen

From: Charles Hansen <Personal information
Sent: October 9, 2013 4:50 PM
To: 'claire.roseneau@ampfinancial.com'
Subject: FW: 23 PANEL MEETING - FLOOD FREE CALGARY Master Planning - INVITATION Contribution

Good Day Claire;;;;;;;;;;; Thanks for your intercession to Allan.

Could you please add this 23 Sept E:mail to the one that you now have. Please print the texts and all ATTACHMENTS.

Charles Hansen

From: Charles Hansen <Personal information
Sent: September 23, 2013 2:16 PM
To: 'ALLAN.MARKIN@ampfinancialinc.com'; 'RSamas'
Cc: 'rlindseth@lindseth.com'
Subject: 23 PANEL MEETING - FLOOD FREE CALGARY Master Planning - INVITATION Contribution

Gentlemen;;;;;;;;;

Thank you for the invitation to add to the Panels' research perception as described by Robert Samaskis-Pillar Engineering.

I have had a thorough description of my Conceptual Master Plan and various elements of my detailed scope of work with Richard Lindseth on these matters on Sept 5th. My Conceptual description of Sept 5th will now be amplified with additional schematic perception and engineering data. The following will subdivide salient Headings:

- **HISTORICAL PRECEDENCE;;** This will relate to a Provincial Upstream Storage Policy established by the Alberta Premier with Max Aitkin , owner of Montreal Engineering in between 1903 and 1906. Long retired engineers from Montreal Engineering are recruited from the Imperial College in London, from Vickers Armstrong and British Thompson Huston has contributed this terms-of-engagement. I have found the archived document location. They can next be verified when funds are available. The initiation of Aitkin's Montreal Engineering was by his need to provide

power to his acquisition of the Exshaw limestone mountain. It needed power to neat the pulverized limestone to produce cement. Therefore Horseshoe Falls Hydroelectric Dam. Others followed as the province needed more electric energy distribution and transmission. As the Province needed more service there was an agreement between Aitkin and the Premier (at what year, until the archives are researched). The Prioritized Terms-of-engagement, sometime near the 1920's, was as follows;

1. **All Dams were to provide FLOOD control storage.**
2. **All Dams were to provide canals eastwardly to accommodate farm irrigation south of the Red Deer River.**
3. **All Dams were to provide Hydroelectric Generation and Transmitted and Distributed to all of Albert. Montreal Engineering will sell the power.**

A). Montreal Engineering sold their corporate terms to Calgary Power who the sold those terms to TransAlta.

B). So TransAlta is responsible to manage Bow River Flood Control to Calgary.

C). TransAlta must now respond to regulatory inspection by the;
Infrastructure Support, Operations Infrastructure Branch,
Environment and Sustainable Resource Development.
M. Javid Iqbal, M.A.Sc., P.Eng. Manager - Dam Safety
Lewis Cheung, Sr. Dam Safety Manager or regarding TransAlta
D). TransAlta did not release the flood surge from their storage in accordance with the Calgary flood plain damage it was released because their Dams were not maintained and full flow storage was said to endanger Dams' failure. .

- **STORAGE PRECEDENCE UP-STREAM HAS THEREFORE BEEN ESTABLISHED:** It is an applicable precedence to apply to the Highwood and the Elbow Provincial responsibility. The following will describe my Master Planned Engineering:
    1. **You have my July Proposal for a series of Earthen/Boulder Wi-Fi SCADA controlled impounding structures up-stream of Bragg Creek and Elbow Falls.** It specifys immediate using the existing river bed boulder insitu supply to construct immediate storage starting now. I suggest that we conduct an Engineered Design/Build process as a pilot project to initiate a workable process with the proposed Panel Secretariat chaired by Allan Markin.
    2. **I have ATTACHED a series of photos and regional Plans to tacitly locate dam/berms across the existing Elbow widened embankments.** The Plans are exact copies of Alberta Parks Kananaskis recreation maps. They approximate the original water impounding width during storm surge events. That continuous Lake effect into the mountains will easily contain over 90,000,000 M3 in stages and needs to be evaluated with funding topographic X-Sections with Trial & Error calculations.

    3. **My ATTACHED photos of Mountain top micro watersheds also show the construction sites of boulder Dams.**
    The site's contain enough bouilder and fine granular supply to imagine a workable material site. This element is important to store upper elevation weight of rain and snowpack melt to

slow their vector path Forces of Gravity and speed of dymamic Forces of the geological gradint elevation incline. The summation of that vector diagram is ATTACHED.

4. **The staged storage from the Mountain top to the River bed flow is therefore slowing the force field of streamsurge.** Therefore the speed and volume exit form the upper watershed to Bragg Creek and Calgary wil not be amplified by the Force field summation of Gravity and slopeing dymamic loading.
5. **It is also considerable to evaluate increased daming of Elbow Lake and Elbow Falls.** The exposed bed rock prominance of the Elbow Falls channel opening provides a perfect opportunity to evaluate a reinforced concrete dam structure. It could also reinforce the geology of the bedrock shapes.

I may not be able to ATTACH all of my sketches and photos prior to your scheduled 3PM Panel meeting. I have another important meeting which will limit my graphic inclusion. I will continue to prepare my design/planning exhibits next.

I am RWA to meet with Robert within the next few days as we discussed.

Respectfully Submitted ;;;;;;;;
Charles Hansen
HANSEN REGIONAL COMPREHENSIVE PLANNING CONSULTING
STRATEGIC CONCEPTUAL LAND USAGE -- COMPREHENSIVE DEVELOPABILITY PLANNING
<Personal information removed>

ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT RESPONSE TO CEAA INFORMATION REQUEST PACKAGE 3, AUGUST 31, 2018
Alternative Means May 2019

MICRO-WATERSHED IMPOUNDING CONCEPT ::::: ***MWIC***

Details on the Micro-Watershed Impounding scheme have not been provided to Alberta Transportation and the only available information that Alberta Transportation is aware of is on the TRJR website. Alberta Transportation does not know who its proponent is, nor does Alberta Transportation have any details to evaluate its merit, or feasibility.

The Proponent is well documented with CEAA and Stantec VP Russ Mackenzie P.Eng who called to discuss a shorthanded verbal questioning, not a engaged Feasibility Analysis.

Alberta Transportation assumes that Micro-Watershed Impounding scheme refers to a series of low-head dams or weirs placed throughout Elbow River and its tributaries. This concept would require significant disruption to the Elbow River system as a whole with the installation of multiple low-head dams that would be required to meet the active "flood storage capacity" requirements for flood control on Elbow River. Micro-hydro and other low-head dams have been proven to be barriers to fish, and mitigations using fishways are often rarely successful at these facilities. "This scheme is likely to render" the river impassable at multiple points in the watershed. The Micro-Watershed Impounding scheme would also require road and utility access to each of the micro-impoundment facilities. There are currently very few roads (both inactive and active) within the Sheep, Elbow and Highwood River watersheds, and disturbance from this access would likely have a considerable effect on the watershed, the fish and wildlife, and the area's stakeholders. ***CEAA has submitted over 50 Emails and ATTACHMENTS in their Public Documents to Alberta Transportation to validate their IR's.*** "likely to render" ***is not a scientific, P.Eng responsible Feasibility Analysis. MWIS requires no new roads. Existing roads allow equipment access to pushing riverbed aggregate to stack 2&3m dams. No*** "utility access" ***is needed.*** "flood storage capacity" ***was estimated on NUMEROUS SUBMISSIONS to accommodate the 100Km³ 2013 flood surge vector forces, which was the major engineering purpose to retain small MICRO DAMS.***

CONCLUSIONS

The TRJR, as it is proposed, cannot meet the Province's flood mitigation objectives. The Micro-Watershed Impounding scheme is not feasible as a flood mitigation solution for Elbow River because of its environmental impact and inefficiency in achieving Alberta's flood mitigation objectives. ***A Feasability Analysis was proposed to Premier Prentice.***

REFERENCES ::::: ***All REFERENCES do not relate or impact a Feasiblity examination of MWIC***

AEP (Alberta Environment and Parks). 2016a. Wildlife Sensitivity Maps. Available at: https://www.alberta.ca/wildlife-sensitivity-maps.aspx#toc-

AEP. 2016b. Alberta Grizzly Bear (Ursus arctos) Recovery Plan (Draft). Alberta Environment and Parks, Alberta Species at Risk Recovery Plan No. 38. Edmonton Ab. 85 pp

Hemmera Envirochem Inc. 2017. Elbow River at McLean Creek Dam (MC1) Environmental Impact Screening Report. Report prepared for Alberta Transportation by Hemmera Envirochem Inc, September 2017.

Hemmera Envirochem Inc. 2019. Assessment of Potential Effects of the MC1 Option on Indigenous Health and Socio-Economic Conditions, Cultural Heritage and Current Use of Lands and Resources for Traditional Purposes, and Physical Heritage. Report prepared for Alberta Transportation by Hemmera Envirochem Inc, April 2019.

Community Flood Mitigation Advisory Panel

- **Allan P. Markin**, P. Eng. Chair

- **Tino DiManno**, P. Eng. Senior Vice President, Canada West, Stantec Consulting

- **Richard Lindseth**, MAA,FRAIC, Richard Lindseth Architecture Inc.

Community Flood Mitigation Advisory Panel Mandate

- **Examine leading community flood prevention and protection practices from around the world.**
- **Consult community flood mitigation managers and technical experts on the ways to guard against or mitigate the impact of future flooding.**
- **Examine innovative solutions aimed at preventing future flood damage on a community wide basis.**
- **Consider additional individual mitigation measures (at the homeowners cost) that are above and beyond what is minimally required for future Disaster Recovery Program funding.**
- **Provide observations about flood mitigation and best practices for government to consider.**
- **Conduct follow-up information sessions with government ministries and their invited stakeholders to discuss observations and clarify issues as needed.**

Community Flood Mitigation Advisory Panel Mandate

Initial Priority: **To focus on Mitigation in Elbow and Highwood Basins, forming an *initial* segment of an *overall* system**

7 Elements of Mitigation :

- Overall Watershed Management for floods, drought, water supply, environmental, etc...
- Flood Forecasting, Modelling and Warning Systems
- Flood Risk Management Policies (Mapping, Development Control, Etc...)
- Community Mitigation Panels, Teams and Advisors
- Erosion Control
- Local and Municipal Mitigation Plans and Initiatives
- Individual Mitigation Measures for Homes

Saskatchewan River Basin

“Take an *Integrated* Approach to Alberta’s Water *Systems*”

Community Flood Mitigation Advisory Panel

"Have you thought of...?"

"I'm retired, but for several years consulted in...."

"I'd like to suggest..."

"Years ago, we did a proposal that may be of interest..."

"Would you consider..."

"It occurred to me that this might work...!"

"I have a proposal to help..."

Community Flood Mitigation Advisory Panel

"..To hear from Albertans,
and find Alberta Solutions
to what is now recognized as..."

"...The Single Largest Natural Disaster in our Nation's History..."

Community Flood Mitigation Advisory Panel

(River) Flow Management –Reduce Volume of Flow

- Retention
- Detention

Conveyance Improvement - Impact Reduction

- Diversion
- Channel Improvements

Retention

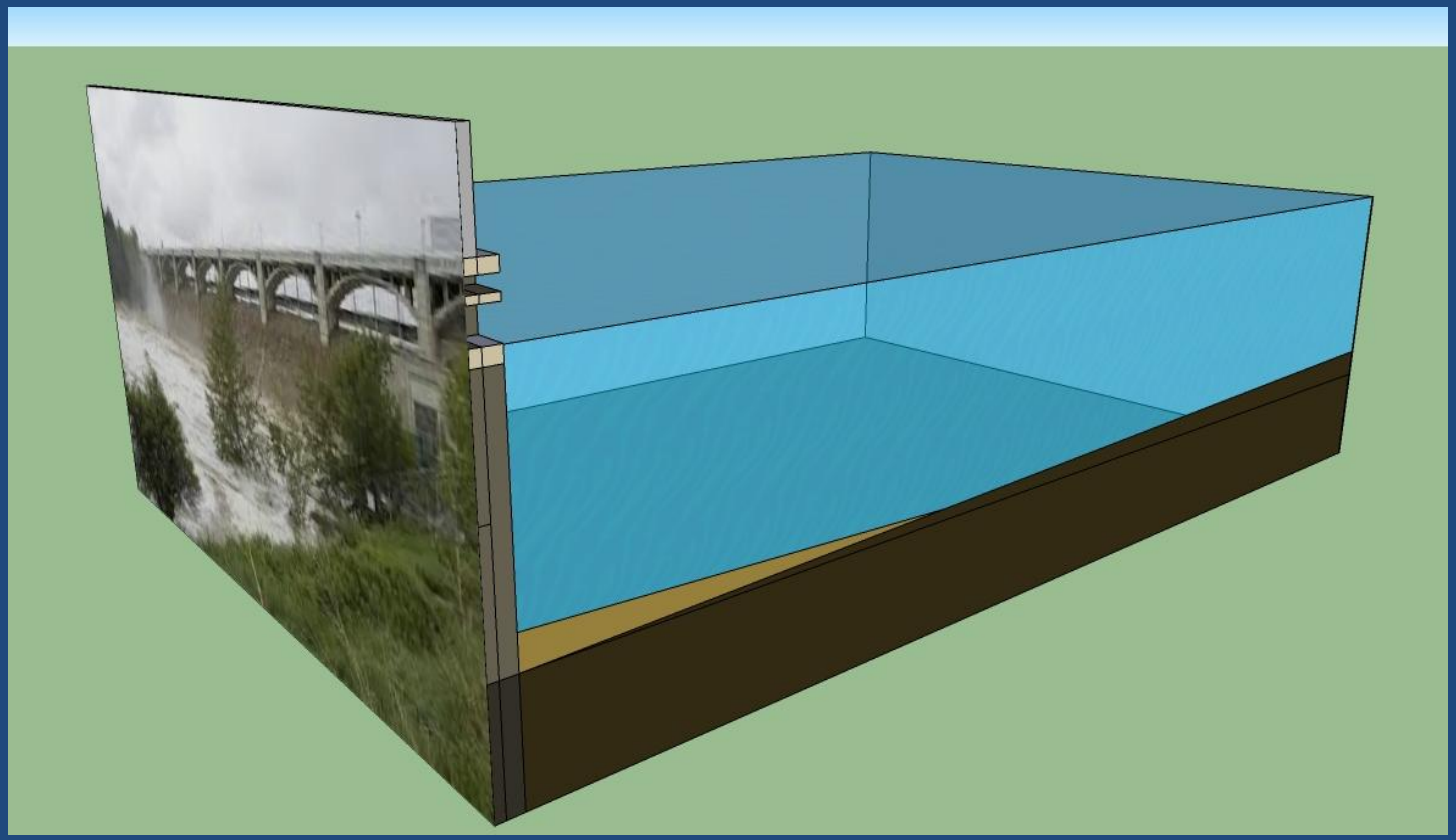
Detention

Diversion

Channel Improvements

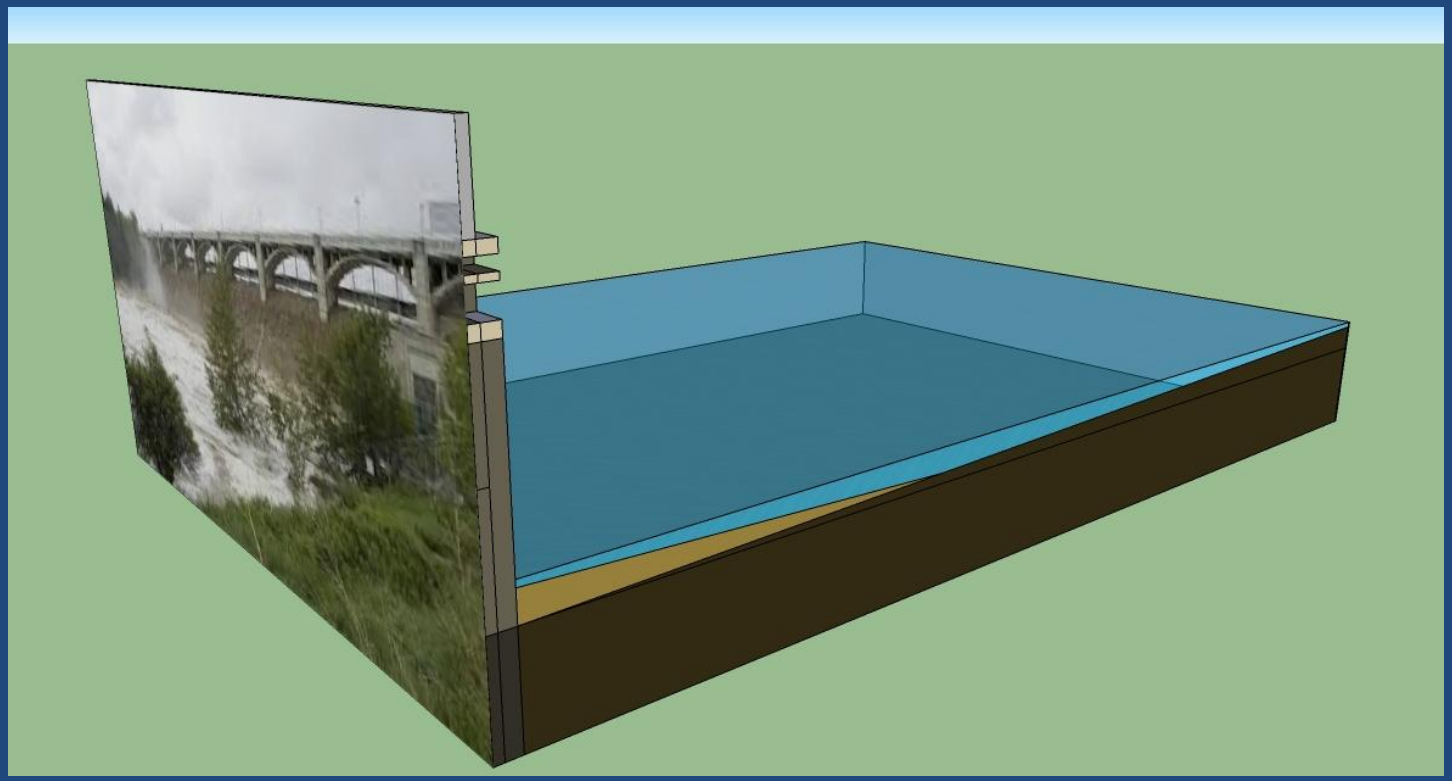
Glenmore Reservoir

Glenmore Reservoir



What role did the Glenmore Reservoir play in the recent flood event?

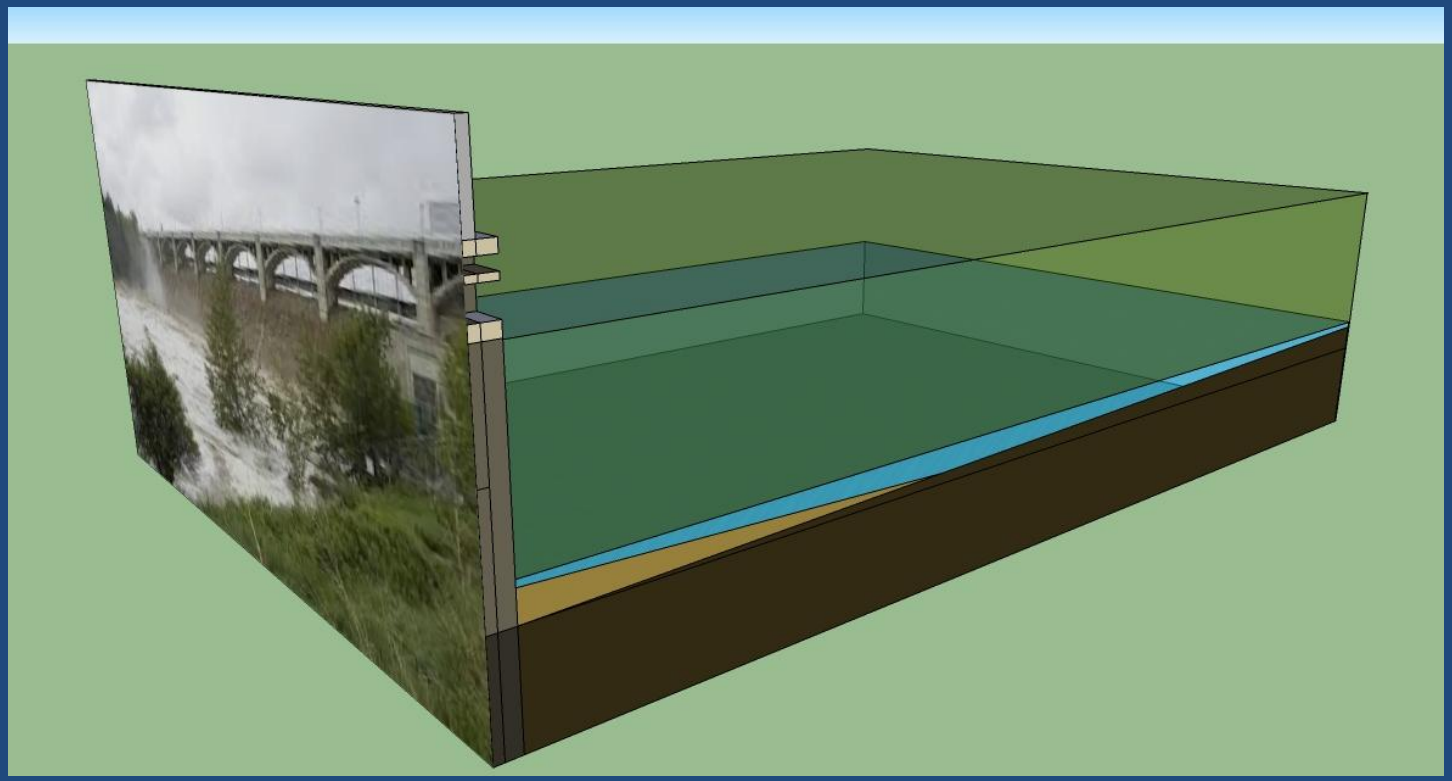
Glenmore Reservoir



The storage capacity of the Reservoir was emptied to lowest workable level

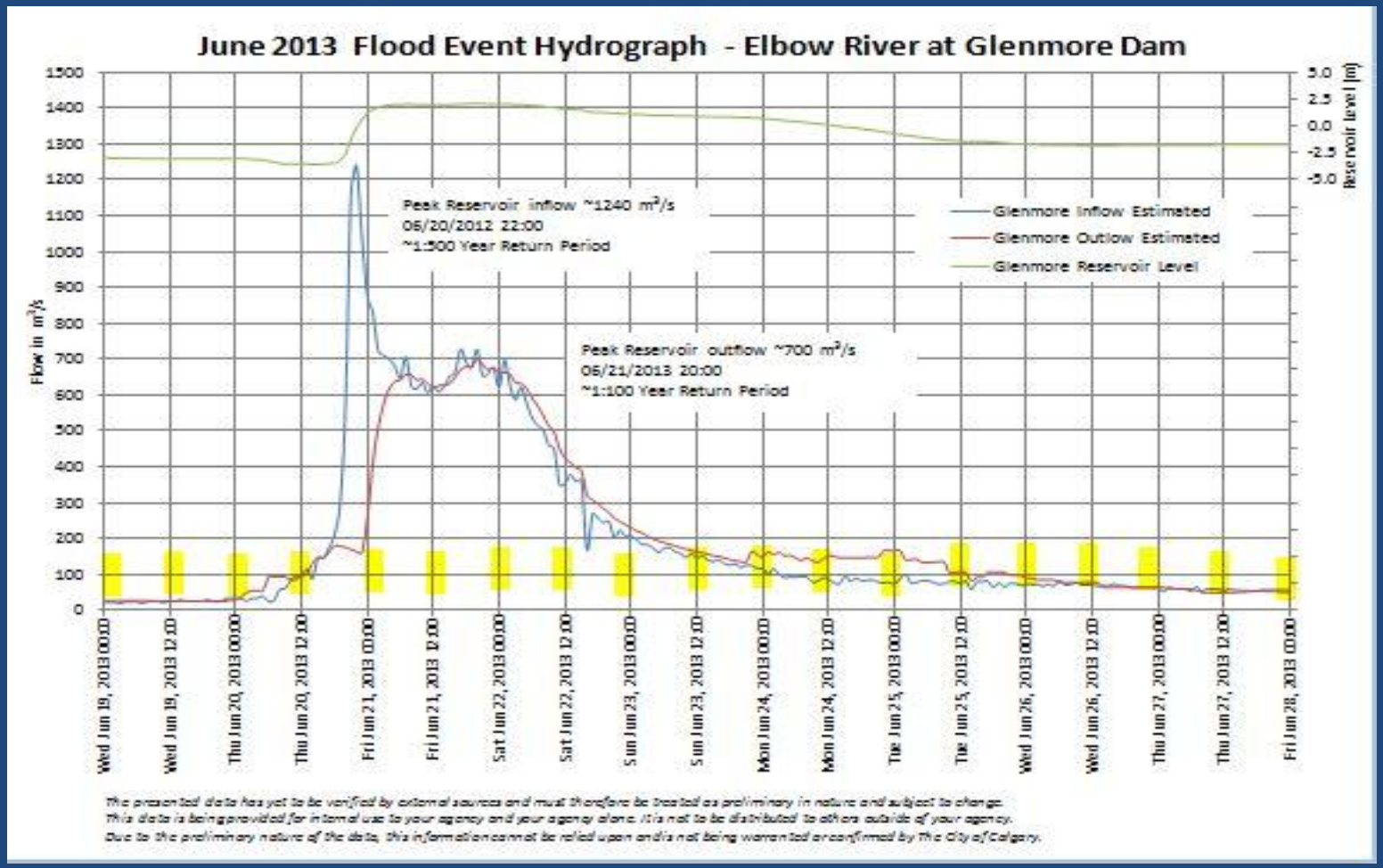
Glenmore Reservoir

2013 Flood Mitigation Approx. 10 million m^3



When refilled, full capacity was retained,
but excess flowed through to the urban river valley

Glenmore Reservoir Hydrograph



Flow amounts exceeding the yellow range points indicate start of flooding

Calgary Elbow Flow Volumes

- Approx. Point of Overflow (Commence Sandbagging) 180-200 m^3/s

- 2005 Flood Flow 308 m^3/s
- 2013 Flood Flow 700 m^3/s

- Estimated Mitigation for 2013 Type Storm: **100 million cubic meters**

High River Flow Volumes

- Approx. Point of Overflow 180 m^3/s
  (Commence Sandbagging Lowest Areas)

- Approx. Point of Overflow 350 m^3/s
- 2005 Flood Flow 671 m^3/s
- 2013 Flood Flow (Approx.) 1,800 m^3/s

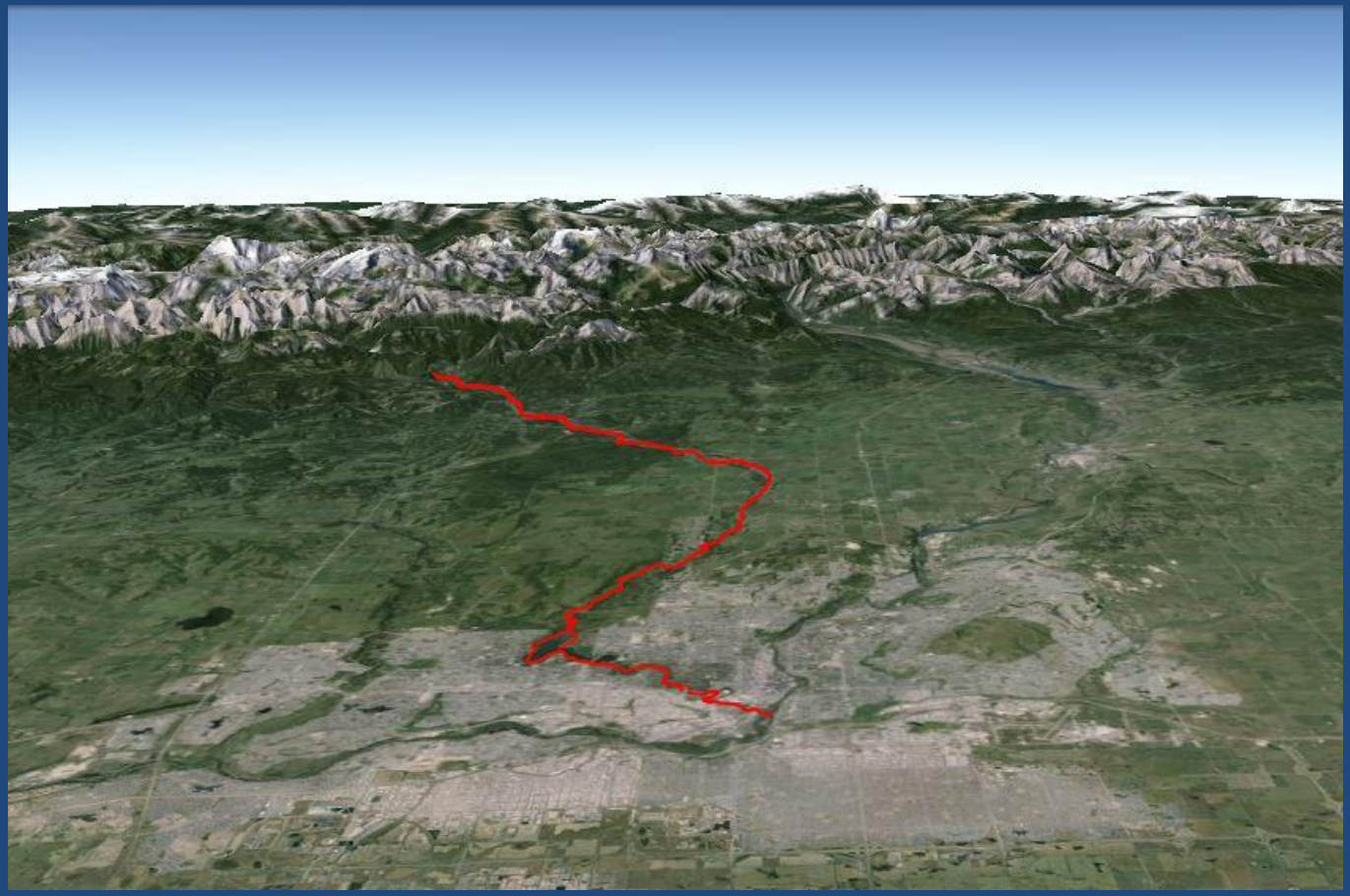
- Estimated Mitigation for 2013 Storm:
  150 million cubic meters

Medicine Hat Flow Volumes

- Approx. Point of Overflow (Commence Sandbagging) 1,500 m^3/s
- 2005 Flood Flow 3,790 m^3/s
- 2013 Flood Flow 5,600 m^3/s
- Protection with current urban mitigation measures 2,750 m^3/s
- Possible further urban mitigation could increase protection to 3,850 m^3/s
    - **Proposed Elbow & Highwood mitigation would bring this number to 4,000** m^3/s

Southern Alberta Watershed

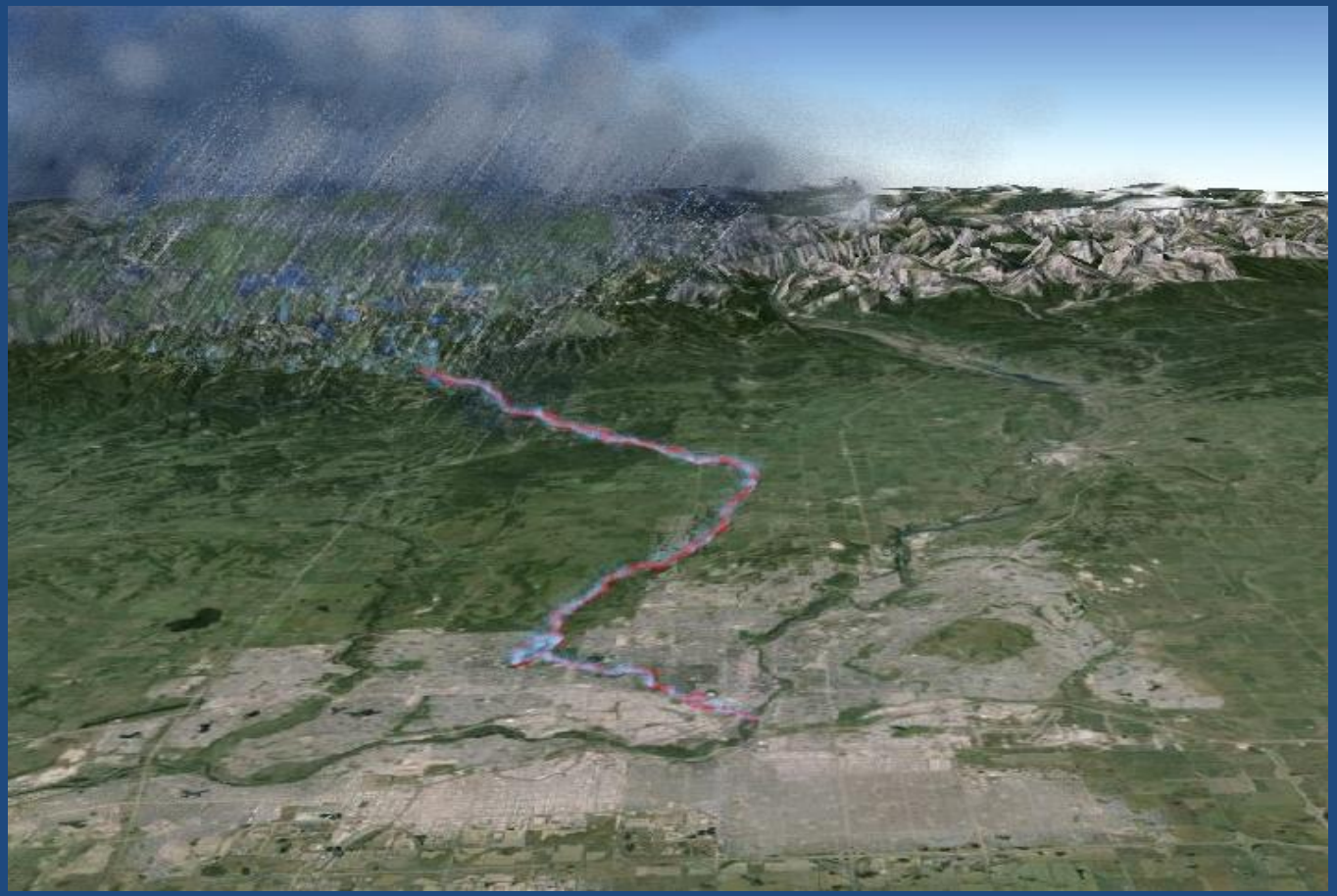
Flood Storm - 2013



Flood Storm - 2013

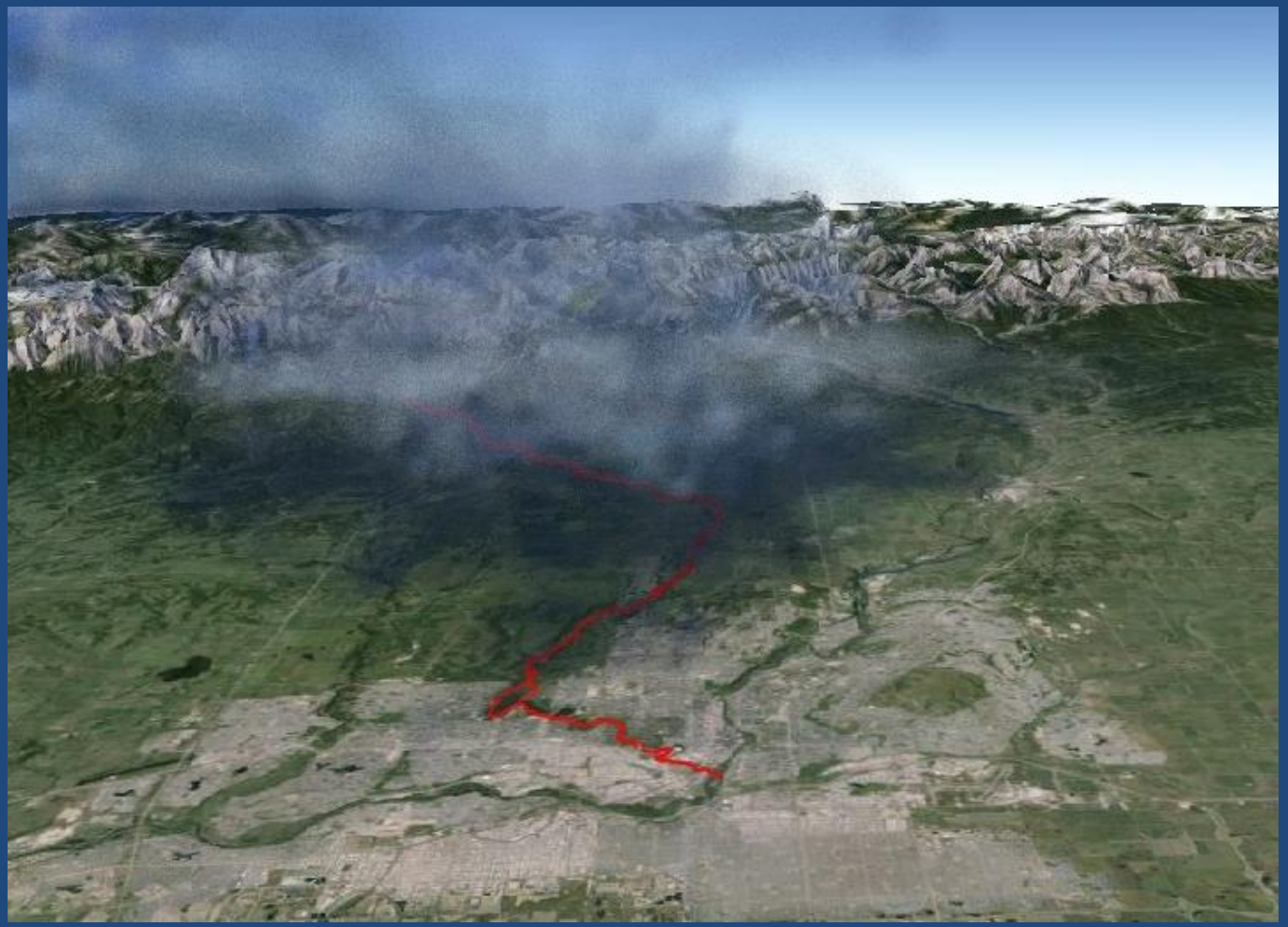
Flood Storm – 2013

"For this kind of alpine storm,
headwater mitigation would have significant effect; however..."



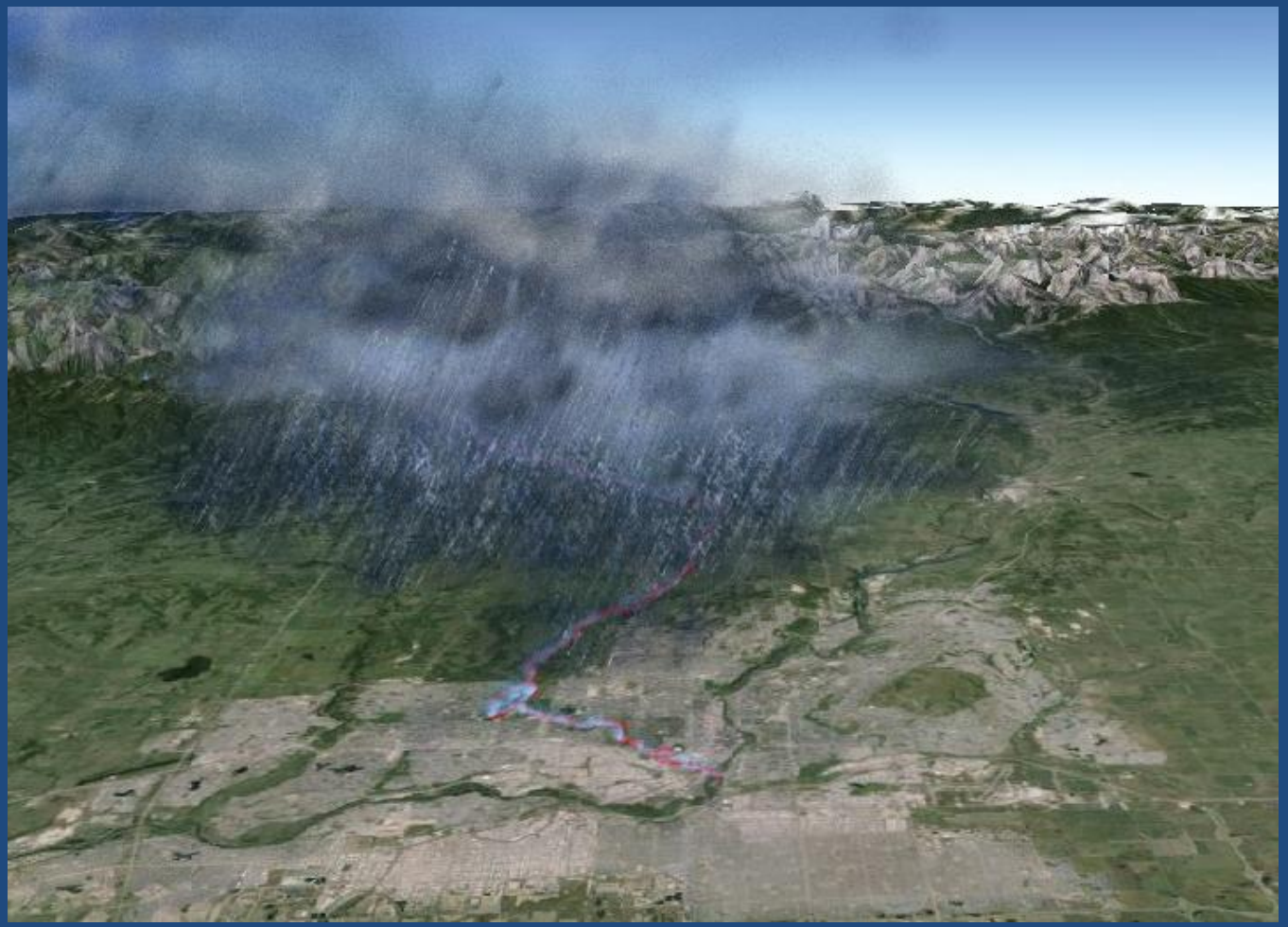
Foothills Storm

...A different storm location, closer to urban areas...



Foothills Storm

...Could cause flooding beyond the headwater mitigation areas.



“A ‘one in 100 year’ flood may occur more than once in 100 years...”

From “Flood 2005 Lessons Learned”

University of Calgary

Environmental Science 502,

June 2006

“It could have been *worse*...!”

Paraphrasing from Television Show “Daily Planet”

Program on University of Saskatchewan Centre For Hydrology

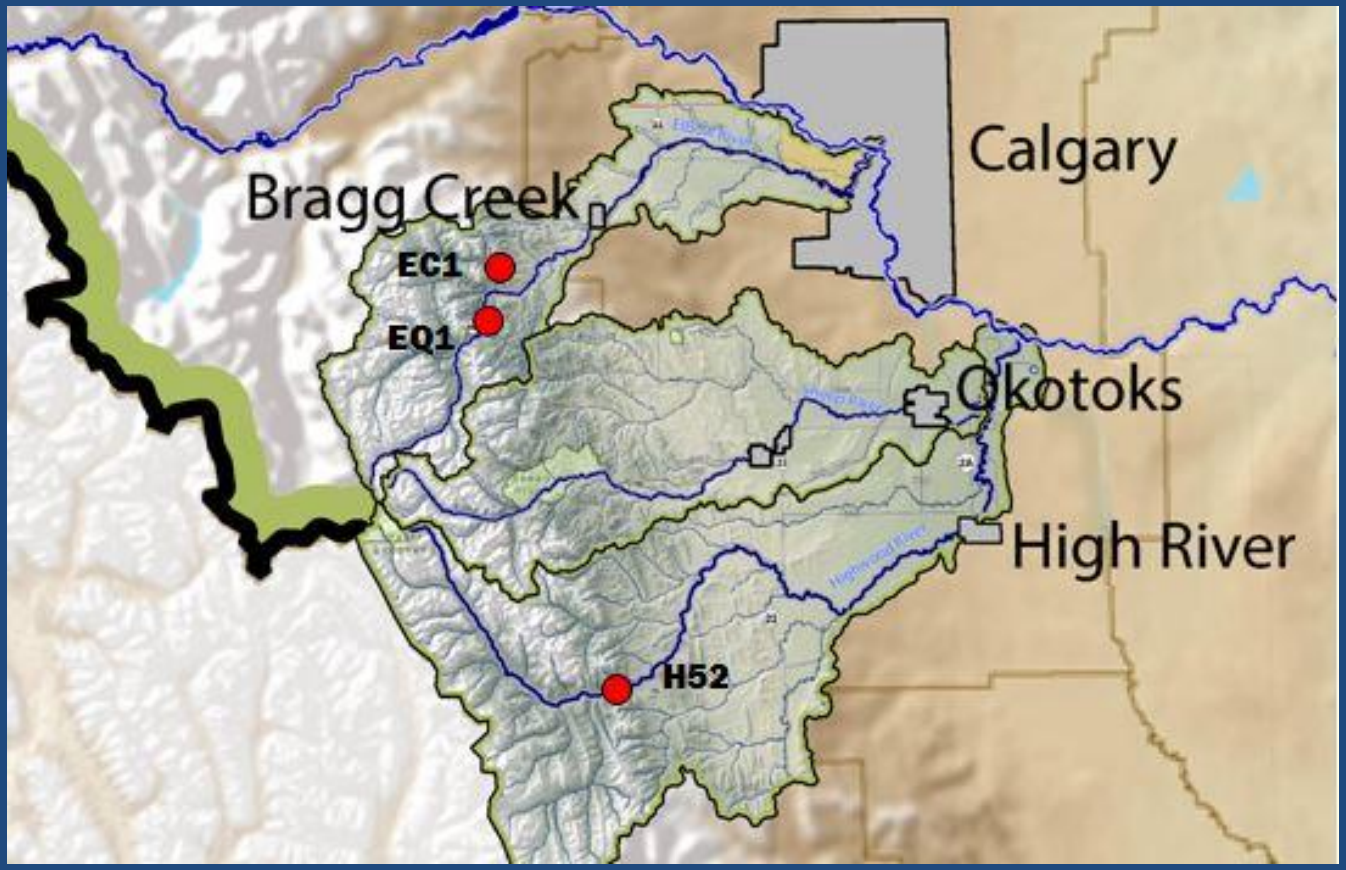
= the need to factor in a

‘margin of safety’

Elbow / Highwood Corridor

A Water System Solution Combining
Dry Pond Detention Berms & Diversion Channels

Three Headwater Berms* with Dry Ponds

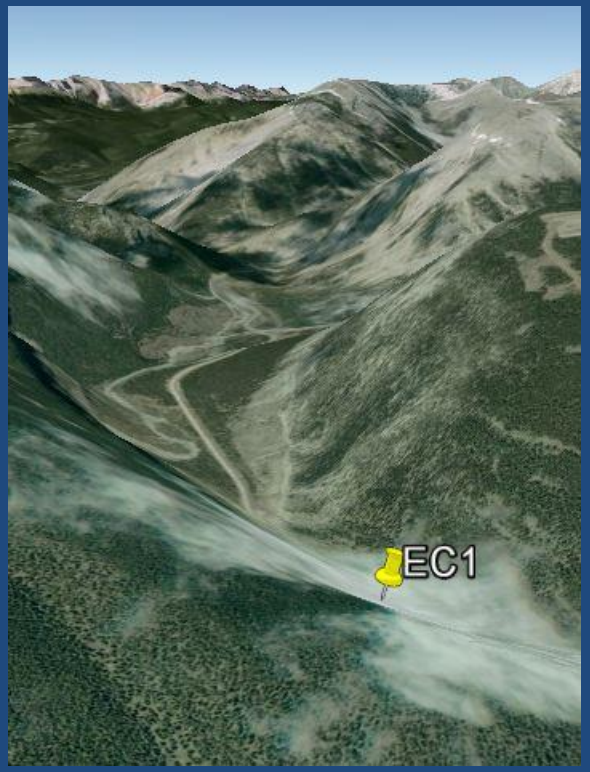


*“Dry Dams” in U.S. Army Corps of Engineers terminology

Elbow / Highwood Corridor

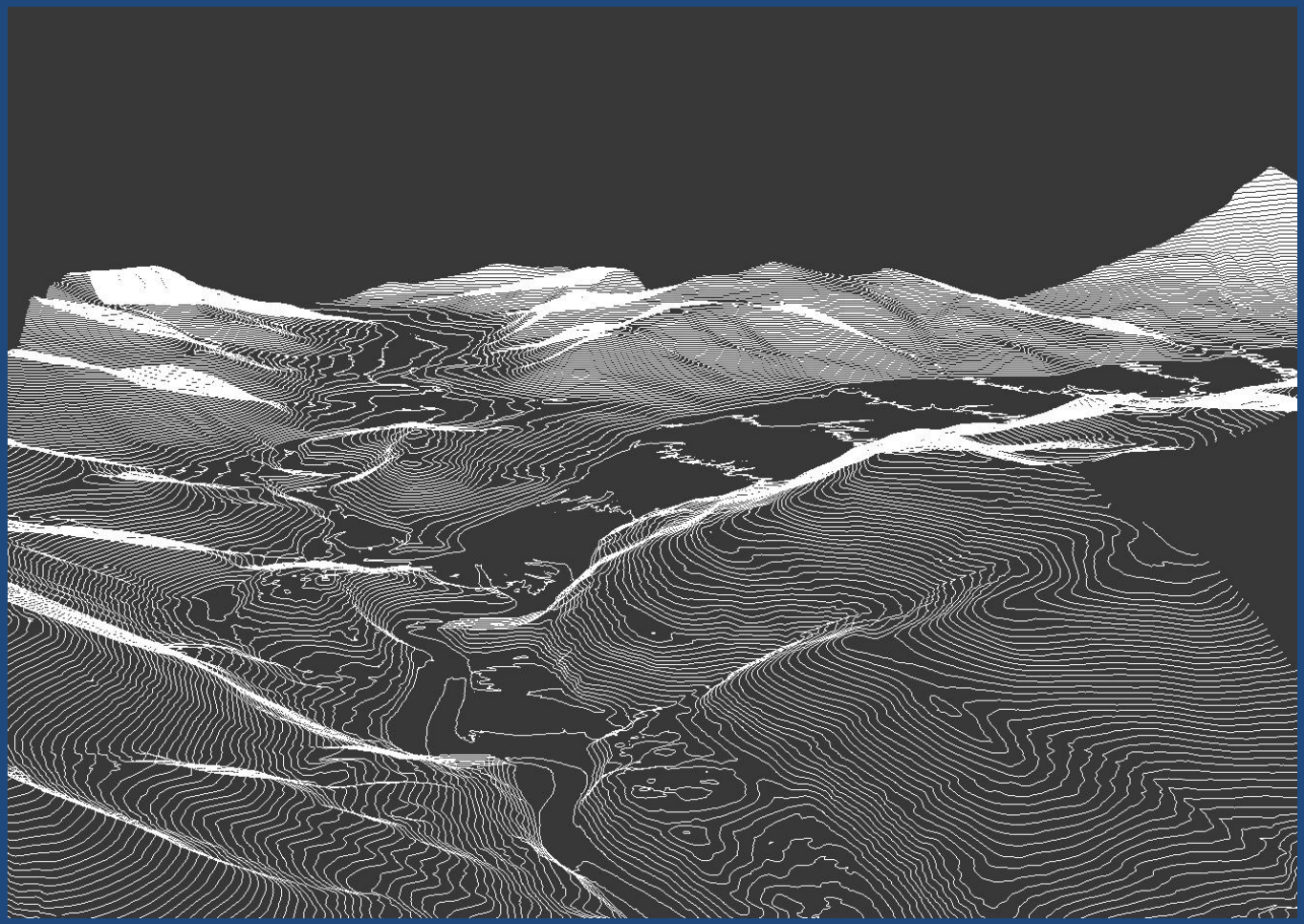
A Water System Solution Combining
Dry Pond Detention Berms & Diversion Channels

Three Headwater Berms with Dry Ponds



Elbow / Highwood Corridor

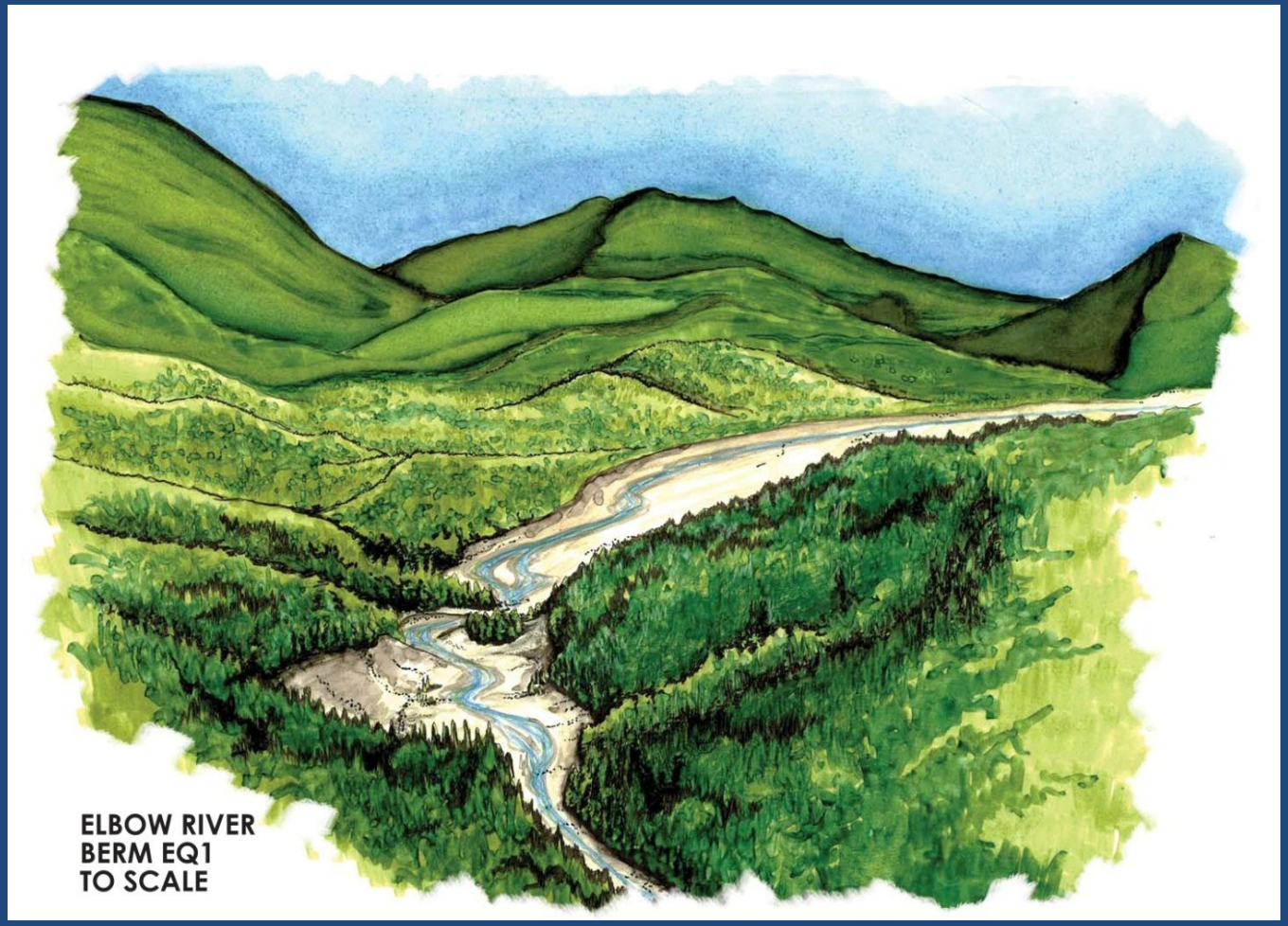
Dry Pond Detention Berm



Lidar Map

Elbow / Highwood Corridor

Dry Pond Detention Berm

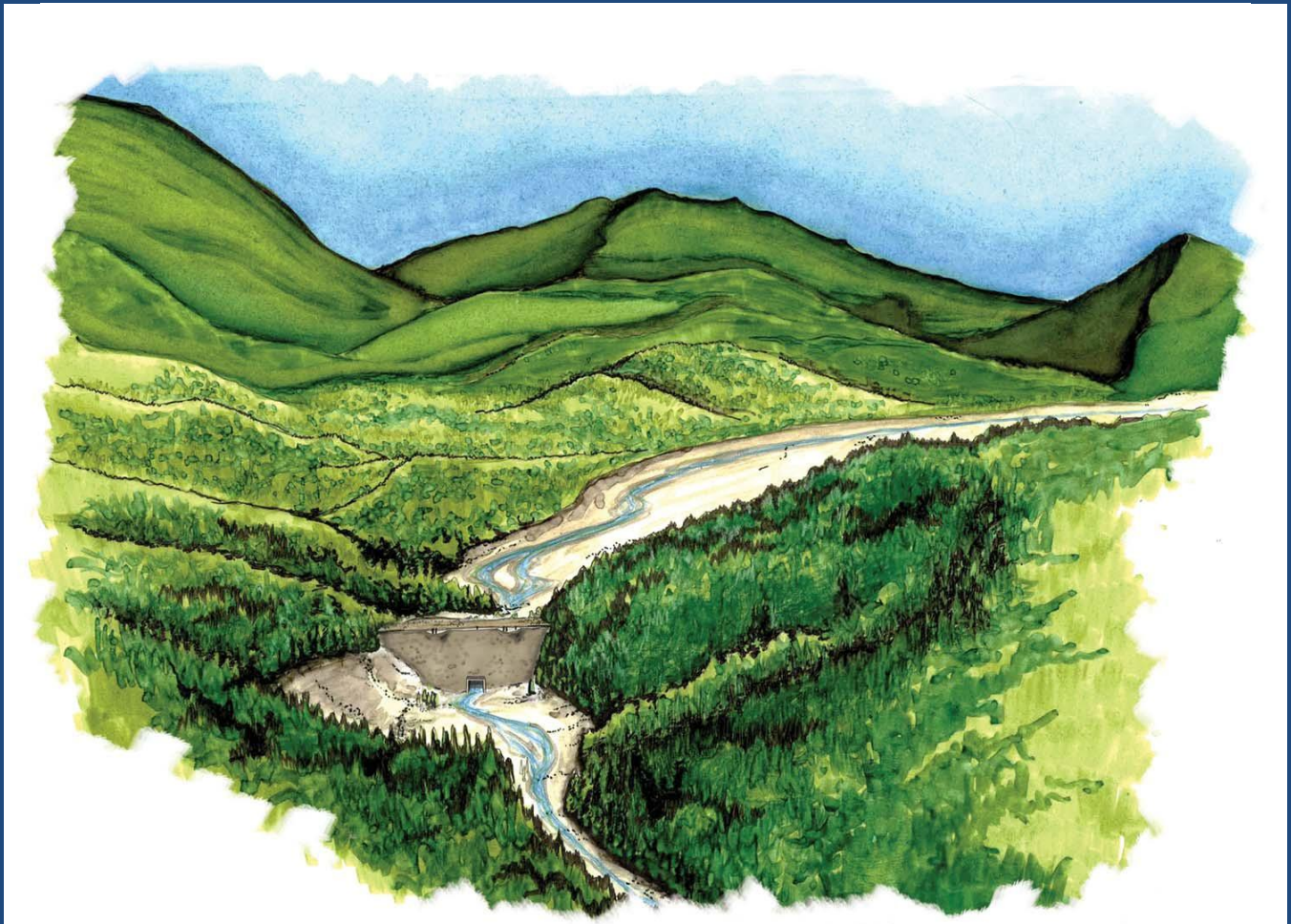


Artists' Rendering

Elbow / Highwood Corridor

Dry Pond Detention Berm

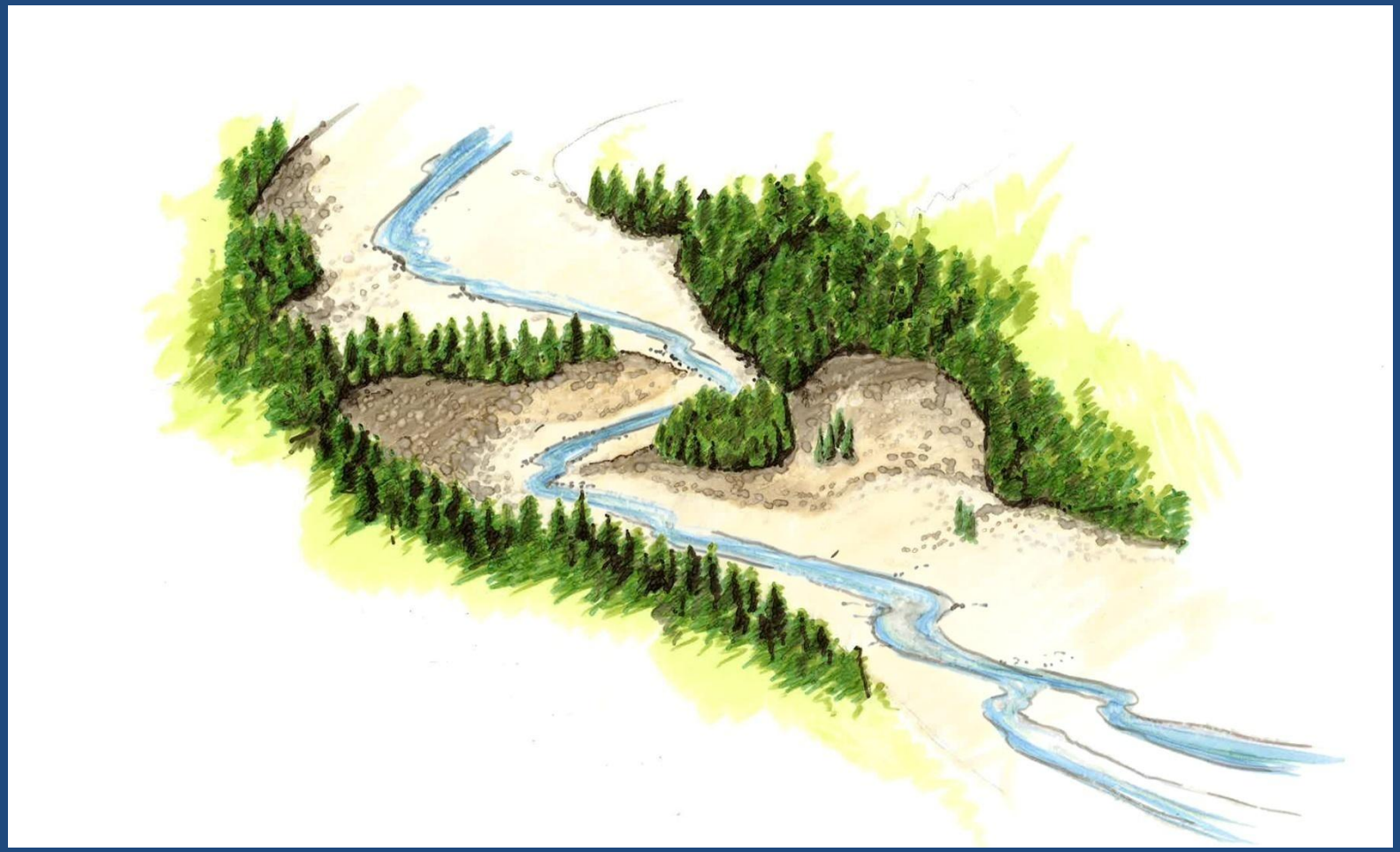
-built to Canadian Dam Safety Guidelines



Artists' Rendering

Southern Alberta Watershed

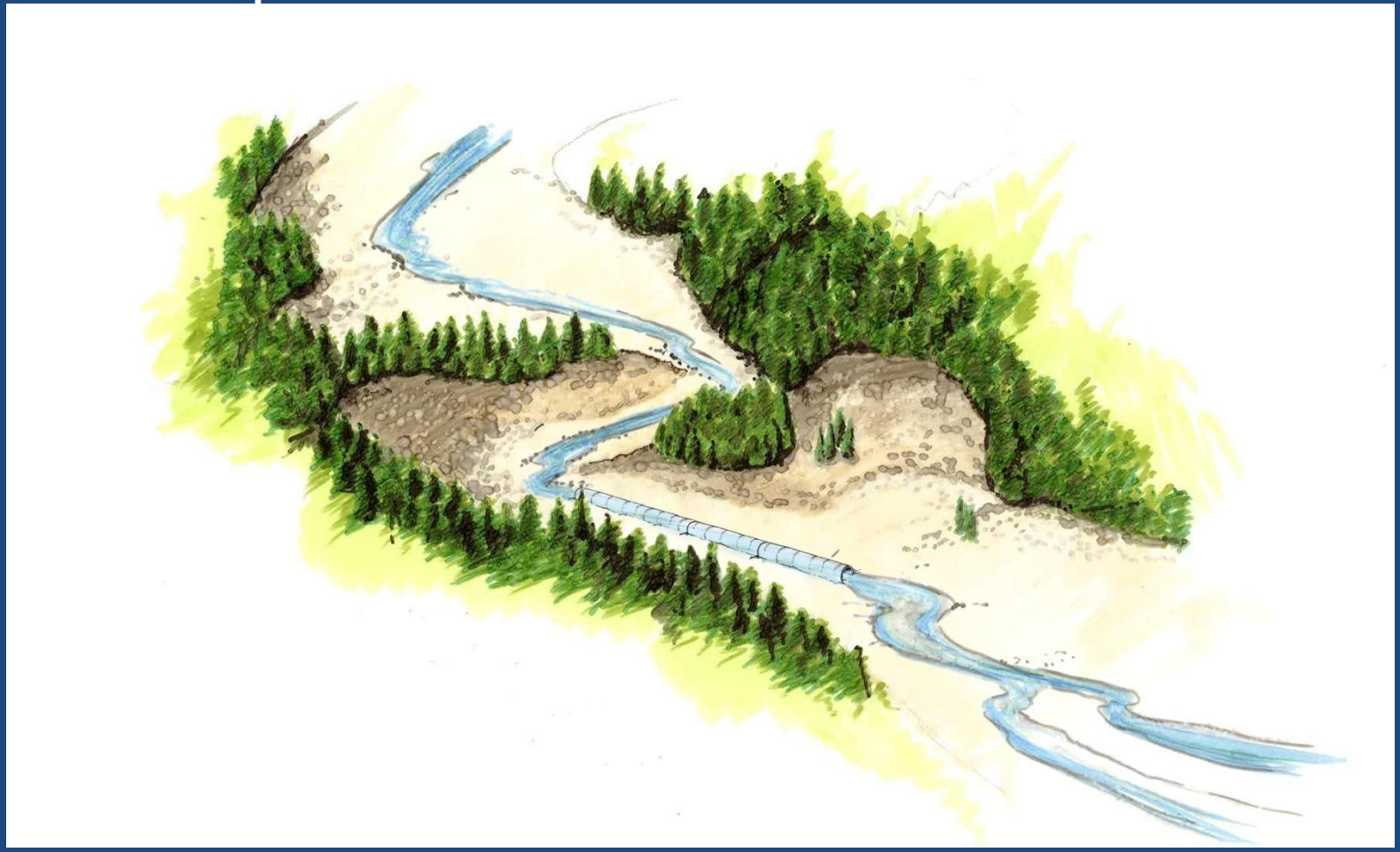
Dry Pond Detention Berm – original stream bed



Artists' Rendering

Elbow / Highwood Corridor

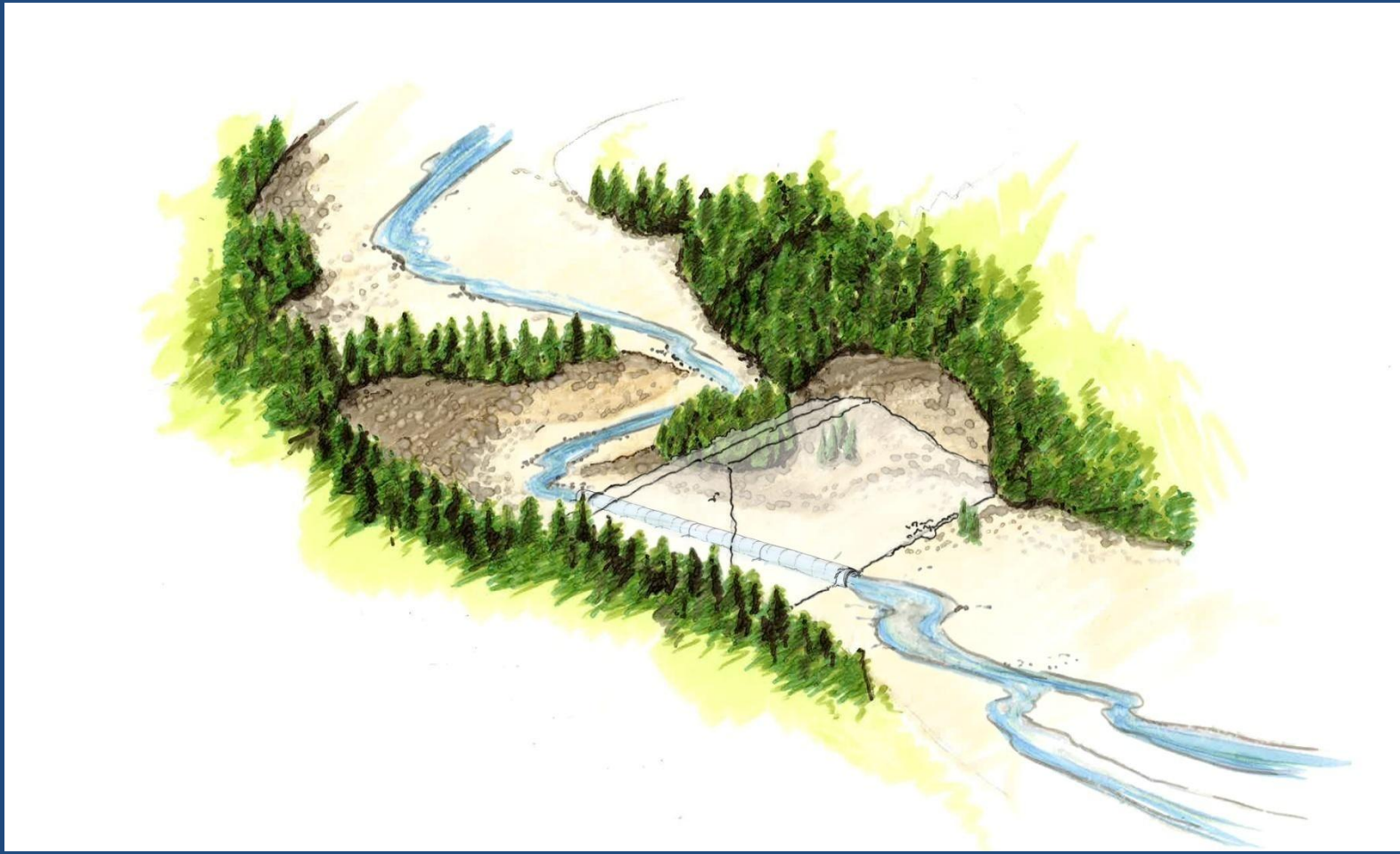
Dry Pond Detention Berm – placement of culvert structure



Artists' Rendering

Elbow / Highwood Corridor

Dry Pond Detention Berm --dry dam overtop



Artists' Rendering

Elbow / Highwood Corridor

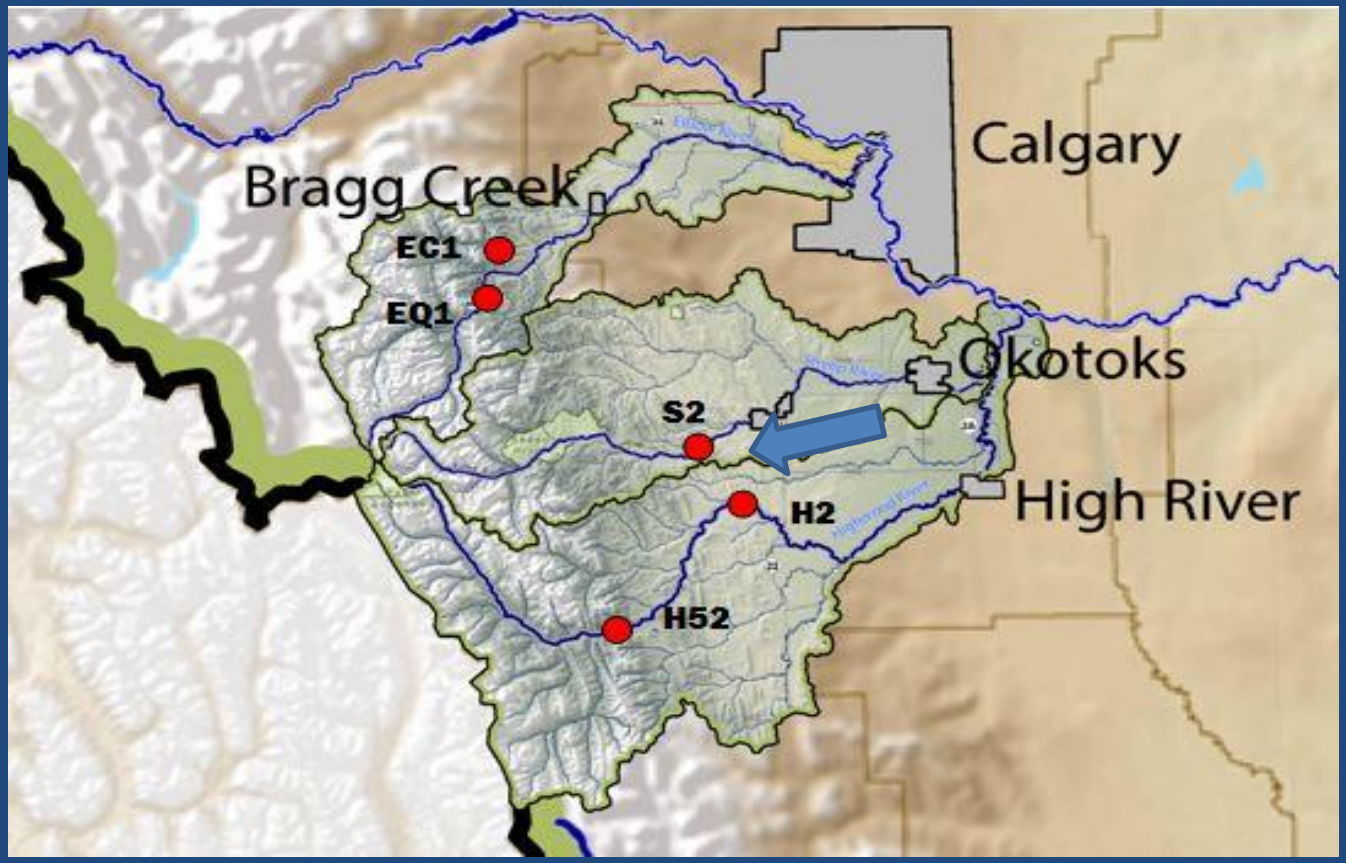
Dry Pond Detention Berm –Gradual filling

Artists' Rendering

Elbow / Highwood Corridor

A Water System Solution Combining
Dry Pond Detention Berms & Diversion Channels

Add Foothills Berms With Dry Pond



Elbow / Highwood Corridor

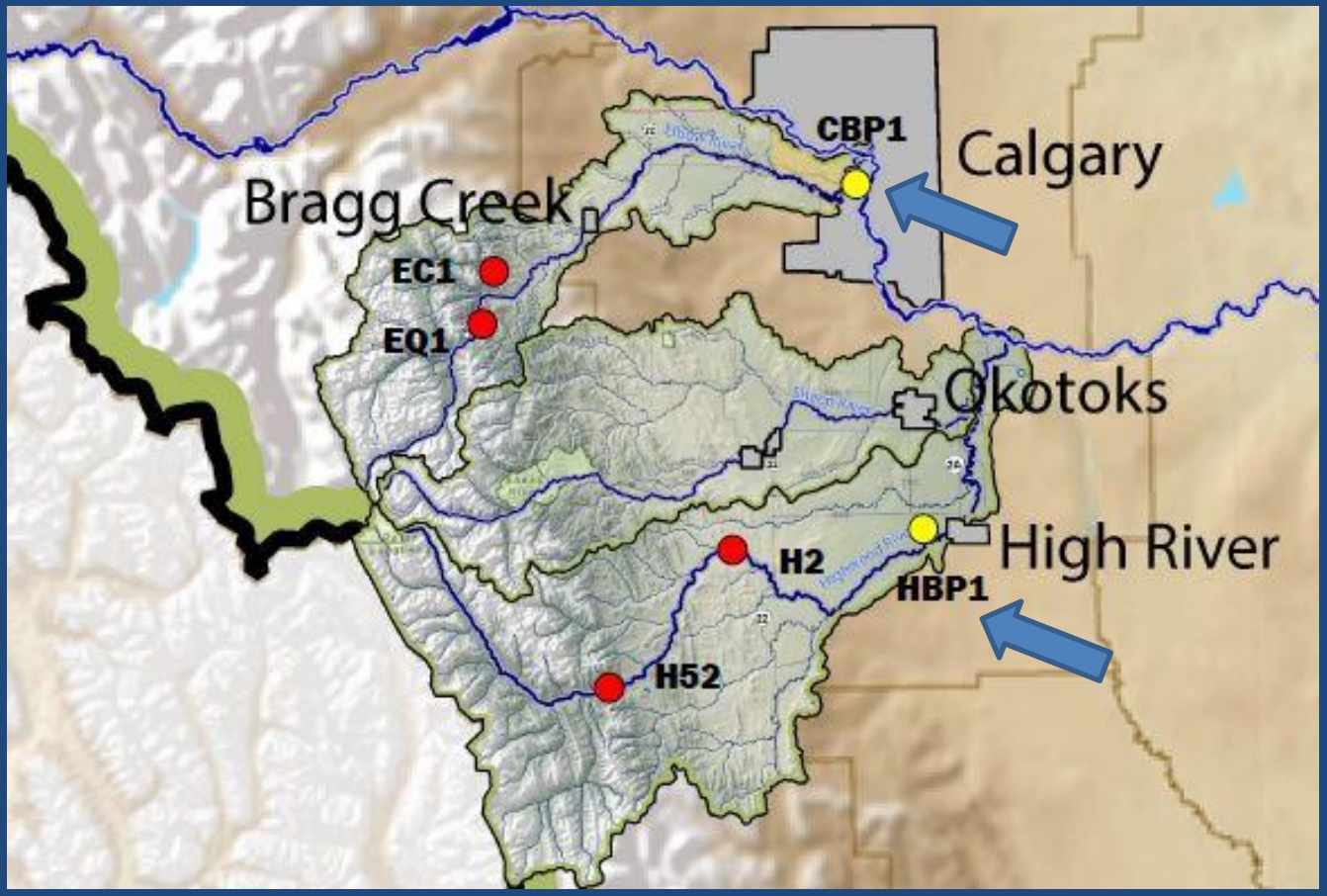
A Water System Solution Combining
Dry Pond Detention Berms & Diversion Channels

Add Foothills Berms With Dry Ponds

Elbow / Highwood Corridor

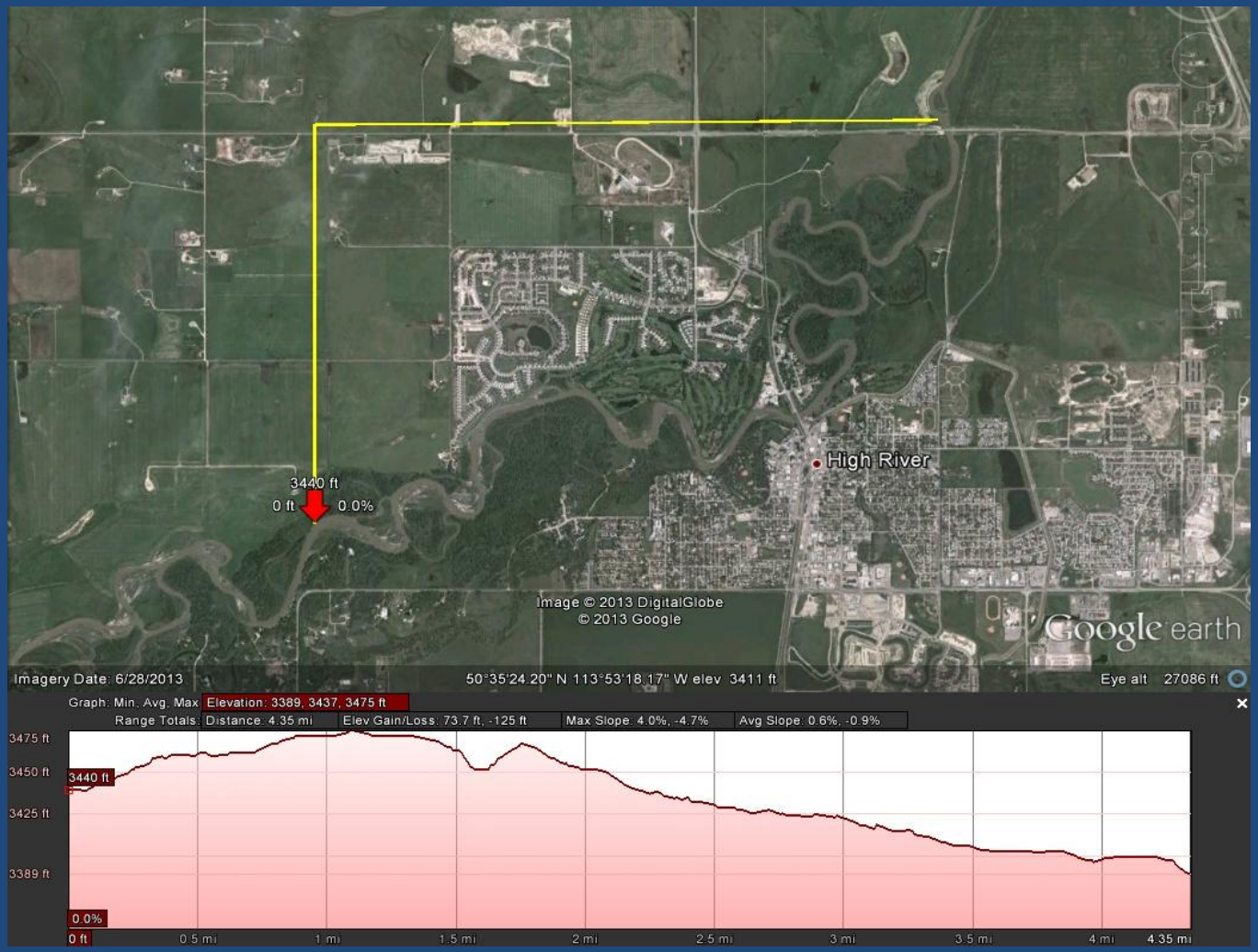
A Water System Solution Combining
Dry Pond Detention Berms & Diversion Channels

Two Diversion Channels for Urban Centers



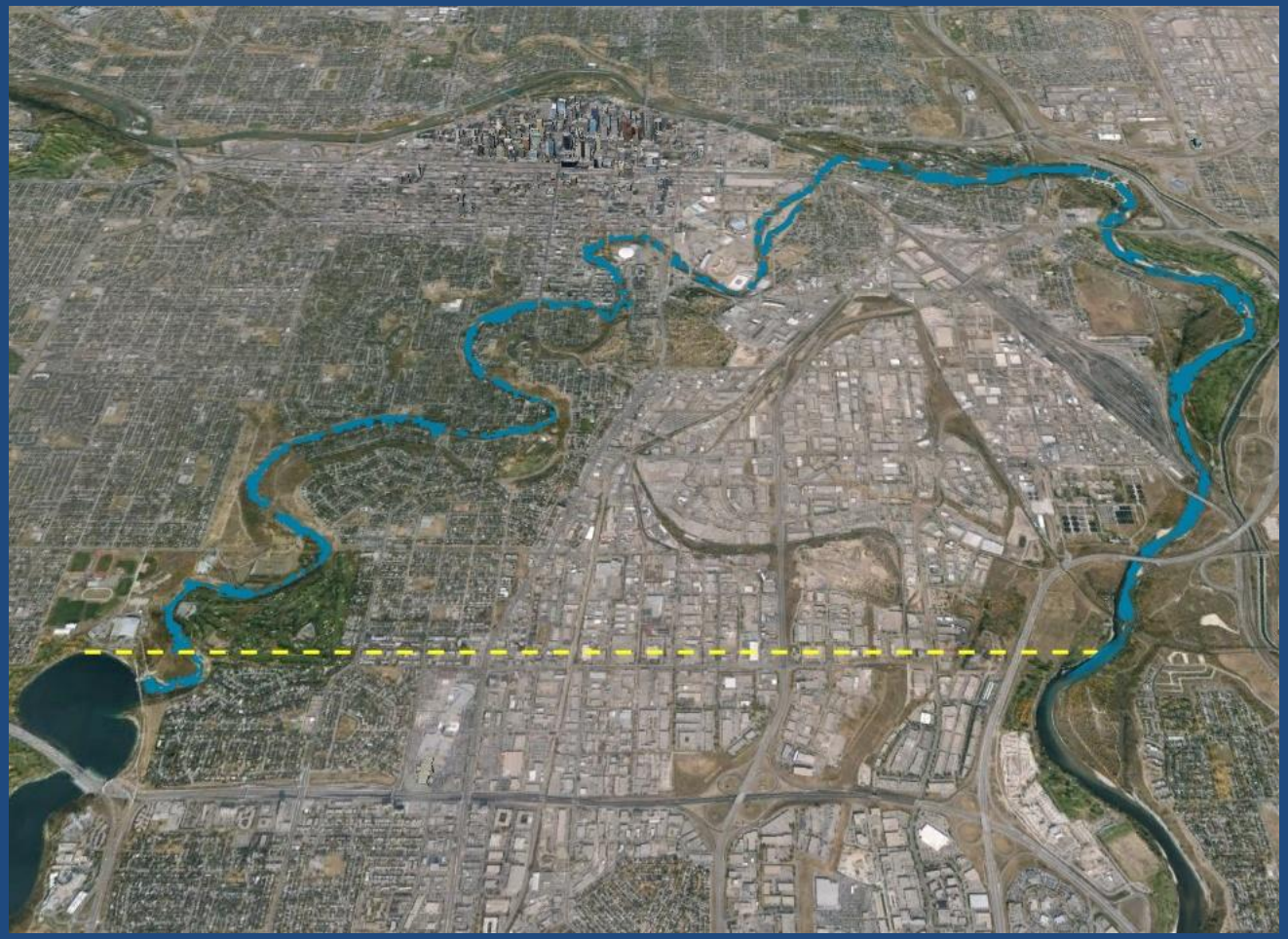
Highwood River Basin Diversion

Example of Possible Overland Route



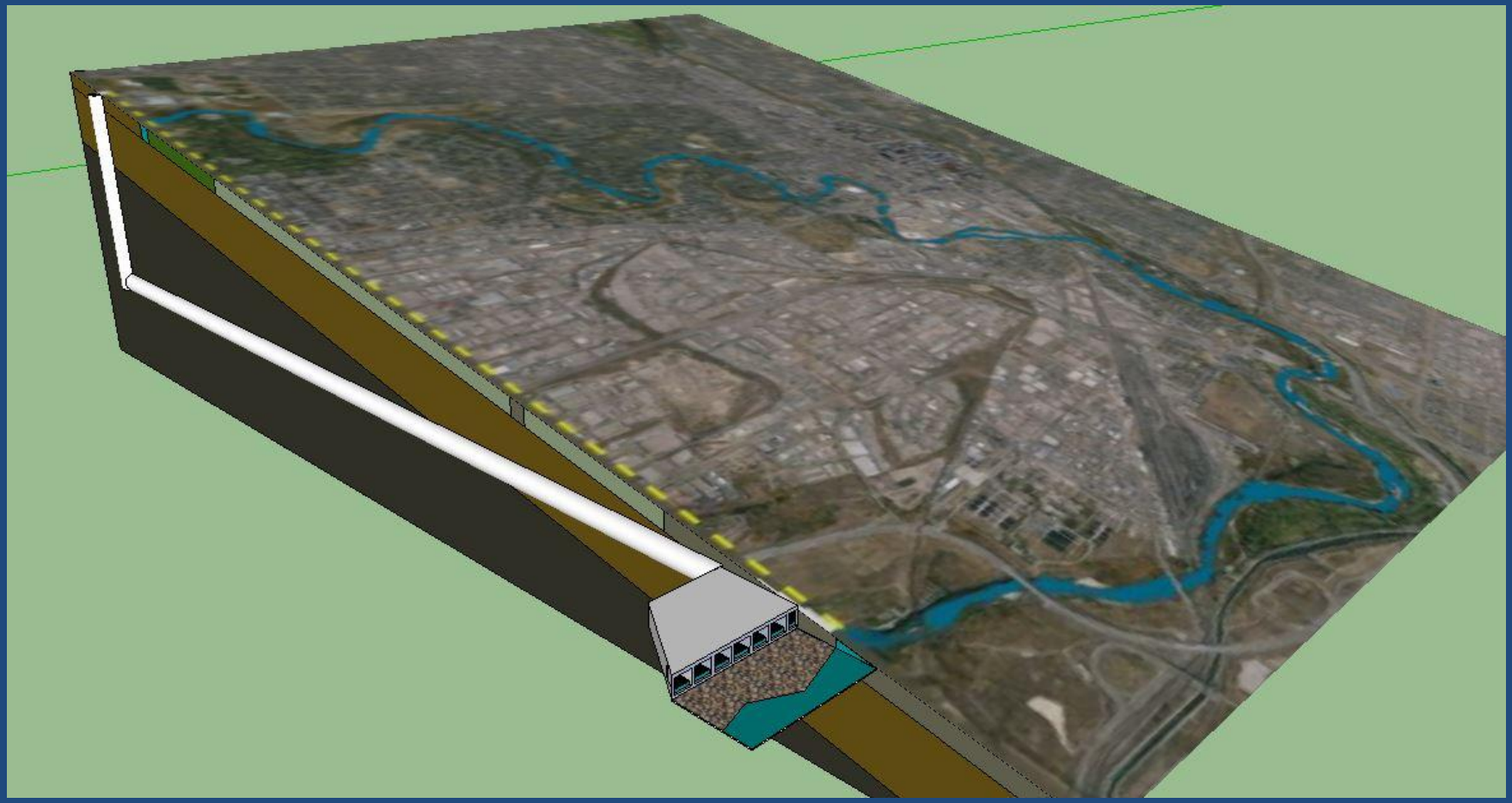
58th Avenue Bypass (CBP1)

Map of Proposed Subterranean Route



58th Avenue Bypass (CBP1)

Diagram of Proposed Subterranean Route
Average Depth to Invert 90 ft

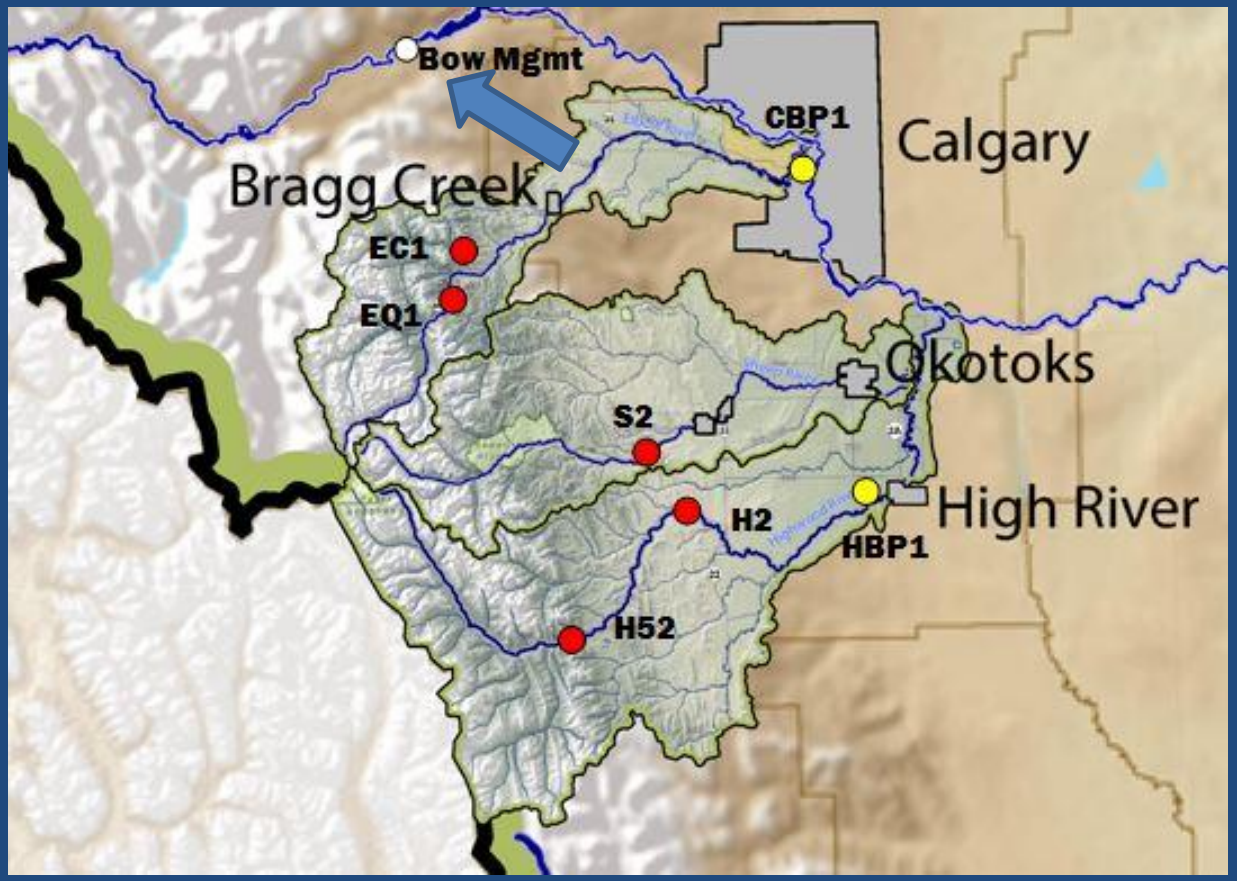


Artists' Rendering

Elbow / Highwood Corridor

A Water System Solution Combining
Dry Pond Detention Berms & Diversion Channels

Comments on Bow River Management



Potential Flow Mitigation Effect of Dry Pond Berms
Potential OVERALL Mitigation Effect of Sites
(Based on Flood Event similar to 2013)

Berm	Estimated Storage	Berm Height	Berm Width	Fetch at Full Supply	In-stream Reduction	Estimated Cost
H5(2)	84,000,000 m^3	50 m	635 m	5,650 m	830 m^3/s	$85 - $100 M
H2	40,000,000 m^3	54 m	1135 m	6,050 m	350 m^3/s	$90 - $100 M
S2	35,000,000 m^3	45 m	845 m	5,740 m	445 m^3/s	$90 - $100 M
EC1	12,000,000 m^3	49 m	170 m	2,570 m	100 m^3/s	$30 - $35 M
EQ1	70,000,000 m^3	51 m	405 m	4,590 m	430 m^3/s	$75 - $95 M

Total estimated cost of berm system = $370 to $430M

Estimated storage volume required in the Elbow River Basin to mitigate flooding = 100 x 10^6 m^3

Estimated storage volume required in the Highwood River Basin to mitigate flooding = 150 x 10^6 m^3

Elbow / Highwood Corridor
Potential Flow Redirection of Diversions
(Based on Flood Event similar to 2013)

Diversion o	Estimated Flow Diversion	Diversion Length (approx.)	Diversion Dimensions	Estimated Cost
HPB1	500 m^3/s	6 km	160 m x 3 m	$90 - 110 M
CBP1	500 m^3/s	5 km	6 - 8 m dia.	$200 - $290 M

Total estimated cost of bypass systems **$290 to $400M**

Total estimated cost of berm systems **$370 to $430M**

Total estimated cost of bypass systems **$290 to $400M**

Total estimated cost of combined systems

$660 to $830M

Elbow / Highwood Corridor

Potential Mitigation Effect : All Measures In Place

(Based on Flood Event similar to 2013)

Location	Peak Flow 2005 [1]	Peak Flow 2013	Flow With Mitigation Measures
Elbow (Bragg Creek)	308 m^3/s	820 m^3/s (2)	310 m^3/s
Elbow (Below Calgary Reservoir)	301 m^3/s	700 m^3/s (3)	0
Highwood (High River)	671 m^3/s	1,800 m^3/s (4)	180 m^3/s
Carseland Weir	1,980 m^3/s	> 4,000 m^3/s (4)	1,700 m^3/s
Medicine Hat	3,790 m^3/s	5,600 m^3/s (2)	4,000 m^3/s (3175m^3/s*)

**With Bow River mitigations, flow rate reduced an additional 15% or 825 m^3/s*

[1] *Water Survey of Canada Hydrometric Data (website)*

[2] *Data provided by Alberta Environment and Sustainable Resource Development (ESRD)*

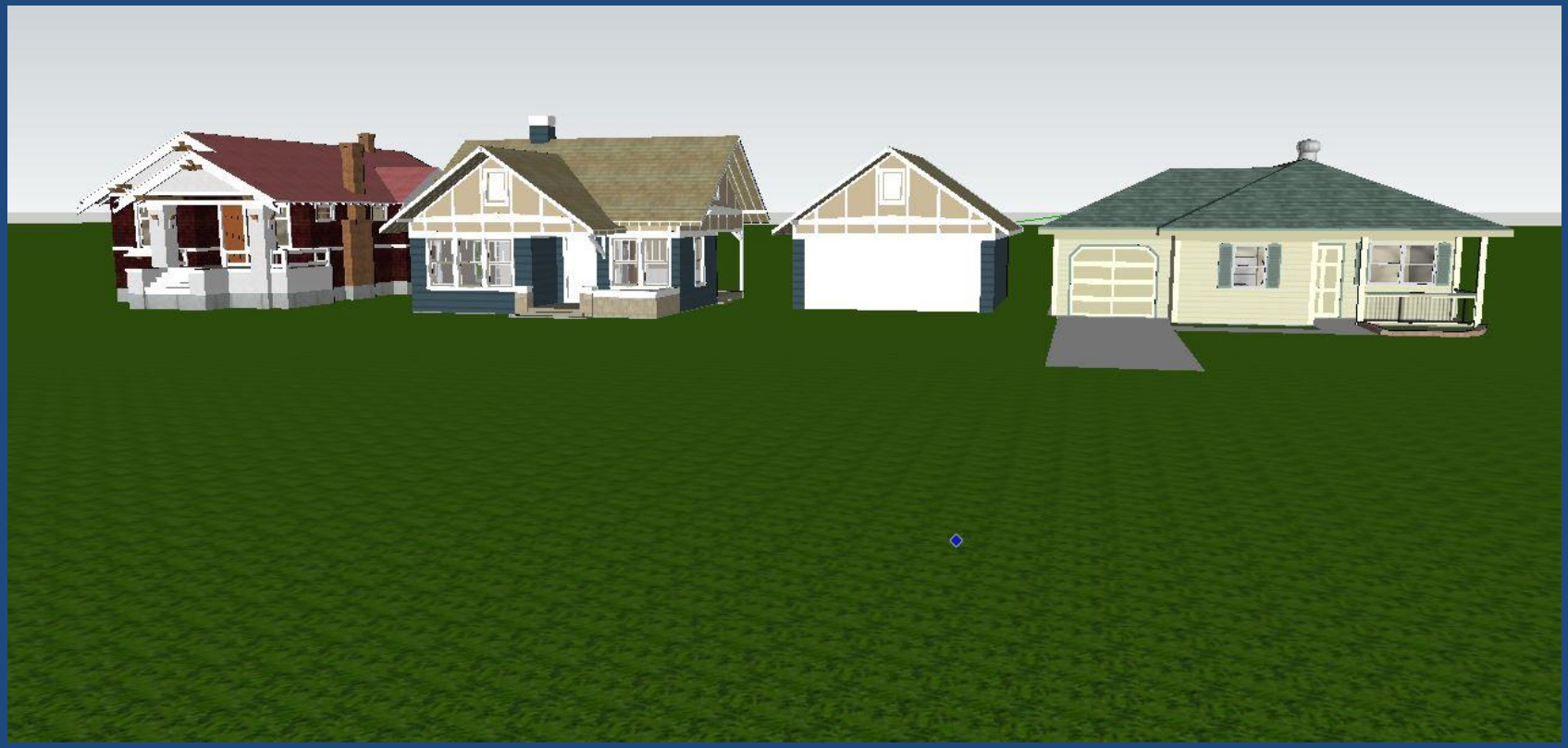
[3] *June 2013 Hydrograph - Elbow River at Glenmore Dam provided by City of Calgary*

[4] *Extrapolated based on data provided by ESRD*

Elbow / Highwood Corridor

What do these charts mean to *you*?

Remembering no two storm events are the same

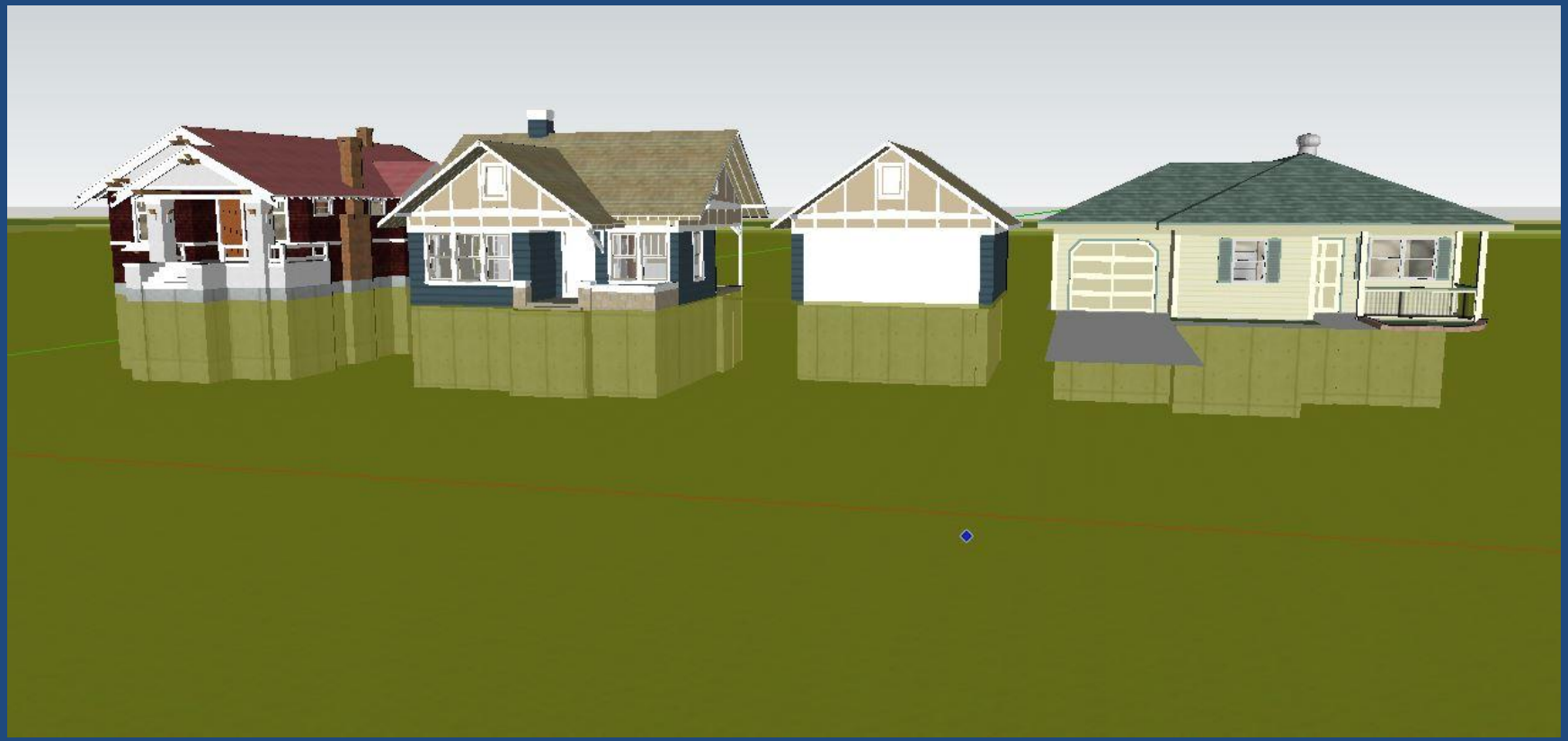


Elbow / Highwood Corridor

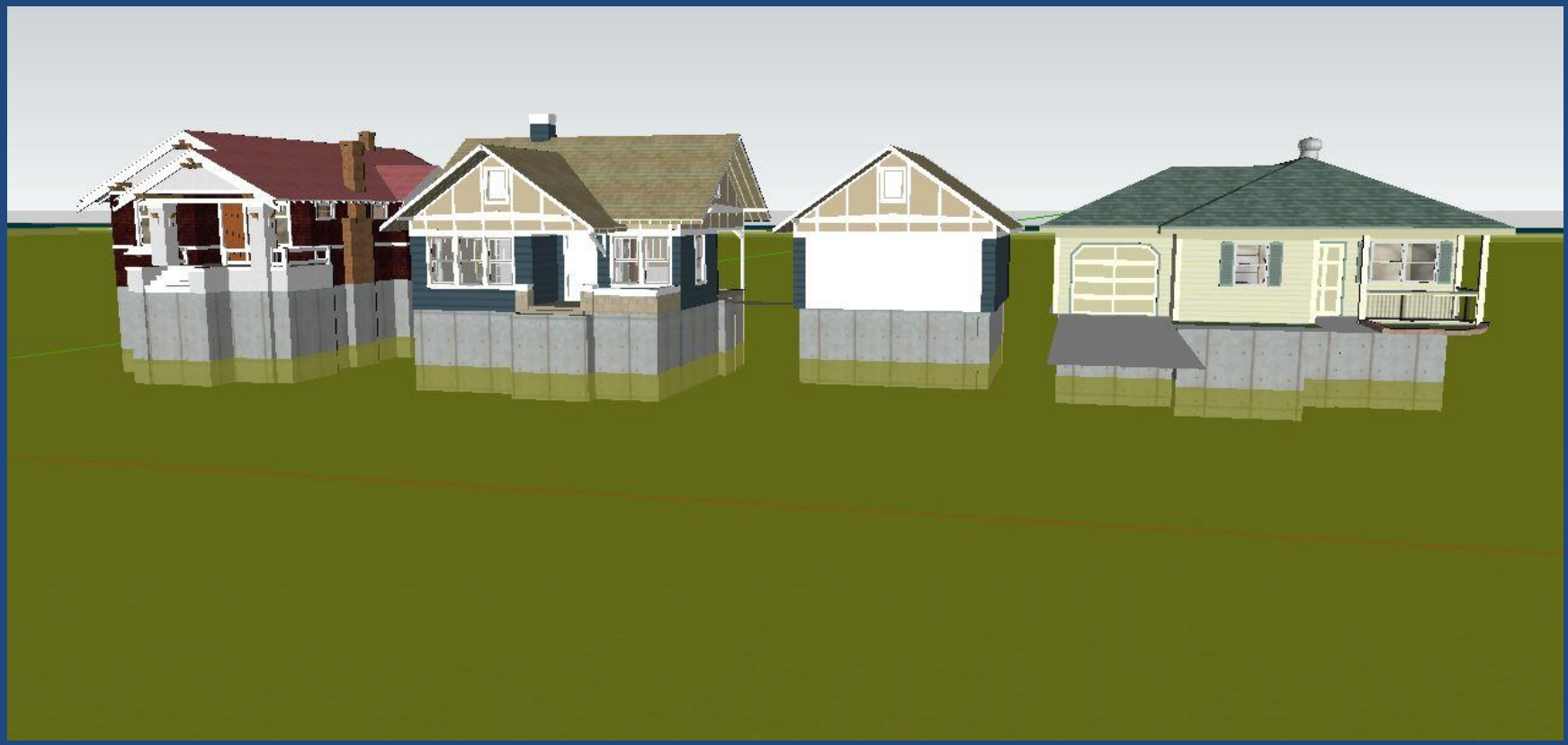
If we exposed the foundations of these homes;
and consider a storm event similar to 2013 or 2005

The full preceding proposal could have mitigated a storm *similar* to 2013

The headwater berms could have mitigated a storm *similar* to 2005



And the full proposal would include *an additional margin of safety*



To provide further protection for possibly different events

Acknowledging no plan could prevent *every* storm flood event

Timelines

- Provided all consultations have been completed satisfactorily, and
- All approvals are in place,
- With construction proceeding on schedule,
- Three headwater facilities could be in place within 7-12 months from commencement
- The preceding system could be complete in 2-3 years

Timelines

- The consultation and approval process, if not managed properly and expedited, could take months or years, delaying the projects and diluting the impetus to proceed.

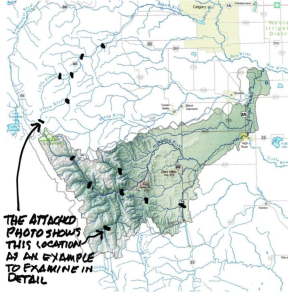
- The Community Flood Mitigation Advisory Panel recommends a thorough, active and expedited process be completed, to ensure the future safety of Albertans and reduce further flood losses within the Southern Watershed.

In Closing

- This **crucial part** of the **Alberta Flood Mitigation System** is achievable and necessary within an expedited timeline.
- **Communities** should continue their action plans for mitigation; in some cases the system relies on these also being completed.
- **Homeowners** should review individual mitigation measures and make prudent decisions.
- **All** of these measures are part of the overall solution.

TYPICAL INSITU AGGREGATE DAM SITES

TYPICAL HEADWATER INSITU AGGREGATE IMPOUND



Calgary
Chestermere
Elbow River
Bow River
Western Irrigation District
Sheep River
Turner Valley
Black Diamond
Okotoks
High River
Little Bow River
Elbow River
Little Elbow River
Highwood River
Eden Valley No. 216
Nanton
THE ATTACHED PHOTO SHOWS THIS LOCATION AS AN EXAMPLE TO EXAMINE IN DETAIL