Draft Meeting Summary
Athabasca River Basin (ARB) Initiative

Working Group meeting #7

Date January 25th, 2018

Time 9:00am to 4:00pm

Location Executive Royal Hotel, West Edmonton

Attendees

Bill Loutitt, McMurray Metis
Brandi Mogge, Fisheries & Oceans Canada
Brian Yee, AEP
Brian Deheer, AWC-WPAC
Carmen Wells, McMurray Metis (MNA Local 1931)
Dallas Johnson, Alberta Innovates
Dan Moore, Alberta Newsprint Company
Gillian Donald, McMurray Metis (MNA Local 1935)
Hank Giroux, DCN
Jim Sellers, Athabasca University
Joanne Volk, Repsol Oil and Gas Canada Ltd
Janice Linehan, Suncor
Jumbo, Fort Chipewyan
Linda Jefferson, ATCO
Karl Giroux, Driftpile
Kelly Dion, FLFN
Marie Breiner, AWC – WPAC
Marv Fyten, Athabasca Watershed Council
Martin Van Olst, Environment and Climate Change Canada
Molly Fyten, Lac La Biche County
Meghan Payne, Lesser Slave Watershed Council
Molly Fyten, Lac La Biche County
Murray Tenove, Alberta Agriculture and Forestry
Patrick Marriott, Alberta Energy Regulator
Reese Robin, Conklin Joint Venture
Waylan Heavy Runner, Land Use Secretariat
Trevor Wall, Integrated Sustainability (rep ANC)
Todd White, Tech
Velma Whittingham, Fort McMurray 468 FN - IRC
Zahidul Islam, AEP
Claire Jackson, Alberta WaterSMART
Danielle Marcotte, Alberta WaterSMART
Denise Di Santo, Alberta WaterSMART
Mike Nemeth, Alberta WaterSMART
Ryan MacDonald, Alberta WaterSMART

Discussion points

1 Opening remarks

Mike Nemeth convened the meeting at 9:05am by introducing himself and the group. He mentioned that there would be a different format today (only plenaries) and a lot of material to get through.

- Denise will take us through what we heard at the sharing sessions.
- Then we will have four plenaries to go through the strategies document in detail.
- At the end of the day we will have a final plenary on existing gaps in this initiative.

Mike reminded the group about the Chatham house rule, in which all information is recorded but without attribution. He also reminded the group that all the slides and a meeting summary will be sent out.

Mike went through a quick summary of the Initiative and where we are at in the process:

- The scope of this project is surface water quantity in the Athabasca River mainstem and tributaries. We can also look at implications on water quality that relate to flow directly, and look at basin landscape and climate changes and how these impact flow.
- This is a collaborative process; we need input from the entire working group.
- At this current meeting we need to refine the strategies; if you see something that needs to be changed or discussed in the strategy please bring it up. We want to hear and document all the varied perspectives from the Working Group.
- The end product of this work is the ARB Roadmap. The Roadmap is intended to inform future planning and help support sustainable water management in the future for anyone who wishes to use the information this work produces. Right now we're trying to identify and sort the strategies into most promise, least promise, and some promise. Each strategy has been run under a set of stress tests to help us look at how it can provide resiliency in the future. The model can only provide us with so much information, and therefore we need to hear from you on each strategy.

Question (Q): Can you remind us of what the outcome is? Is the strategy summary document that was sent prior to this meeting a version of the end document?
Response (R): The outcome will be a Roadmap. The strategy summary document will comprise part of the final version of the Roadmap. The Roadmap will include where the basin is today- the challenges and strategies to address challenges in response to future change. The Roadmap will include the potential outcomes of those strategies and subsequent trade-offs based on the modelling results and commentary from the Working Group.

Q: Are you planning to look at the strategies in numerical order? Or in order of promise?
A: We will be looking at the strategies in the numerical order as seen in the summary document. Just because they've landed in these matrix quadrants as of now, doesn't mean they should stay where they are; the category of "promise" may shift around for each strategy, and that's what we want to discuss today. Also, the numbering of the strategies does not indicate a priority or ranking of the strategies. Numbering is only there for referencing purposes.

2 Indigenous Sharing Session update - Denise

Denise started by acknowledging that we are on Treaty 6 lands today. She explained that we wanted to reach out to as many First Nations and Métis communities and tribal councils as possible. She showed a map of the communities that have been visited in order to discuss this project; the yellow stars represented follow-up community focused dialogue sessions, "sharing sessions". The purpose of the sharing sessions was to hear from people who had expressed interest but weren't able to attend Working Group meetings in Edmonton. The project team also wanted to go into communities and hear community perspectives to help create an inclusive and meaningful dialogue. In this way we could hear directly on issues concerning water, and share what we've done in the initiative so far. Along the way we've also identified gaps that could be filled.

Denise presented the issues and concerns that were heard during the sharing sessions:

- We heard that water quality and ecosystem health is of most concern in the basin. We found there was a lot of alignment with what we have heard in the Edmonton Working Group meetings. We also heard concerns with fisheries and wildlife health.
- We heard a lot of stories, particularly around navigation in the Fort Chipewyan area where winter roads are critical for supplies. We heard about water let out of a dam at one point that disrupted the winter roads; these stories helped us understand some of the constraints with living in these Northern areas. With potential for a warmer and wetter climate, the challenges with winter roads may increase.
- Access to clean drinking water was an issue of concern. There is a strong lack of trust in the water supply in Fort Chipewyan. Cancer is still a big concern there.
- We also heard that the trap lines look very different today from how they did years ago. Some of the wildlife are missing and game organ meats can no longer be consumed.

Denise explained how what we heard can be brought into consideration with the strategies discussed here today, including exploring what navigation flows could look like, what instream flow needs (IFNs) could look like, water quality, etc. We've found that the issues shared at the sharing sessions supported the concerns heard at the Edmonton Working Group meetings. We hope the strategies we look at today could further address some of the concerns we've heard in the communities.

3 Plenary Session 1

A Draft Strategy Summary document was sent out prior to the meeting for Working Group members to read. Today we are going to go through an overview of each of the 13 strategies that have been identified by the Working Group; we will a description of the strategy, how it was simulated in the model and what the model showed for results, and summarise the previous Working Group discussion. Throughout the discussion we will look at the modelling results summary tables, and show where the Working Group placed the strategy in the matrix at the last meeting and discuss if it needs to move at all. Finally, we'd like to identify actions that could be taken to implement or advance each strategy if it were to be advanced in the future to support sustainable water management. All comments and questions will be documented throughout the day.

The group was told that the summary table of results in the slides provide the overall PM model results for each strategy, and that the second, third, and fourth columns shouldn't be compared as they are results of the strategy relative to base case under the dry condition, the historical condition, or the wet condition respectively.

Strategy 1: Effluent reuse

Strategy overview and how it was simulated in the model

This strategy is to reuse industrial or municipal effluent instead of returning the treated effluent to the river. The intent is for the effluent from industry or municipalities to be used for other industrial purposes, resulting in a reduction in fresh water withdrawn from tributaries and the mainstem and a reduction in return of treated effluent back into river. Effluent reuse is already being piloted and looked at in the basin.

Some potential benefits from the effluent reuse strategy may include increased flows on tributaries, reduced withdrawals, possible improvement of water quality, and reduced truck traffic in riparian areas.

Results from simulations in the model

The modelling that was done to illustrate this strategy was completed by taking the return flows from the industrial and municipal sources in the upper part of basin, putting the return flows into large off-stream storage, and allowing Temporary Diversion Licences (TDLs) to withdraw water from the storage. A central storage location was simulated for ease of illustrating changes in flow, but it is recognized that the strategy would be more feasible to implement at the local level with a network of smaller storage facilities. The modelling showed fewer IFN violations within the McLeod and Pembina sub-basins.

Q: What is the current condition? How are these flows managing right now, does this water return to the river?
R: In the base case (which represents the model as this are today) the water is being returned to the river.

Q: Are the TDLs that take water from the storage new or existing licences?
R: They are existing.

Comment (C): The write up in the Strategy Summary document doesn't reflect the modelling or the strategy very well.
R: The wording in the write-up will be edited to reflect the strategy as discussed today.

Q: Have we considered the evaporative loss of that storage? It could be quite significant.

R: No, evaporative loss was not accounted for in this strategy. The simulation was done to show what could happen if the return flows were taken out of the system, reused elsewhere, and not returned to the river, so evaporative loss would be part of that removal from the system.
C: As long as you are consistent between the strategies, for example evaporative losses are always ignored, it shouldn't matter if you have evaporative loss or not. We are just trying to see the benefit from one strategy to another.
R: The modeling is representative of how the strategy could work; we could have modelled many small individual storage ponds, but for simpler modelling we modelled one large storage pond to see the impacts on flow. In reality it's likely that most of the reuse would be trucked or piped. One of the main benefits of this strategy would be that there would be less stress on the smaller tributaries where the TDLs are withdrawn.

C: The strategies are modelled to reflect the maximum benefit from each strategy. In reality many of the return flows would be hundreds of kilometers from where the point of use would be; matching the return flows and the points of use may be difficult. When considering this the benefits, as shown from the model, are exaggerated.
R: Yes, the overall benefit can be somewhat exaggerated in the results depending on how it was simulated and what would be implemented on the ground. However; the results do show what the benefit to the system, whether local or more regional, could be regardless of the magnitude of those benefits. The discussion surrounding net benefits and feasibility should reflect this.

C: Some approvals to certain licences are dependant on volumes being returned to the river; if the volume is not actually returned, then the conditions of licence are not being met.
R: A licence amendment would be needed. Return flow is a consideration in the licencing, but at the end of the day it is an estimate, and therefore the enforceability of the return is questionable. However, the environment downstream relies on the return flow and to take it away may result in negative effects on the downstream environment. This would all be assessed as part of an amendment to a licence.

C: The water conservation policy, as well as others, have reuse aspects and are imminently being updated.

Discussion of benefits and tradeoffs of this strategy

This strategy was identified as most promising.

C: The Strategies Summary document needs to make the geographic location of the benefits clear. The tributaries would benefit, but downstream on Athabasca would perhaps not. With regards to net benefit or net environmental effects there are other considerations that should be taken into account, such as the infrastructure costs of the strategy. Another consideration may be if a secondary user uses water it may be a consumptive use, therefore this water will not be able to be used by anyone else. It

needs to be clear that because water is being moved around it is not always a benefit, the water could be lost.
R: Yes, agreed. How it was simulated was that the water being used was assumed taken out of the system (e.g., deep well disposal), however the strategy was to look at taking effluent and reusing it for industrial purposes, as opposed to using freshwater that would then be taken out of the system.

Q: When we say promising, do we mean in terms of reality?
R: Yes, it has to be realistically promising.

Q: The document mentions that TDL licence holders would have to agree to use effluent, however in reality this might not actually happen. This is an opportunistic strategy, it makes sense in a local context, but from a basin wide perspective it might not always be worth it. Hopefully any upcoming policy will reflect that.
R: Water conservation policy includes consideration of environmental effects. The policy emphasizes the use of alternative water sources in areas that are short of water. In areas that have a surplus of water, it might be best to use freshwater, this is context dependent.

Q: How are we picking identifying a lot of benefit versus a little benefit? How are we to make sense of the values in the summary tables and relate these to the benefit scale on the matrix?
R: The benefits come from the modelling results, but also comes from the discussion that the Working Group has had at previous meetings. In the summary table on the slides to help identify what is a "big" versus a "small" benefit we've highlighted important results in the blue boxes. It is sort of a judgement call based on modelling results and feedback and dialogue from the Working Group in past meetings, and today.

Q: Does this strategy need to move around on the matrix?
R: It depends; if in reality a source and a demand match, then the strategy is 'most promising', but on a basin wide scale it might not amount to a whole lot, but locally IF it can make sense, then we should leave it in 'most promising'.

It was suggested that this strategy remain in the 'most promising' quadrant, but given what's been said, it should be lowered in the quadrant, to indicate that it may have fewer benefits. In the summary document there should be a qualifier "in certain locations in the basin, it would be deemed least promising".

Discussion on feasibility of implementation

- An updated water conservation policy would need to support, and define the requirement, to look at downstream effects on lack of return. In some cases return flows are needed for downstream needs or minimum flows. This is checked are part of the regulatory process to amend the licence.

- A feasibility assessment would need to be completed, if it was determined that the strategy is feasible then capital would be needed to develop infrastructure.

Strategy 2: Water conservation

Strategy overview and how it was simulated in the model

There is a lot already happening on this front, that is recognised. A large driver for conservation is to free up water to enable future development. Some known examples of conservation include SAGD recycling and intensity targets and municipal conservation such as metering and less lawn watering. The expected benefits from increased conservation would be decreased withdrawals. As a result, we'd expect to see increased flows in the system which would help maintain aquatic health. We took a simplistic approach to the modelling conservation; we reduced industrial, commercial, and municipal demands by 10% basin wide. This strategy is not suggesting we set a new 10% target over and above of what's already being done, it is recognised that there has already been a lot of work done in this area.

Results from simulations in the model

Results from the modelling showed a slight change in navigation and flood days (an increase of two flood days on the Lesser Slave River), fewer IFN violations, improved walleye recruitment which is very sensitive to demands, and reduced shortages due to reduced demands, primarily in winter when flows are low.

Discussion of benefits and tradeoffs of this strategy

This strategy is currently in the "some promise" quadrant, in previous Working Group meetings it was noted that the strategy yielded moderate net benefits overall and is easily implemented.

Q: Can we identify what was modelled exactly? A lot of the SAGD licences are groundwater, were these licences reduced? What is modelled, is it full allocated volume or the actual use data?
R: Where we have actual use data we used it, and where we didn't we used a scaling factor based on other licences of the same type. We're scaling surface water licences not groundwater licences, as seen in SAGD.

C: On oil sands mine sites we already have water conservation targets, the Strategy Summary document makes it sound like things aren't happening, when they are actually happening. This needs to be reflected in the report, and we need to ensure the report hits the right tone.

C: Alberta water strategy set out a 30% reduction intensity target that is sector based. This strategy encouraged a great deal of conservation in those sectors. With reduced use of water, there is also an economic benefit which is a pretty important diver.
R: Good example. Have you seen, or do you think that you'll see any sort of apathy as we get closer to the conservation target?
R: I can't say I've seen that happening. There may be a point of diminishing returns. I am aware however of other negative environmental impacts that increase when we use less water (e.g., increased GHGs), there needs to be a balance.

C: It is worth mentioning that this are already happening and we are working towards these strategies.
R: Yes, these things should be highlighted and the general public should be made aware, maybe this document can help educate the public. That is not to suggest that we have all the answers and that there isn't room for improvement, but the progress that has been made should be recognized in the document.

C: It seems like the numbers in the summary table look really great, and yet this strategy is still in the 'some promise' category. Maybe this strategy should be moved up to the top, or maybe it is getting harder to do because we've done so much already.

Discussion on feasibility of implementation

- The Water Conservation, Efficiency, and Conservation targets are already in place, this needs to continue to be implemented; recognizing the continued work and to move beyond the targets.
- Education and awareness of the general public of what is already being done is an important part of this.

Strategy 3: On-stream storage

Strategy overview and how it was simulated in the model

This strategy was to explore new on-stream multipurpose storage options within the ARB and understand how storage infrastructure can affect the timing of flows in the basin and serve multiple purposes. This strategy was modelled at three sites with different operating objectives to explore multipurpose on-stream storage at different locations along the river. The model was run for each site with the multipurpose operating objectives seen below and also run for just hydropower generation so differences in the watershed could be assessed from single vs. multi-purpose use.

1. McLeod site: operated to meet the Aboriginal Extreme Flow (AXF) for navigation and to meet the IFN on the McLeod River

2. Mirror site: operated for low flow augmentation and to meet the Surface Water Quality Management Framework (SWQMF)
3. Grand Rapids site: operated to meet downstream ecosystem flows, to meet the AXF for navigation, to reduce shortages by meeting the SWQMF, and then to maximize hydropower

Results from simulations in the model

McLeod site (operated for multipurpose objectives): modelling results showed an increase in the number of days the AXF is met, and a large increase in the number of days that the IFN is met on the McLeod River.

McLeod site (operated for hydropower only): modelling results showed an increase in IFN violations on the McLeod River, this is because the storage is not being operated for downstream considerations. This model run also showed an increase in walleye recruitment reduction because the operations of the storage is not set up to mimic the natural hydrograph.

Mirror site (operated for multipurpose objectives): there is a decrease in the number of days that the AXF is met, a negative impact on walleye recruitment, and a decrease in winter shortages seen specifically in the dry conditions. These results are seen because water is released from storage to meet, or avoid triggering, the SWQMF, therefore there are fewer shortages caused by the SWQMF. The negative impact to walleye recruitment is seen because at some points in the year the storage is holding back water to refill.

Mirror site (operated for hydropower only) t was modelled as a run of river site, therefore having only a small amount of storage to maximize head, this model shaves off the top of the hydrograph off, but has less of an impact on the hydrograph than when the Mirror site is modelled with operations to meet multipurpose. Because the site is storing a little bit of water there are increased shortages as well as a negative impact on walleye recruitment.

Grand Rapids site (operated for multipurpose objectives): the results showed an increase in days that the AXF is met, a reduction in shortages and a reduction in walleye recruitment.

Grand Rapids site (operate for hydropower only): simulated as a run of the river hydropower site the model showed an increase in streamflow in the spring, additionally the operations shaves off the top of the hydrograph off, therefore resulting in a reduction in walleye recruitment. There is not much change in terms of shortage.

Discussion of benefits and tradeoffs of this strategy

This strategy was placed on the line between least promise and some promise.

It is thought that the strategy could have moderate to high net benefit, as there are benefits to having flow regulation on the river, but there are also some tradeoffs, these are seen in the negative impact to walleye recruitment and other environmental effects.

C: Last time the Working Group met this strategy was theoretical; today there are two 100MW run of river projects proposed in the ARB, one site is Pelican Rapids and the other is Sundog. These projects are due for review on February 9th. Because these projects are under 200 MW by regulations they may not need to go through an EA; however, the minister decided that they should still go through EA. Even though these projects are run of river they will likely still involve structures across river. This is an example of how strategies can and should inform changes in the basin. If we wanted storage as part of a hydro development, these two sites are now likely gone.

C: There is research and modelling on the effects of global warming on the ARB. We're predicting earlier spring thaw and earlier rain, which increases flow and causes drier conditions later in the summer. If we can assume that this is going to happen then storage might be a proactive measure that is essential and that provides potential for beneficial flow augmentation under future climatic conditions.
R: Yes, we've thought about that and recognize that. Adaptation to future climate might be an avenue Alberta should pursue using water storage in northern Alberta. If there is going to be storage in the ARB then there may be benefits in using that storage for multiple purposes other than hydropower generation.

Q: Recognising that there are simplifications in the modelling, what sort of constraints were placed on the amount of water that the storage could release? In the McLeod, you can't release 100cms without causing flooding.
R: The releases to meet downstream needs were done to release the deficit between flow and target, so not the target flows (e.g., 100 cms). We will check on that and make sure the storage is not causing other issues like floods on the McLeod.

C: There are many things to consider and it's hard to arrive at a decision, there are many conflicting opinions, environmental negative effects, positive impact for flow augmentation, and large social challenges in implementing.
R: There needs to be recognition of all the impacts. The group has recognized the negative environmental effects, that is why the strategy is not higher up on the matrix, as a group we should also bear in mind adaptation to future flows as previously mentioned.

C: I'm noticing that these strategies haven't been vetted through traditional land users and haven't considered how traditional communities use the river. I find this is quite lacking; dams would be very destructive to the communities. This process should be brought to the land users to see how they feel about these strategies.

R: We agree, which is why over the course of this Initiative we have been trying to reach out to traditional land users, and will continue to reach out, through the sharing sessions and other means.

C: The Sundog project is going to be very destructive as that area is considered a sacred site to our community. We have no time to fight this process.
R: Those projects are separate from the ARB Initiative; this Initiative tries to give us a good indication of what a project like that would look like in terms of changes in flow on the river.

C: This model doesn't reflect what the impacts of new hydropower projects will be on the land users.
R: That's why we document commentary and encourage everyone to share thoughts and perspectives. Anything you want to add will be incorporated into the final report. The commentary supplements the overall picture of a strategy.
C: The Athabasca River is a beautiful river to canoe, and I wonder what happens to that opportunity if these hydropower projects get pushed through.
R: Yes, those cultural and recreational impacts will be recognized in this strategy.
C: Alberta has no storage on the Milk River in southern Alberta; however, there are diversions in the US which allow there to be flow on the Milk River, this allows there to be rafting businesses and canoe trips. Naturalised flow would be much lower. If drought is more prevalent under future climates scenarios flows on the Athabasca might decrease more than otherwise if a dam wasn't there.
R: There are going to be trade-offs with storage; this strategy seems to be floating between 'least promise' and 'some promise'. We hope that nothing in the report will suggest that this Working Group thinks on-stream storage is the thing to do for water management in the ARB. We've adjusted the language surrounding on-stream storage to say: "should a hydropower development go ahead in the ARB the projects should look at using the storage to meet other purposes and objectives". There are still trade-offs, but if dams are going to be built to meet the provinces renewable energy needs, it is important to consider how they can be used to create other opportunities for the basin.

C: It doesn't seem like the Working Group is supporting of moving this strategy into the 'some promise' category; if it is on the line then that shows that it requires more investigation, which can be done through the EA process.
Q: The document said it was least promising with low feasibility and moderate benefit. It's moving around on the matrix and seems to be creeping up to some promise.
R: The strategy was moved based on notes from past Working Group meetings. It was moved to straddle the line prior to the meeting, in part to force a conversation; we wanted to bring that to you today to see how you felt. There are other processes like EAs that can hash out the benefits more clearly and help place it in terms of promise on the matrix more confidently.

Discussion on feasibility of implementation

- A feasibility assessment would need to be completed in order to understand trade offs that would come with on stream storage.
- An environmental assessment would be needed.
- If on stream storage were to be implemented the on-stream storage locations would need to be vetted with traditional land users.

4 Plenary session 2

Strategy 4: Off-stream storage

Strategy overview and how it was simulated in the model

This strategy was to look at developing new off-stream storage sites to meet multiple basin water management objectives such as enhancing industrial water supply, flow regulation for aquatic health, improved riparian health, navigation, and hydropower.

Two model runs were completed to illustrate the effects of off-stream storage. In both of these runs the location of the off-stream storage was the McMillan off-stream storage site, the two model runs operated the off-stream storage for different objectives, one to meet the SWQMF (‘McMillan SWQMF’) and one to meet the AXF and the SWQMF (‘McMillan AXF’). The off-stream storage was modelled as a closed system, the water would be pumped into the storage from the mainstem of the Athabasca River during high flow times and would be released as needed based on the operating objectives.

Results from simulations in the model

When operated to meet the SWQMF the modelling shows that this strategy will decrease the number of days that the AXF is met under dry conditions, would decrease shortages under dry conditions, and would have a negative impact on walleye recruitment. The negative changes to the AXF and to walleye recruitment are reflective of when water is being pumped from the river to re-fill storage.

When operated to meet the AXF and then meet the SWQMF there is an increase in days that the AXF is met, a decrease in shortages, and a negative impact to walleye recruitment.

Q: Does this strategy recognize that we already have existing off-stream storage on the mine sites that helps meet the SWQMF?
R: No, this is not reflected, because the demands these sites have are still reflective of actual use. The fact that there is some existing off-stream storage will be reflected in the final report.

Q: Would this strategy be to build an additional off-stream storage facility even though there are already off-stream storage facilities that exist?

R: This strategy is to develop off-stream storage to meet multipurpose objectives. Current off-stream storage is to meet industrial demands when needed. We can flag that as an important point in the report, should additional off-stream storage opportunities be maximized in areas where there is currently existing infrastructure. However, if you wanted to meet other needs as well, not just industry needs, then maybe you should look at other sites. But it is an important distinction that there are a number of on-site facilities.

C: It is questionable to be looking at this strategy as a hydropower benefit; energy will be expended to pump the water into storage, in essence this strategy would be hydropower neutral.
R: Hydropower was never identified to be a key component of this strategy; it is noted because some power could be recovered to neutralise the costs, and with the water being released it might make sense to have hydro on the outlet to capture some additional benefit.
C: In some cities they pump water uphill with solar power, so that they can then generate hydropower at night when they release the water, it is a form of energy storage.
R: This is a good point, if off-stream storage is something that were to be put forward in the future, hydropower might be an added bonus that could be realised from that strategy.

Discussion of benefits and tradeoffs of this strategy

C: One of the other purposes for off-stream storage is a contingency water supply for the SWQMF, this is already something that is being done. This could be an added bonus; if a facility were to be built it could expand its scope and release water for the SWQMF. Off-stream storage at the source of industrial operations is a very common and promising strategy in and of itself, but the benefit incurred here is specific for that meeting the framework.

C: There could be water quality concerns here; McMillan is a brine lake, so returning water from the lake to the Athabasca could affect water quality in the Athabasca.

Q: With off-stream storage water temperature and water quality concerns should be recognized; have we seen an issue there?
R: This is not seen in the model, we haven't modelled water temperature directly, but it could be an issue.

Discussion on feasibility of implementation

- A location for off-stream storage would need to be determined, this would ideally be done working with communities and traditional land users.
- A feasibility assessment would need to be done, this would include a study of possible water quality and water temperature impacts as well as an EA.

- There is already existing infrastructure for this purpose, perhaps existing infrastructure could be built upon or maximized.

This strategy remained in the 'most promising' quadrant.

Strategy 5: Existing infrastructure

Strategy overview and how it was simulated in the model

This strategy was to look at altering existing water storage infrastructure and/or operations to meet multiple basin water management objectives. The existing water storage infrastructure that looked at was the Paddle River Dam and the weir at Lesser Slave Lake. This strategy looked at changing the operations of the Paddle River Dam to ensure that there is enough water being released for downstream demands and raising the weir at Lesser Slave Lake by 30 cm. From a modelling perspective these changes are fairly simple, from an operations perspective some these changes may be more challenging. This strategy was modelled with operating rules to meet the SWQMF and then operating to meeting the downstream AXF for navigational purposes.

Results from simulations in the model

The modelling results for this strategy while meeting the SWQMF show a large increase in the flooding downstream of Lesser Slave Lake, this is because the flood threshold downstream of Lesser Slave Lake is very low. The results also show a reduction in flooding at Fort McMurray. IFN violations increase under historic and wet conditions, but decrease under dry conditions. Additionally, there is a reduction in shortages, this decrease in shortages is because there is an increase in storage and therefore the SWQMF is always met, therefore demands do not need to be cut off based on the SWQMF.

When this strategy is modelled to meet the AXF instead of the SWQMF there is an increase in flood days below Lesser Slave Lake, an increase in IFN violations, and an increase in shortages. This increase in shortages is because Lesser Slave Lake is holding more water back.

Discussion of benefits and tradeoffs of this strategy

C: This infrastructure already exists, from that perspective it seems like this strategy should move in the matrix; it should be very easy to implement as the infrastructure already exists.
R: There are many expensive houses along Lesser Slave Lake, there would be a lot of push back to raising the weir along the lake; from this perspective this strategy would be very challenging to implement and would be a 'least promising' strategy.
R: The weir has been an on-going water management issue for a while, it is a fixed crest weir with a gate that releases at 6 cms. This option to raise the weir was considered years ago, so its not that far fetched to raise is by 30 cm.

Q: When considering all existing infrastructure, would we not want to operate all infrastructure differently to optimize water management? From that lens this strategy depends on context; other examples of existing infrastructure include existing off-stream storage on mine sites.
R: Are there other structures in the basin that should be considered? If there is no other infrastructure then this strategy remains a 'low promise' strategy. It was noted that most major dams in this basin are tailings ponds, tailings ponds might not be the most promising infrastructure.

Discussion on feasibility of implementation

- Identify if there is other infrastructure in the basin that could be operated differently, if there is further infrastructure this strategy would warrant being looked at further.
- This strategy would a capital investment, prior to the capital investment an economic assessment would be needed.
- This strategy does not seem socially or ecologically feasible.

Strategy 6: Environmental flows

Strategy overview and how it was simulated in the model

This strategy is to establish IFNs for all tributaries in the basin as a precautionary water management measure. These IFNs could be established using the Alberta Desktop method in order to proactively manage ecosystem health, the intended outcome would be to maintain or increase flows in the tributaries, primarily during low flow periods. Additionally, this strategy may maintain a more natural hydrograph.

This strategy was modelled by calculating the IFN values for the tributaries, using the Alberta Desktop method, and setting these values as minimum flows. Anytime the IFN was no met Temporary Diversion Licences (TDLs) were not supplied water.

Results from simulations in the model

The modelling results showed a large decrease in IFN violations as well as an increase in shortages, and a positive effect on walleye recruitment.

Q: Were TDLs the only licences that were shorted in the model?
R: Yes.
Q: In order to meet the IFNs would licences other than TDLs need to be shorted? If not then is it a real shortage, TDLs are temporary and are already subject to IFNs.
R: Some TDLs expire, but others are renewed annually, therefore this would represent a shortage that would always be there, however TDLs can vary substantially from year to year.

Discussion of benefits and tradeoffs of this strategy

This is already being done to some degree; the Alberta Desktop method can be applied, and is routinely applied, in the province.
Q: When the Alberta Desktop method is used to calculate the IFN for a particular licence, is the IFN value public? Is everyone informed of the value?
R: Not necessarily, an improvement to the current situation would be to increase transparency; increased transparency helps inform the public of ecosystem needs
Q: How is the IFN calculated for the tributaries?
R: It was calculated using the Alberta Desktop method, not the modified Desktop method, which will eventually be used for the Surface Water Allocation Directive (SWAD). SWAD is still in draft form so it could not be applied in this Initiative yet.
Q: How would this apply to older licences, if an IFN was put in place would it apply to existing licences?
R: Making an IFN apply to existing licences would be a major move and would incite political reactions. For example, the SWQMF does apply to all the licences.

C: This strategy may be fairly easy to implement going forward, however applying it to existing licences would likely be very challenging. Focusing on TDLs is easy because they need to be renewed annually, and going forward it's easier than applying it to older licences.

C: It may be more realistic to identify priority areas and focus on those rather than implementing IFNs for the whole basin right away.
R: Taking a provincial wide look at all the tributaries may identify where effort would be best applied and where to focus resources. However, for tributaries without gauge data this may be challenging.

Discussion on feasibility of implementation

- The SWAD is already being developed, and the Alberta Desktop method is already being used. It may be beneficial to better promote these by taking a risk based approach, applying them to high risk locations first.
- Data and transparency to what is already happening in creating IFNs and where they are would be beneficial to this strategy.

Strategy 7: Navigational flows

Strategy overview and how it was simulated in the model

This strategy looks at implementing minimum flows to improve navigation in the lower Athabasca basin. The minimum flow (the AXF) that is modelled is 400cms at the confluence of the Athabasca

River and the Firebag River, this minimum flow is only enforced during open water season – April 16th to October 28th.

In order to simulate this in the model, all upstream licences are shored to try and meet the AXF.

Results from simulations in the model

The modelling results show an increase in days that the AXF is met, an increase in days that the IFN is met, and an increase in shortages in the system. It was noted that even by shutting off all upstream licences the flow targets could not be met all the time.

Discussion of benefits and tradeoffs of this strategy

This strategy is currently sorted as a 'least promising' strategy; realistically all the licences in the ARB wouldn't be able to be shut off. There is little benefit (6 to 13 days over 30 years) for basin in meeting the AXF, however there is big cost associated with shutting off all the licences.

C: This strategy is challenging to comment on because the groups that are directly affected by the strategy, such as the community of Fort Chipewyan are not present. It would be beneficial to flag this as an education and awareness piece – both to allow understanding that the AXF cannot be met all the time under natural flows and to understand where the 400cms came from (a study done on behalf of two First Nations back in 2010).
R: It may also be appropriate to consider other means to achieve the AXF, such as using structures to increase flow, or using alternate watercrafts. Furthermore, up to date bathymetric studies are needed to understand the dynamic nature of the channel.

C: One of the findings of the P2FC was that cutting off withdrawals was not a good way to meet the navigational flows. Bathymetric surveys have been done in the past and we need to recognize that the channel has changed but it is still representative.

Q: How does this strategy differ from the IFN strategy? The Working Group decided that the IFN strategy was a great option, how can this be classified as 'least promising'?
R: There are different costs and drawbacks to this strategy, the modelling shows that cutting off all upstream licences only increases the days that the AXF is met but a couple of days. However, the modelling results do not show large shortages when compared to other strategies, the project team will verify the results.

C: This strategy would only be beneficial in the shoulder seasons were the flow is low, so there are not many days to begin with during that open water season where that flow isn't met naturally.
R: Yes, in past Working Group meetings we looked at changing the duration of the open water season, the modelling results weren't significantly different.

Discussion on feasibility of implementation

- Actions suggested to move toward implementation included a bathymetric study of the river, but it was indicated that one was done already for navigation. With the changes from sediment deposits in the river it is likely outdated. The river used to be dredged for navigation up until ~2007, now it is not.
- In order to look at this strategy it would be beneficial to use the change in Fall Aboriginal Navigation Index (ANI) as a PM rather than number of days meeting AXF; this would help demonstrate that the limiting withdrawals upstream doesn't create significant change in the natural conditions, shorting users won't have much of a positive effect.

Plenary 3: Strategy 8-11

Strategy 8: Oil Sands returns

Strategy overview and how it was simulated in the model

This strategy is to release treated oil sands process water, it assumes that water quality guidelines are met. The thought is to release the water when it will be beneficial to the basin; either during low flow periods to possibly augment flows or during high flow periods to dilute the treated water to alleviate water quality concerns.

This strategy was modelled with the returned flows being released to the water during the low flow period and with the return flows being released to the water during the high flow period.

Results from simulations in the model

The modelling results show that if the water is returned during low flow periods there in a very small increase in flow at the mouth of the Athabasca River during spring and winter. If the water is returned during high flow periods there is an improvement in walleye recruitment, this is because the water is being released in the summer when walleye recruitment is taking place.

Q: The model shows a return flow of 12.2 cms, where did this number come from? Additionally, it's not likely that the returns flows would take place during low flow. There are some assumptions made with this strategy that need to be looked at more closely.
R: The assumptions were made because we didn't have any better information, it would be fantastic if we could take a closer look at it and more representative information was provided. Since it wasn't we had to make assumptions based on available information.

Q: Is this stored water that will then be added to the system?
R: Yes, this is water stored at oil sands sites.

Q: The 12.2 cms return flow seems very high, where did this number come from?
R: The cumulative volume of water stored at oil sands sites comes from publicly available data; some assumptions were made surrounding this data, for example it was assumed what volume of the water

could be released, how quickly it could be treated, etc. This cumulative tailings water volume was then modelled to be released over a period of five years.

C: The document says that this strategy has low feasibility, but industry is currently working on allowing tailings water releases to take place.
R: During previous meetings we explored this what-if scenario as a Working Group, we heard that this strategy may have low feasibility. Does this strategy fit in this document as a strategy for long term sustainable water management, or is it an industry initiative that should be recognised as separate from The ARB Initiative?
C: The longer that industry stores water on site the more the water quality is degraded; releasing water is much more of a water quality issue than a water quantity issue.

C: Is this a strategy that fits into the Roadmap? There is still a lot of work that needs to take place before there will be consideration of releasing process water into the river. This is a very complex problem; the modelling is too simple to show the true benefits and challenges associated with it.

This issue has its own dedicated working group, the group is looking at the water quality aspects of releasing treated process affected water; the group will eventually look at timing of releases. Looking at this strategy from a quantity perspective may not be very useful.

C: This strategy should be removed, from many people's perspective it is a disastrous idea; additionally, there are no monitoring strategies included in in the strategy.

Based on the commentary here today this strategy will be removed. This was a difficult strategy to consider, we appreciate the Working Group's comments.

Strategy 9: Land conservation

Strategy overview and how it was simulated in the model

This strategy is to increase the quantity and improve the condition of conserved and restored land across the basin. The goal of this strategy is to maintain or improve hydrologic and watershed health by increasing the quantity and improving the condition of conserved and restored land across the basin. Potential benefits from this strategy are greater infiltration and retention in the soils, less flashy runoff, less flooding, and higher baseflows.

This strategy was modelled using land conservation shape files, the CPAWS20 shape file and the CPAWS50 shape files. These shape file delineate the land to be conserved or reclaimed, the CPAWS50 shape file represents a larger amount of land. In the modelling the roads, seismic lines and pipelines were reclaimed back to the natural landscape; towns and big communities were not reclaimed. When impervious surfaces such as roads are reclaimed more water remains on the landscape and less water is returned to the rivers. From a surface water flow perspective this shows up as a negative outcome in the PMs, but it is not necessarily a bad thing; this strategy needs to be thought of from a broader water management context.

Results from simulations in the model

The modelling results show less flooding at Lesser Slave River, a slight increase in shortages, and an increase in IFN violations these changes are seen because less water is reaching the rivers. These modelling results are consistent between the CPAWS20 and the CPAWS50 runs, the magnitude of change is larger in the CPAWS50 model runs. Overall the magnitude of change in flow is not very large.

The PMs do not show substantial benefits from a water supply perspective, the strategy shows a decrease in flow to the Athabasca river. There is a reduction in flood days, this is because the system is less flashy after the strategy has been implemented. There is an increase in IFN violations because less water is running off the landscape to the rivers.

Discussion of benefits and tradeoffs of this strategy

Currently this strategy is a strategy with ‘some promise’, are there other net benefits that should be considered?

C: This strategy results in a reduction in runoff, which would also indicate a reduction in erosion and sedimentation; this could remove a lot of the nutrient loading and we would see some water quality benefits. Perhaps the strategy should be sorted with higher net benefits.

Q: When considering the two scenarios, CPAWS20 and CPAW50, is this strategy attainable, would it be possible to conserve this much land?
R: It is a lot of land, but it could be attainable, the question is whether or not it’s possible to convert because of the current and future needs of the land.

Q: When considering agriculture, once land is in agricultural production and has hit a steady state, it is unlikely that it will come out of production; furthermore, it is unlikely that the linear features associated with those agricultural lands would be removed. From this perspective is it feasible to conserve so much land?
R: The project team didn’t do a spatial assessment of what areas are more reasonable to conserve or reclaim than others. The understanding of the CPAWS suggested land is that the conserved areas take development into consideration and avoid reclaiming developed land as much as possible, or developed land with higher net present value (NPV).

Q: A trade-off analysis would be an important component of this particular strategy. With regards to the modelling, it this modelled to happen all at one time?

R: Yes, the reclamation happens all at once in the modelling, we didn't look at reclamation trajectories.

C: It is difficult to reconcile the negative impacts to the IFN, as shown by the PMs, and the benefits for the basin. A healthy watershed is not just the flow in the river, it's the land and the whole basin. This strategy is likely more useful for the basin than the model shows. This strategy should be done regardless of water quantity management, it would be helpful to present the benefits from various points of view.
R: Yes, that is true, and this commentary is valuable. The model can't show all the benefits for a strategy, so we need the commentary and dialogue about the non-modellable benefits and tradeoffs of each strategy. Even though the PMs show a lot of red this strategy is sorted as a strategy with high benefits because of all the other benefits of this strategy other than when looking strictly at flows.

Discussion on feasibility of implementation

- Capital would be needed to get this strategy moving.
- Regional planning will be an important part of implementing this strategy. In terms of implementation this strategy should be part of regional planning.
- A cost-benefit analysis should be completed when considering this strategy, if lands are conserved there will likely be loss of productivity and compensation required.
- It might not be feasible to achieve 20% or 50% specifically, rather portions of those suggested areas
- This strategy should be sorted to show higher benefits, this will keep us accountable to making an effort to land conservation.

Strategy 10: Forestry practices

Strategy overview and how it was simulated in the model
This strategy is to continue to support practices in Forest Management Agreements (FMAs) that minimize hydrologic change.

This strategy was difficult to model, in order to illustrate the impact that forestry practices have on water management poor forestry practices were modelled, these poor practices reflect what would happen if significant harvesting and clearcutting were allowed. To show this 28,000 km^2 of forest was removed in the ARB, this is essentially double the current disturbance. Doubling the forestry disturbance allows more water to run off the landscape because it is not intercepted by forests.

Results from simulations in the model

Please keep in mind that the results would be the inverse of what the strategy would achieve. By continuing to support practices in FMAs that minimize hydrologic change (which forestry already does in most cases) the results would be inverse to what the modelled results showed. The modelling results show an increase in surface water flow in the ARB. There is an increase in days that the AXF is met, an increase in flooding, a decrease in IFN violations, and a decrease in shortages. Although these changes to PMs appear positive they aren't necessarily positive, as there may be other negative consequences associated with increased forestry such as road fragmentation, nutrient runoff, increase sedimentation, or damaged riparian areas.

Discussion of benefits and tradeoffs of this strategy

Currently the strategy is sorted as a strategy with 'some promise', it shows moderate benefits to the basin at a basin-wide scale, and it is east to implement. What other benefits may come from applying this strategy?

C: Benefits from this strategy would be seen more in smaller watersheds with high levels of disturbance than at a basin wide scale.

C: With increased forest disturbance there would be increased runoff and higher sediment loading flowing to the river, furthermore there would be a decrease in groundwater flow. There are benefits of having trees capture the snow and allowing it to infiltrate. If loss of water storage in the groundwater system were examined there would be negative impacts from increased forest disturbance.

C: The model results from this strategy are similar to those seen in from the land conservation strategy. There is a big difference between overall watershed health and how much water is in the river, this distinction needs to be clarified. Furthermore, you wouldn't choose to alter forest harvest in order to manage flows, therefore this is a bit of an awkward one to think through.

C: When considering caribou habitat, current research is actually pointing to the fact that clearcutting forestry practices might not be as bad for caribou as current forestry practices (e.g., selective harvesting). Clearcutting creates one road access road and a more focused footprint relative to selective harvesting, one clear cut area is easier for caribou to avoid.

Discussion on feasibility of implementation

C: Implementation of this strategy is already taking place.
R: The language surrounding this strategy will be changed to "continue to support". We'll ensure that the language reflects that this strategy is already being carried out.

C: Best management practices (BMPs) are one of the valuable aspects of this strategy; this strategy should be raised a bit higher to show that it is very beneficial.
R: This strategy has been moved to 'most promising'.

Strategy 11: Wetlands

Strategy overview and how it was simulated in the model

This strategy is to avoid further wetland loss and promote wetland restoration through the continued refinement, implementation, and enforcement of related legislation, policies, and mechanisms such as the Alberta Wetland Policy. Some benefits of this strategy would be improved water quality and improved ecosystem health.

This strategy was difficult to model, in order to illustrate the impact that wetlands have on water management the removal of wetlands was modelled. In order to model the impact of wetland removal 30% of the wetlands in some specific sub basins were removed in the model. The wetlands were removed and replaced with hard, impervious surfaces.

Results from simulations in the model

The modelling results show reduced baseflows due to decreased storage with wetlands loss, and overall there are increased flows. This illustrated what would have happened to streamflow when wetlands are lost from the landscape, thus supporting the strategy of minimizing or avoiding wetland loss in the ARB.

Discussion of benefits and tradeoffs of this strategy

This strategy has been sorted almost right in the middle of the matrix – it shows moderate benefits and will be moderately feasible to implement.

Q: Regarding feasibility of implementations, it is noted that an action could be to implement land use planning restrictions to limit residential developments, why is this specific to residential development? From a watershed perspective it doesn’t make sense to limit the land use planning restriction to residential development.
R: That will be changed in the strategy.

C: This is something that should be done anyways; wetlands provide benefits other than flow to the river – they are mother natures way of off-stream storage.

C: There are currently challenges to implementing the Wetland Policy.
Q: It is noted that the strategy would be more effective in the central and lower portions of the basin, why would that be the expectation?
C: The new Wetland Policy includes the green areas; the majority of the ARB is a green area.

Q: What is the strategy exactly? Is it wetland conservation or wetland loss? It looks like the IFN violations on the slide looks mixed up.
R: The IFN violations on the slide are incorrect, this will be updated.

C: How this strategy is shown is confusing, near Fort McMurray there has been nearly a 50% loss in wetland footprint, and the closure and reclamation plans do not target restoring an equivalent footprint of wetlands. Specifically, reclaimed wetlands from oil sands doesn't fit in here, however general basin wide wetland restoration is a reasonable strategy.
R: This comment highlights why avoiding wetland loss is just as important as wetland restoration.
C: Muskeg can't be regrown; it's a very important part of the landscape and its very difficult to restore, so conserving it in the first place is more important than restoring. Environmental groups and knowledge holders should work together to set up a database to evaluate the potential impacts of proposed developments. This would be helpful so that impacts can be identified to policies, so that we can't come back to the table and say there was no consultation and no one-on-one collaboration. Include community groups straight from day one to avoid certain issues.

Discussion on feasibility of implementation

C: The feasibility of implementation should move towards 'hard to implement', it seems that there is a lot of money being spent that hasn't gone towards wetland restoration.
R: Good point - it is easier to conserve something than restore it, we should focus efforts on conservation.

Strategy 12: Linear connectivity

Strategy overview and how it was simulated in the model

This strategy is to reduce the total linear footprint on the landscape through mechanisms such as road and trail deactivation, seismic line reclamation, and restrictions on off-highway vehicle use. Linear features fragment the landscape and have the potential to interrupt hydrologic functions, ultimately affecting streamflow. This strategy reduces this interruption and aims to determine the hydrological impact of linear disturbances in terms of changes to streamflow. As a result of this strategy it would be expected that there would be a decrease in flashiness, and an increase in baseflow. It is likely that the impacts from this strategy would be seem more locally than at the basin scale.

This strategy was modelled by restoring 40% of the linear features in five sub basins in the model. The model results show very slight changes, it should be noted that the land use changes seen in this strategy as it is modelled are very small, as changes in 40% of those linear features is 40% of just 1% of the landscape.

Results from simulations in the model

The results show less flow in the Christina River from for this strategy. There are also likely positive environmental and ecological benefits and likely improvements in water quality.

Discussion of benefits and tradeoffs of this strategy
This strategy is currently sorted as a strategy with 'some promise', it has low net benefits and is easy to implement.
There are likely environmental, ecological, and water quality benefits from this strategy.

Q: Why is this an important strategy for sustainable water management? In this particular case this strategy is important to conserve west slope cutthroat trout and that is important enough.
C: Linear fragmentation contributes to habitat fragmentation; however, it does not necessarily have a big impact to water quantity and quality.

Q: How was this strategy modelled? Was there any updating on the Digital Elevation Model (DEM)?
R: There was no update to the DEM, therefore there was no update to the routing, the way this is modelled likely underestimates the benefit.

C: Existing processes and management frameworks should be better acknowledged in the document. The impacts of this strategy would be seen more on a smaller scale; in smaller areas this strategy could have significant benefits and could be easy to implement; at the scale of the basin it would be way more difficult to implement.

C: From a water quantity lens it's hard to make a good case for this strategy, however there are a lot of other reasons to implement this strategy. Linear disturbances are often highlighted as key issues, they play a huge role in wildlife habitat, from an aquatic perspective another well known issue is stream crossings and fish barriers. There are many reasons besides water quantity as to why we would want to do this strategy.

C: An example of a BMP could be to make roads more sinuous and less linear. Also, to have smaller right of way so that the road can self reclaim. This strategy has a big education and awareness aspect, as human behaviour is difficult to change.

Discussion on feasibility of implementation

- There are many drivers other any water quantity that would encourage the implementation of this strategy.
- There is an education and awareness piece to the implementation of this strategy, for example off-road vehicle users need to be educated on the impacts of off-road vehicles.

- There is a scientific research complement to the implementation of this strategy, there is a need to understand the impacts of linear connectivity and to understand that reducing linear connectivity has a greater impact at a local scale.

Strategy 13: Oil sands mining reclamation

Strategy overview and how it was simulated in the model

This strategy is to continue current reclamation practices and enforcement in the energy sector in order to ensure mines are reclaimed in a manner that restores or improves watershed functions.

This strategy was not modelled because mine scale water management is outside the scope of this project.

Discussion of benefits and tradeoffs of this strategy

This strategy is currently sorted into the 'some promise/ quadrant, we heard that it would give moderate benefits and that it is easy to implement.

Q: Should this strategy be limited to oil sands mines, or should it include coal and aggregate mines as well?
R: This strategy was originally discussed as a strategy for oil sands companies, but we don't need to limit it to oil sands, the strategy could include all mining operations. It is also recognized that a lot is being done in the oil sands industry.

C: It's odd that the Muskeg River Management Plan is an example of reclamation.
R: The principle of the plan is to replicate the watersheds natural performance. But it could be seen more as an example for IFNs.

C: The requirements for reclaiming oil sands mines have increased substantially in the past years, it is now much harder to reclaim mines to meet the standards.

C: There has been and is instrumental watershed research work at Syncrude to study re-establishing hydrological function and connectivity. There has been modelling work done through CEMA regarding mine reclamation, this modeling was coupled to future climates. This model could be easily expanded to include all of the mines however there is no longer funding to expand on the model. Without funding the feasibility of the modelling component of this strategy is very challenging.
R: It is recognized that mine reclamation plays an important role, it is a vital part of long term sustainable water management. Going forward data and research is an important gap to fill.

Discussion on feasibility of implementation

- Detailed modeling should be completed to support the implementation of this strategy, this detailed modelling could build off of the CEMA work that has already been completed.
- Data and scientific research are needed to bolster this strategy, these data should feed into new reclamations plans and updates to current reclamation plans.

6 Gaps discussion

Megan lead a discussion on the gaps that have been identified by the Working Group over the course of the Initiative. This plenary was to confirm the gaps that have been identified to date and hear from the group on: Are there any gaps that are not on this list? and which gaps need attention first (e.g., what are the critical gaps)? After this meeting we will send out the full table of gaps and commentary with any additional gaps added from today. We welcome your edit/revise/adds to the list, and will bring this back to the next meeting with a draft recommendation on which gaps should be filled first.

We need to identify what the gaps are. We've captured throughout these series of meetings the gaps so far. Which are the critical gaps that you would address first and why? Any other data, knowledge, process, or policy gaps that are missing?

- C: We need to have more data from a water quality perspective, i.e., cavern storage.

- Q: Is there fisheries data for the winter. Winter low flows can be a particularly sensitive time, is there any data for the winter under ice low-flows?
- R: There is a report that came out of CEMA that tracked that kind of info.

- Q: One of the gaps that came up was about the tailings management plans for the oil sands mine. There's no cumulative understanding of how filling the end pit lakes with river water will affect the mainstem river. There needs to be a cumulative assessment for that volume taken out of the river and stored in lakes.

- C: We generally know some of the overarching concerns and Traditional Knowledge. It would be better to understand more of the specific concerns around TK, and we need to figure out how that plays into our planning and where we go in the future.

- Q: In terms of process, I think there should be more of a focus on risk based processes. Where do we need to focus our efforts sooner, where are the basins that are most at risk?

Which of these gaps would you pick to close first and why?

- C: It would be interesting to see what the naturalized flows would be like at any point in the basin. Say if there wasn't any development what kind off low would I expect to see flows naturally.
- R: AEP is working on this and once it is finished they are aiming to publish and make the data available. Also, the government is currently developing a tool that will take surrounding data and estimate real time flow in locations where there are no stations. We intend to make it publicly available.
- C: I think all this hinges on the awareness and ready access of data. To fill all of these gaps you need strong data, and that data needs to be accessible, not just available. Part of accessibility would mean having a site where people know what data sets are being collected or developed, and where/when they can be downloaded.

7 Next Steps and Close

In closing, Mike reminded the group that the next meeting is on March 14th, where the plan is to discuss actions and where we go next, and confirm the final report and final communication plans. Mike reminded the group that feedback on the draft strategies document is welcome, and all comments should be submitted by Feb 5th so we have time to incorporate everything into the document.

C: Some of the pros and cons are from the modelling exercise and some are from knowledge from the group. This should be distinguished in the final report (e.g., A, B, and C came from model, and X, Y, Z came from discussion).

R: Yes, that is a good point – we should separate the two and make them clear in the final report

Q: Is there an education element as an action coming out of this process? Sometimes there's some misconceptions on water use, and it would be beneficial to have an education piece on the learnings from this initiative.

A: We do hope to get out and educate/spread the information that we've collected throughout this process. At this time there are no formalized plans as to how that information will be shared. In the report specifically, we will have a section of the document which shows important learnings about the basin (i.e. proportion of water demands in relation to flow in the Athabasca).

Mike thanked the group for their time and efforts today.

The meeting adjourned at 3:33 p.m.

ALBERTA waterSMART
Water Management Solutions

Sustainable Water Management in the Athabasca River Basin Initiative

(ARB Initiative)

Working Group meeting #7
January 25, 2018

Welcome and introductions

Today's discussion

9:00	**Welcome, introductions, and opening remarks**	**Mike**
9:20	Indigenous Sharing Sessions update: key messages that we heard and information to help our thinking on today's discussions	Denise
9:30	Plenary session 1: strategies 1-3: • Review key points for each strategy • Identify actions and enabling conditions • Confirm strategies as most, least, or some promise • Document additional comments	All
10:30	Break	All
10:45	Plenary session 2: strategies 4-7	All
12:10	Lunch	-
12:50	Plenary session 3: strategies 8-11	All
2:15	Break	All
2:30	Plenary session 4: strategies 12-13	All
3:10	Plenary session 5: gaps identified in water management data, processes and policies • Identify, review and confirm gaps • Identification of critical path gaps	All
3:40	Next steps, and close	Mike

Chatham House Rule

"When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed."

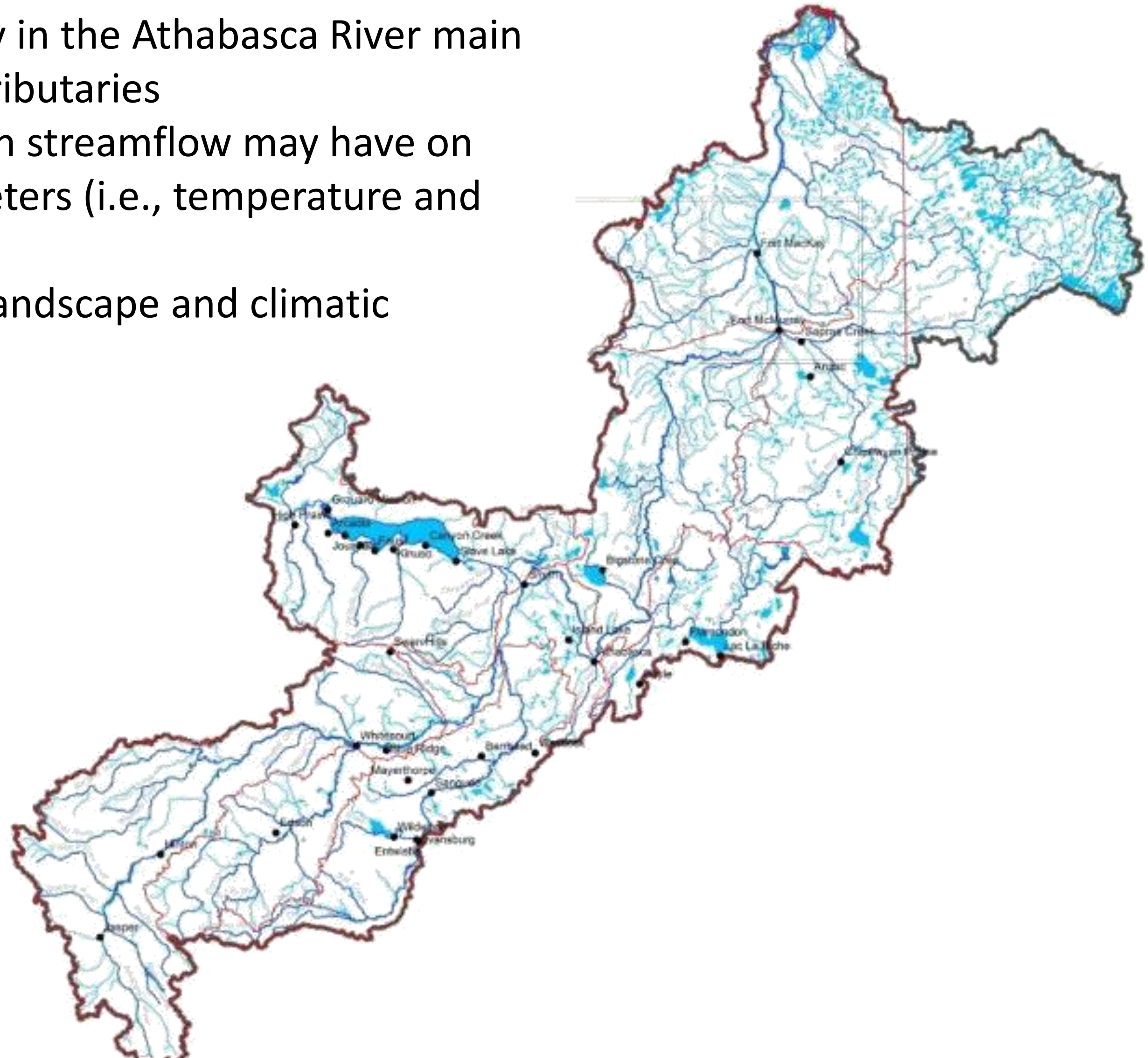
Be bold, be innovative, speak openly……focus on addressing the challenge, not the blame

Keep in mind…

- Slides and meeting summary will be sent out after today’s meeting.
- Materials and information presented can be shared publically- all meeting material available on the project website (visit www.albertawatersmart.com or Google “ARB Initiative”)
- Please ask questions as we go through the slides and during the working sessions.
- Some of the material will be reviewed again in future meetings.

Current scope

- Surface water quantity in the Athabasca River main stem, and the major tributaries
- Implications changes in streamflow may have on certain quality parameters (i.e., temperature and dissolved oxygen)
- Implications of basin landscape and climatic change on streamflow

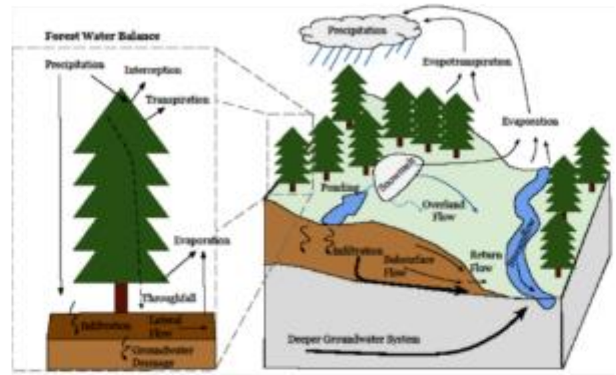


Collaborative water management creates informed discussions that can move toward action

First Nations, Métis Regions, Métis Locals, and Métis Settlements

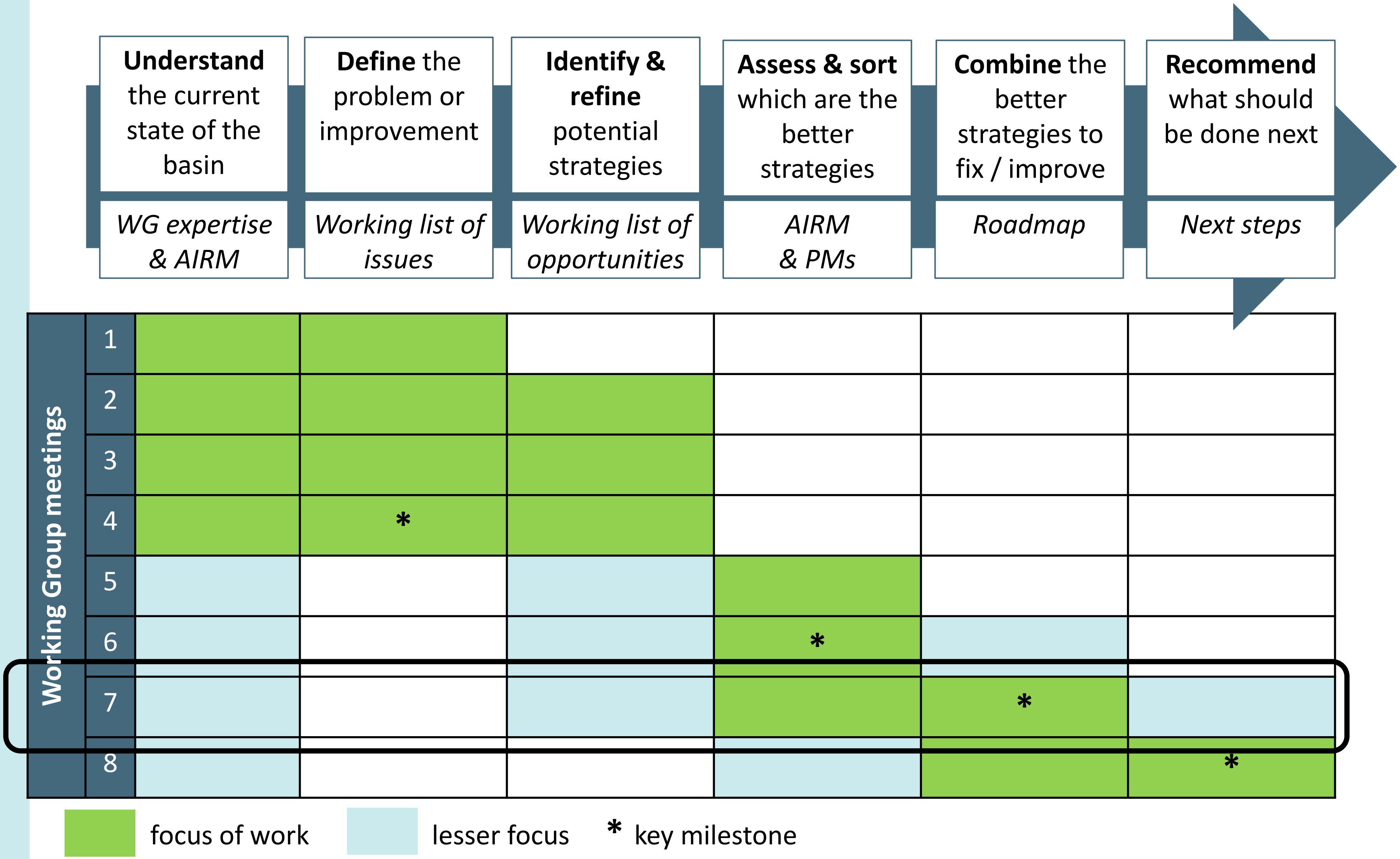
1. Bring together an inclusive basin-wide working group

2. Provide a strong base of data and tools



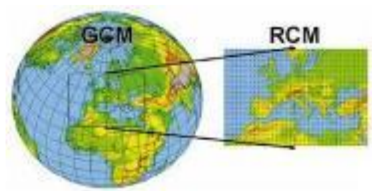
3. Work collaboratively to identify challenges and opportunities

Collaborative process to develop the ARB Roadmap



Athabasca Integrated River Model (AIRM)

Input: opportunities (e.g., changes in demand/water use, flow targets, infrastructure changes, land use and landscape change, changes in climate, etc.) and expertise.



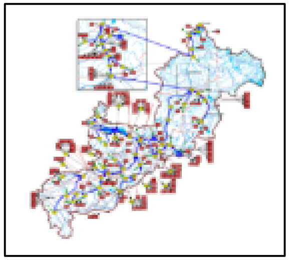
Output: future daily precipitation and air temperature

ALCES

Outputs: changes in landscape composition from various scenarios

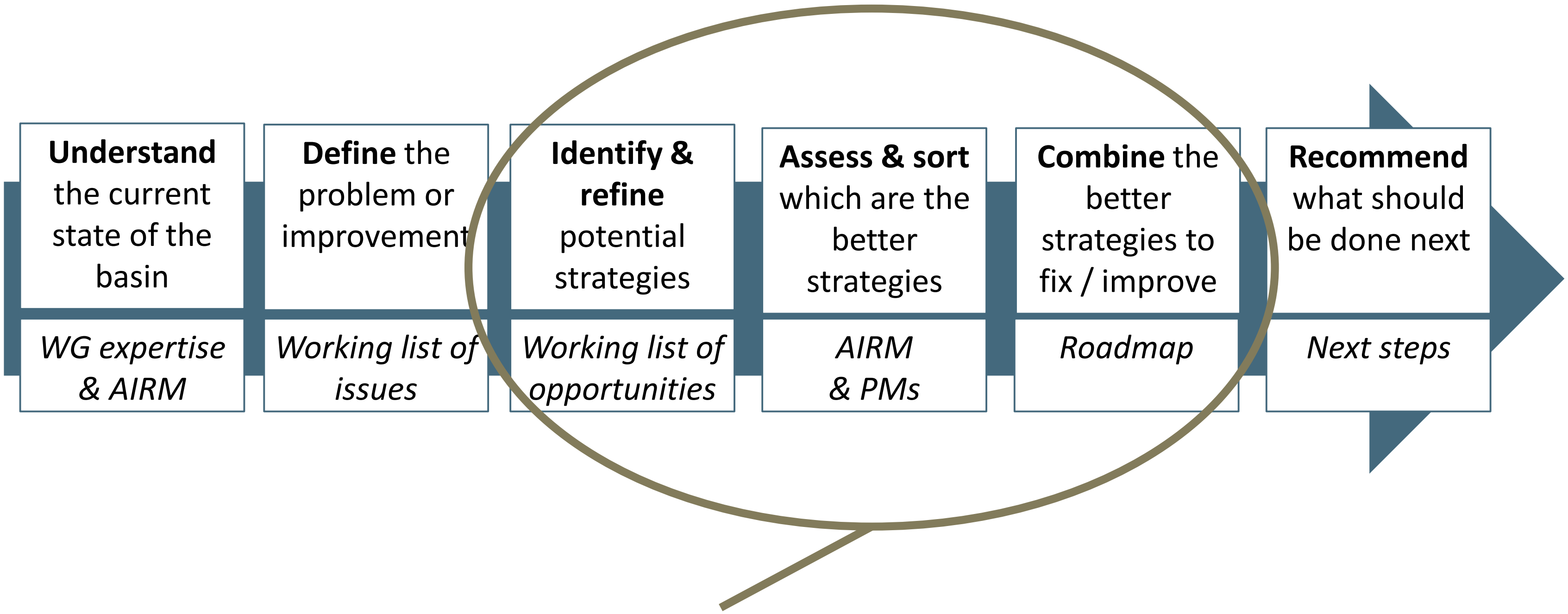
Raven

Outputs: changes to streamflow based on changes to climate and landscape, changes in snowpack, soil moisture, etc.



Outputs: Changes to streamflow and PMs that show effects of strategies on the system

Collaborative process to develop the ARB Roadmap



Identify, refine, assess and sort strategies:

Under current basin conditions

\+

Under potential basin conditions ("stress tests")

- More challenging conditions than today
- Based on plausible science and/or projections
- Useful for assessing performance of strategies

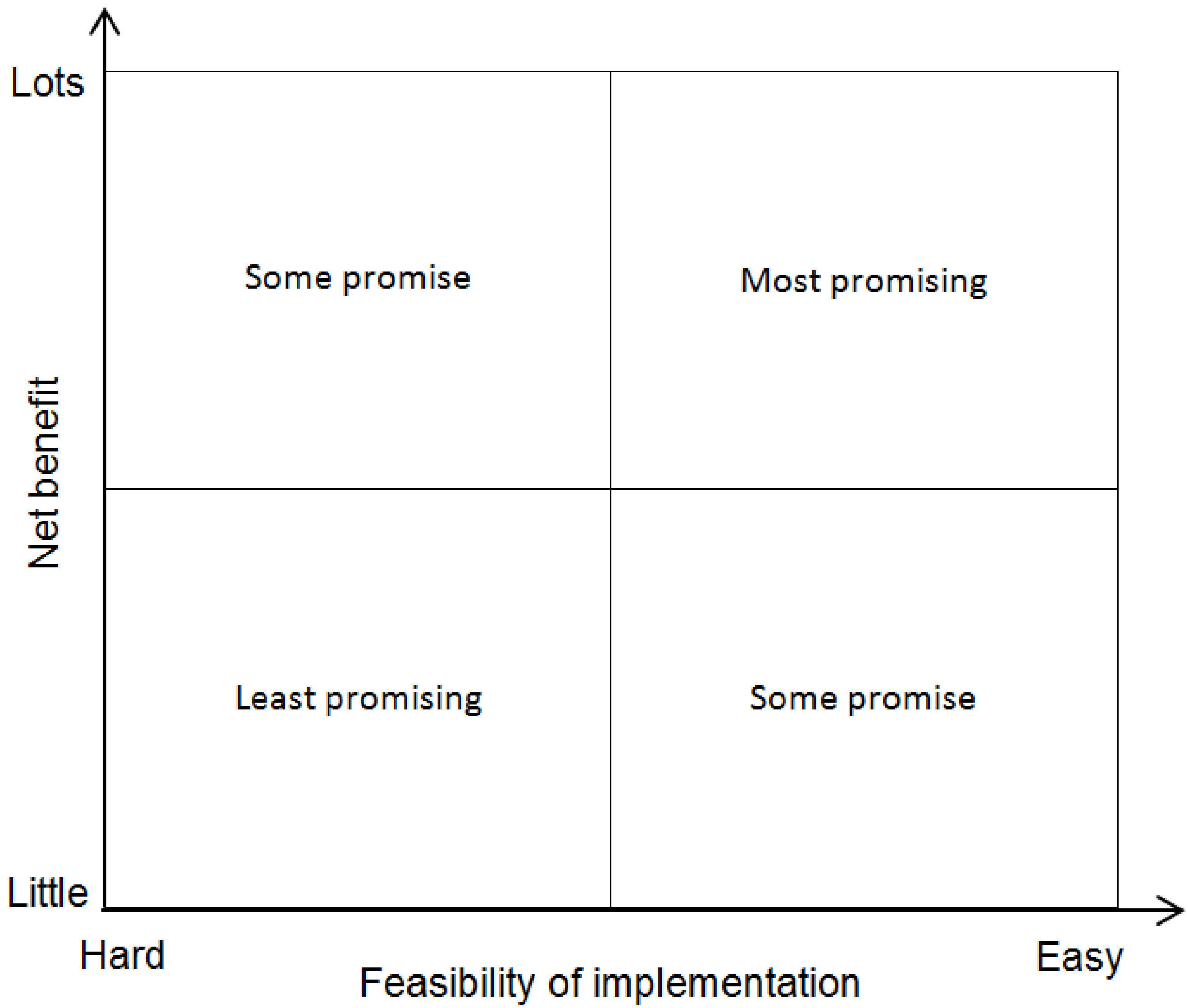
Goal for this work is a Roadmap for sustainable water management in the ARB

A Roadmap is:

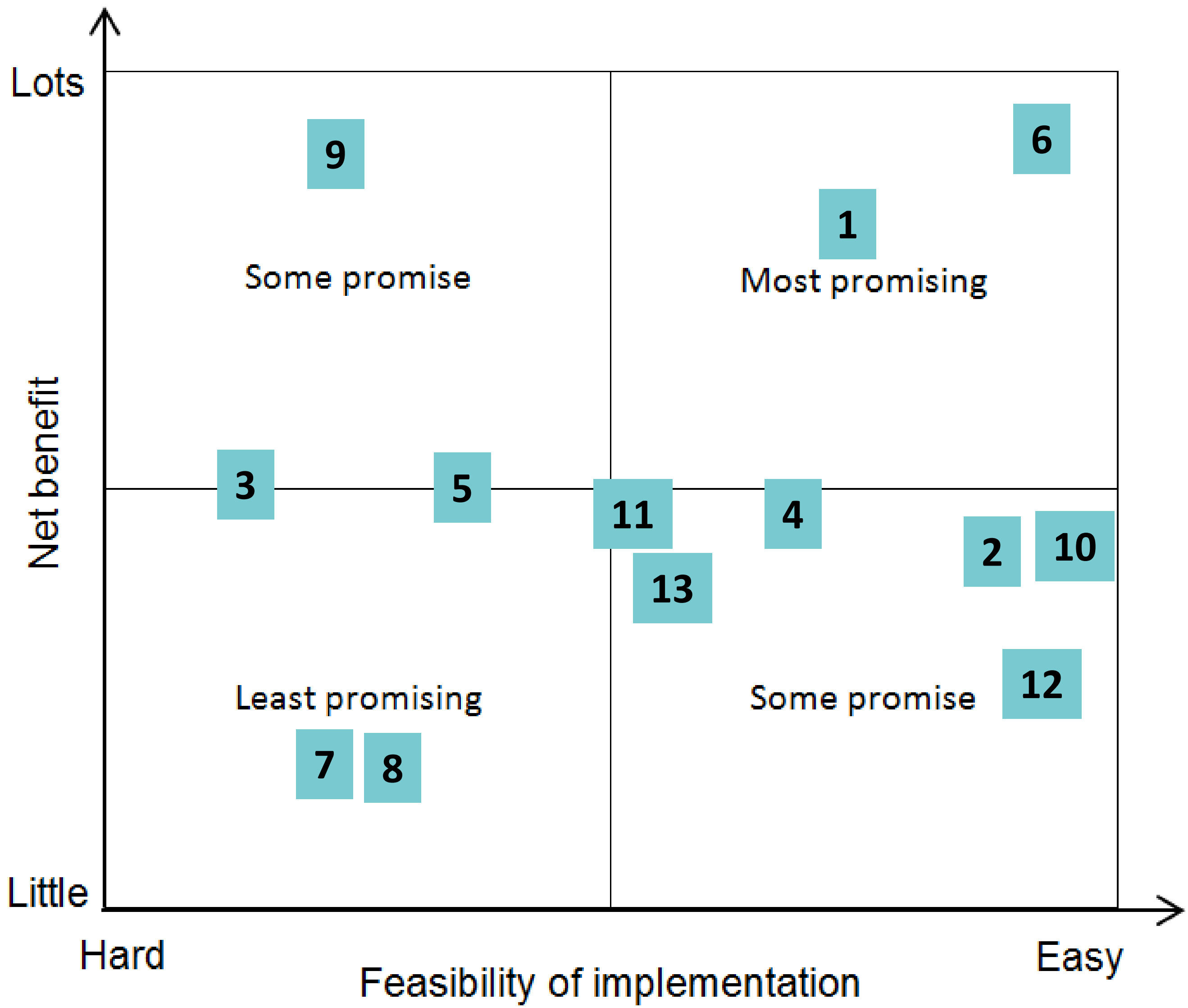
- a set of strategies with practical actions
- developed by an inclusive basin-wide working group using collaborative modelling and dialogue
- a recommended or potential path toward sustainable water management in a basin
- intended to inform future planning and management efforts as they relate to water

- **Screens** and **sorts** strategies; does not prioritize projects
- Identifies **gaps** and **recommends next steps**; does not layout an Implementation Plan
- Reflective of **collaborative findings**; not Consultation or a decision making body
- A **guiding** document; not a basin Plan

Matrix – most promising, some promise, least promising



Matrix – most promising, some promise, least promising



Current strategies for sustainable water management in the ARB

1. **Effluent reuse-** Enable reuse of industrial or municipal effluent to reduce reliance on freshwater
2. **Water conservation-** Continue to achieve water conservation and efficiency improvements with regional development
3. **On-stream storage-** Explore new on-stream multi-purpose storage options
4. **Off-stream storage-** Develop new off-stream storage sites to meet multiple basin water management objectives
5. **Existing infrastructure**- Alter existing water storage infrastructure and operations to meet multiple basin water management objectives
6. **Environmental flows-** Establish IFNs for all tributaries in the basin as a precautionary water management measure
7. **Navigational flows-** Implement minimum flows to improve navigation in the lower Athabasca basin
8. **Oil sands returns-** Treat and release oil sands process water
9. **Land conservation-** Increase the quantity and improve the condition of conserved and restored land across the basin
10. **Forestry practices-** Support practices in Forest Management Agreements (FMAs) that minimize hydrologic change
11. **Wetlands-** Avoid further wetland loss and promote more wetland restoration
12. **Linear connectivity-** Reclaim linear features and reduce future linear disturbances in watershed
13. **Oil sands mining reclamation-** Continue to set and meet high standards of reclamation of energy footprint to maintain or improve hydrological functions in a watershed

Numbering does not indicate a priority or ranking of the strategies. Numbering is only there for referencing purposes

Reminders for today

We want to hear all perspectives on each strategy, not draw a consensus on each.

All comments and opinions will be captured. Diverse and dissenting opinions will be captured and included (without attribution).

There is a lot to get through today, we will have regular breaks, and will need to stay on time allow time for discussion on each strategy.

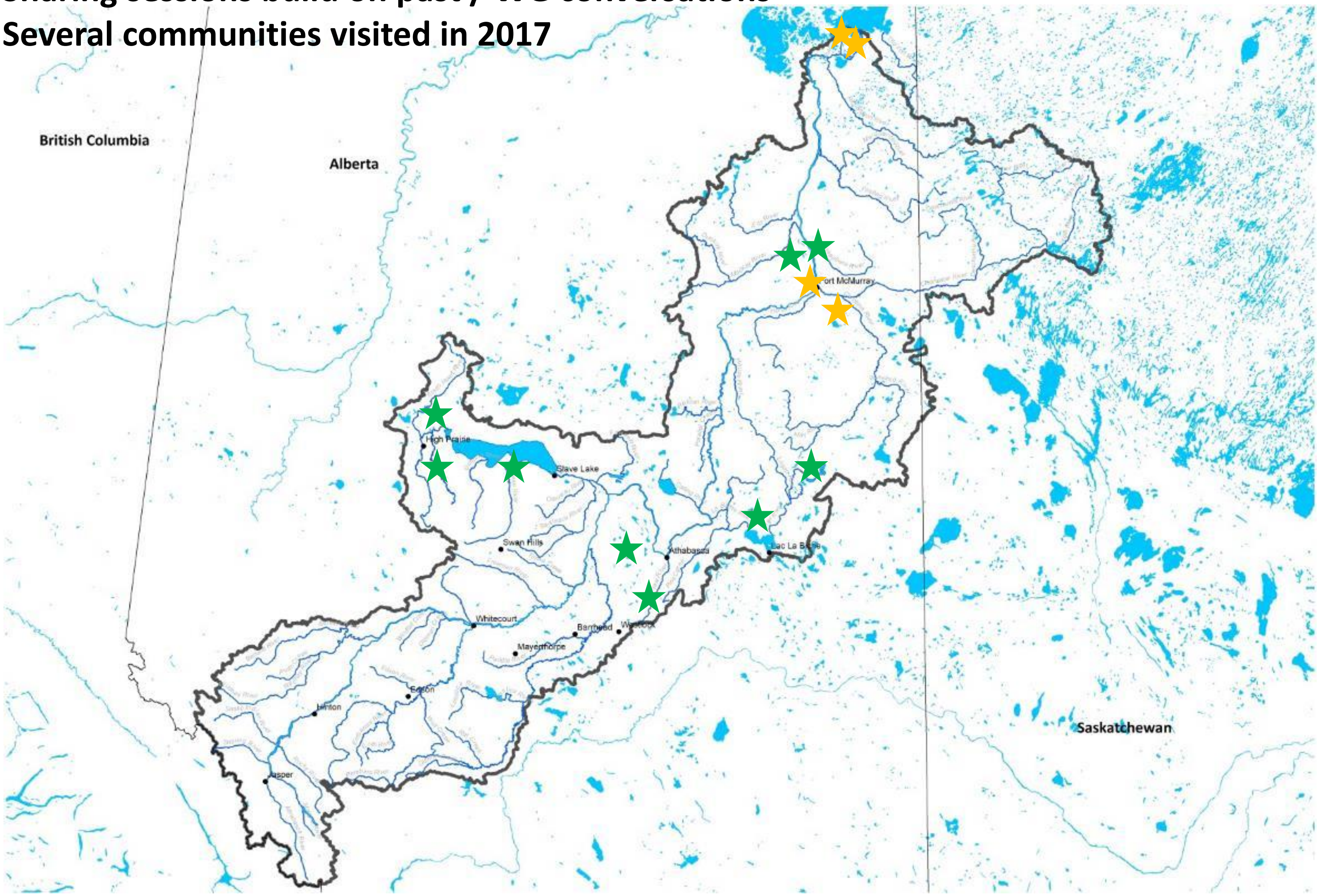
Feedback also accepted in writing today or via email before Feb 5th.

Today's discussion

9:00	Welcome, introductions, and opening remarks	Mike
9:20	**Indigenous Sharing Sessions update: key messages that we heard and information to help our thinking on today's discussions**	**Denise**
9:30	Plenary session 1: strategies 1-3: • Review key points for each strategy • Identify actions and enabling conditions • Confirm strategies as most, least, or some promise • Document additional comments	All
10:30	Break	All
10:45	Plenary session 2: strategies 4-7	All
12:10	Lunch	-
12:50	Plenary session 3: strategies 8-11	All
2:15	Break	All
2:30	Plenary session 4: strategies 12-13	All
3:10	Plenary session 5: gaps identified in water management data, processes and policies • Identify, review and confirm gaps • Identification of critical path gaps	All
3:40	Next steps, and close	Mike

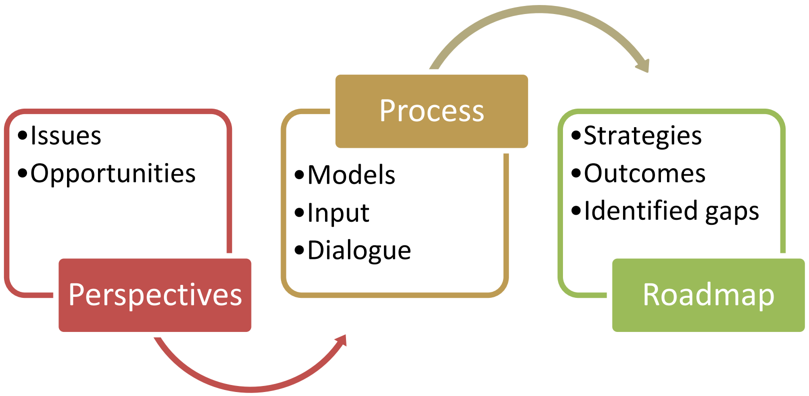
In-community and focused sessions

- **In-community meetings at the outset of the ARB Initiative**
- **Sharing sessions build on past / WG conversations**
- **Several communities visited in 2017**



Sharing sessions: purpose

- Create dialogue to share perspectives on water challenges and concerns
- Supplement, clarify and confirm information previously gathered on water-related issues
- Increase ability to formulate strategies that align with working group and reflect community-scale interests
- Identify gaps for Roadmap outcomes and recommendations, and inform future and potential water and watershed planning approaches



Sharing sessions: what we heard

- Greatest concerns are water quality, ecosystem health, water quantity
- Gaps in information / community understanding regarding
  - changes in water and land environment
  - changes in lake levels
  - fishery and wildlife health
- Some community-based monitoring currently in place
  - in partnership with private companies (e.g., consulting firms and oil and gas companies)
  - creates more trust in data and information sharing

Sharing sessions: areas of concern

Navigation and transportation disruption (quantity)

- adequate water levels for water course transportation
- winter road disruption (flooded/melted) due to released reservoir water –and potentially under warmer, wetter conditions
- can impact access to food and supplies

Access to clean drinking water (quality)

- external source water supply transported into communities
- lack of trust in water supply for consumption (e.g., Fort Chipewyan: cancer amongst community perceived to be linked to water)

Fishing and trapping losses (ecosystem)

- species loss or absence of insects, birds, fish
- commercial fishery closure
- game organ meats unsafe for consumption

Sharing sessions: informing strategies

Taking sharing session outcomes forward:

- Water quality, ecosystem health, water quantity
- Strategies for navigation, instream flow needs for fish habitat and water quality improvement (DO and temp)
- Actions to support expansion of community-based monitoring, stream gauge stations network
- Gaps in data and information were identified and needed for better water-related decisions

Photo Credit: Denise Di Santo

Today's discussion

9:00	Welcome, introductions, and opening remarks	Mike
9:20	Indigenous Sharing Sessions update: key messages that we heard and information to help our thinking on today's discussions	Denise
9:30	**Plenary session 1: strategies 1-3:** • **Review key points for each strategy** • **Identify actions and enabling conditions** • **Confirm strategies as most, least, or some promise** • **Document additional comments**	**All**
10:30	Break	All
10:45	Plenary session 2: strategies 4-7	All
12:10	Lunch	-
12:50	Plenary session 3: strategies 8-11	All
2:15	Break	All
2:30	Plenary session 4: strategies 12-13	All
3:10	Plenary session 5: gaps identified in water management data, processes and policies • Identify, review and confirm gaps • Identification of critical path gaps	All
3:40	Next steps, and close	Mike

Mechanics of today's plenaries

Draft strategy summaries document was sent out January 11th

Today's summary slides will provide a brief overview of each strategy, including:

- Description of strategy
- What was modelled
- Summary table of modelling results
- Net benefits and feasibility of implementation

Summary table of results will provide the overall PM model results for each strategy

- First column- describes the PM
- Second column- results of the strategy relative to base case under the dry condition
- Third column- results of the strategy relative to the base case under the historical condition
- Last column- results of the strategy relative to the base case under the wet condition
- Don't compare the columns

We hope today's discussion will focus on:

- Confirming each strategy as most, least, or some promise
- Identifying actions and enabling conditions to advance each strategy
- Documenting any additional comments or perspectives

Danielle will take notes and keep us on time - we commit to touch on each strategy today

Strategy overview: Effluent reuse

Enable reuse of industrial or municipal effluent to reduce reliance on freshwater

Take return flows (treated effluent) from industrial, municipal, or commercial operations and reuse that water for other industrial purposes. This would support development in areas without withdrawing additional freshwater, while also reducing treated effluent release back into the river.

Examples of this strategy:

- Alberta Newsprint Company treating effluent for reuse in hydraulic fracturing in the Athabasca and Peace basins.
- The Regional Municipality of Wood Buffalo is looking into the option of sending treated waste water to industrial users.

Potential benefits

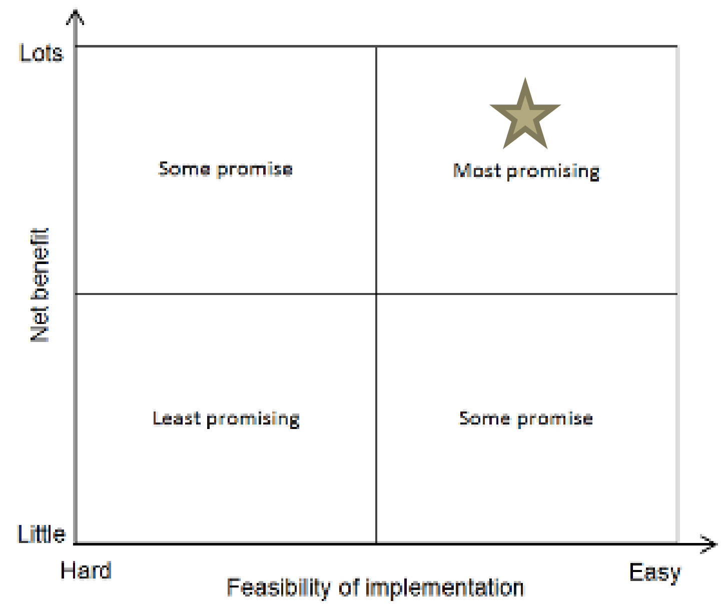
- Increased flows (reduced IFN violations)
- Reduced withdrawals
- Possible improvement in water quality
- Reduced truck traffic in riparian areas

Key modelling results and discussion: Effluent reuse

Period and Location	_Dry_Reuse	_Hist_Reuse	_Wet_Reuse
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	0.0 Days	0.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	-24.0 Days	-5.0 Days	-1.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	-88.0 Days	-33.0 Days	-19.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	1.59%	1.40%	0.63%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.02%	0.01%	0.02%
Spring - at the Mouth	0.02%	0.00%	0.00%
Fall - at the Mouth	0.03%	0.02%	0.03%
Winter - at the Mouth	0.34%	0.02%	0.03%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.0 m^3/s	-0.0 m3/s	0.0 m3/s
Winter - whole system	-0.35 m3/s	0.0 m3/s	-0.02 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Effluent reuse

This strategy was identified as a **most promising strategy**.



Net Benefit

- Slight increases in flows (reduced freshwater withdrawals)
- Reduction of IFN violations
- Limited impact on flow at a basin scale but has visible benefits on smaller rivers and possible benefits to water quality

Feasibility of implementation

- High infrastructure costs if central storage
- More feasible to implement at the local level with a network of smaller storage facilities
- Quality of the water for reuse needs to match it's end use.
- A water reuse policy under development for the province; therefore, implementation of this strategy may be more feasible upon completion and release of that policy.

Strategy overview: Water conservation

Continue to achieve water conservation and efficiency improvements

Promote conservation and efficiency practices for municipal, industrial, and commercial water use; supporting future regional development without increasing demand for fresh water.

Examples of this strategy:

- Steam Assisted Gravity Drainage (SAGD) recycling targets and water intensity targets
- Water metering, stormwater collection and use, lawn watering restrictions, and low-flush or low-flow plumbing fixtures as part of water conservation and efficiency programs

Potential benefits

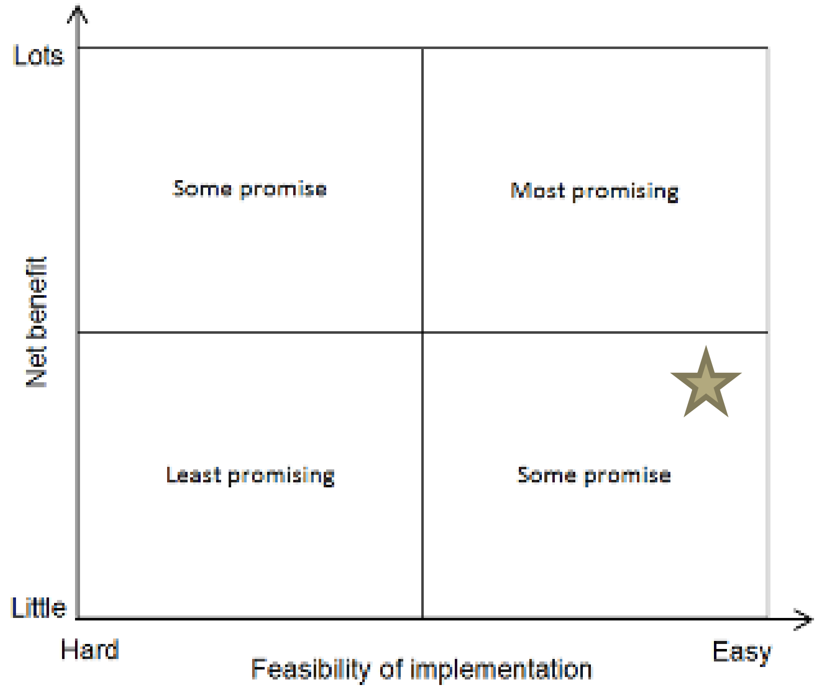
- Decreased withdrawals
- Increased return flows
- Increased flows
- Improved or maintained aquatic health

Key modelling results and discussion: Water conservation

Period and Location	Dry – Water conservation	Historic – Water conservation	Wet – Water conservation
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	1.0 Days	0.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	2.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	-3.0 Days	0.0 Days	-2.0 Days
Annual - Mouth of the McLeod River	-54.0 Days	-20.0 Days	-17.0 Days
Annual - Mouth of the Clearwater River	-20.0 Days	-3.0 Days	-3.0 Days
Annual - Mouth of the Lesser Slave river	-40.0 Days	-34.0 Days	-48.0 Days
Annual - Mouth of the Pembina River	-8.0 Days	-6.0 Days	-5.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	-7.62%	-7.50%	-7.62%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.10%	0.05%	0.07%
Spring - at the Mouth	0.16%	0.08%	0.08%
Fall - at the Mouth	0.13%	0.06%	0.09%
Winter - at the Mouth	0.25%	0.17%	0.20%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.88 m3/s	-0.01 m3/s	-0.02 m3/s
Winter - whole system	-3.21 m3/s	-0.0 m3/s	-0.06 m3/s
Fall - whole system	-0.02 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Water conservation

This strategy was identified as having **some promise**.



Net Benefit

- Yielded moderate net benefits for the basin
- Increased walleye recruitment
- Reduced shortages
- Reduction in IFN violations

Feasibility of implementation

- Socially feasible
- Much is already being done to advance water conservation goals
- Some sectors have conservation targets that exceed 10%
- Overall, this strategy was noted to be highly feasible
- Effective education, outreach, and awareness are big factors in the success of the strategy

Strategy overview: On-stream storage

Explore new on-stream multi-purpose storage options

Provide on-stream storage options within the ARB and understand how storage infrastructure can affect the timing of flows in the basin and serve multiple purposes.

Examples of this strategy:

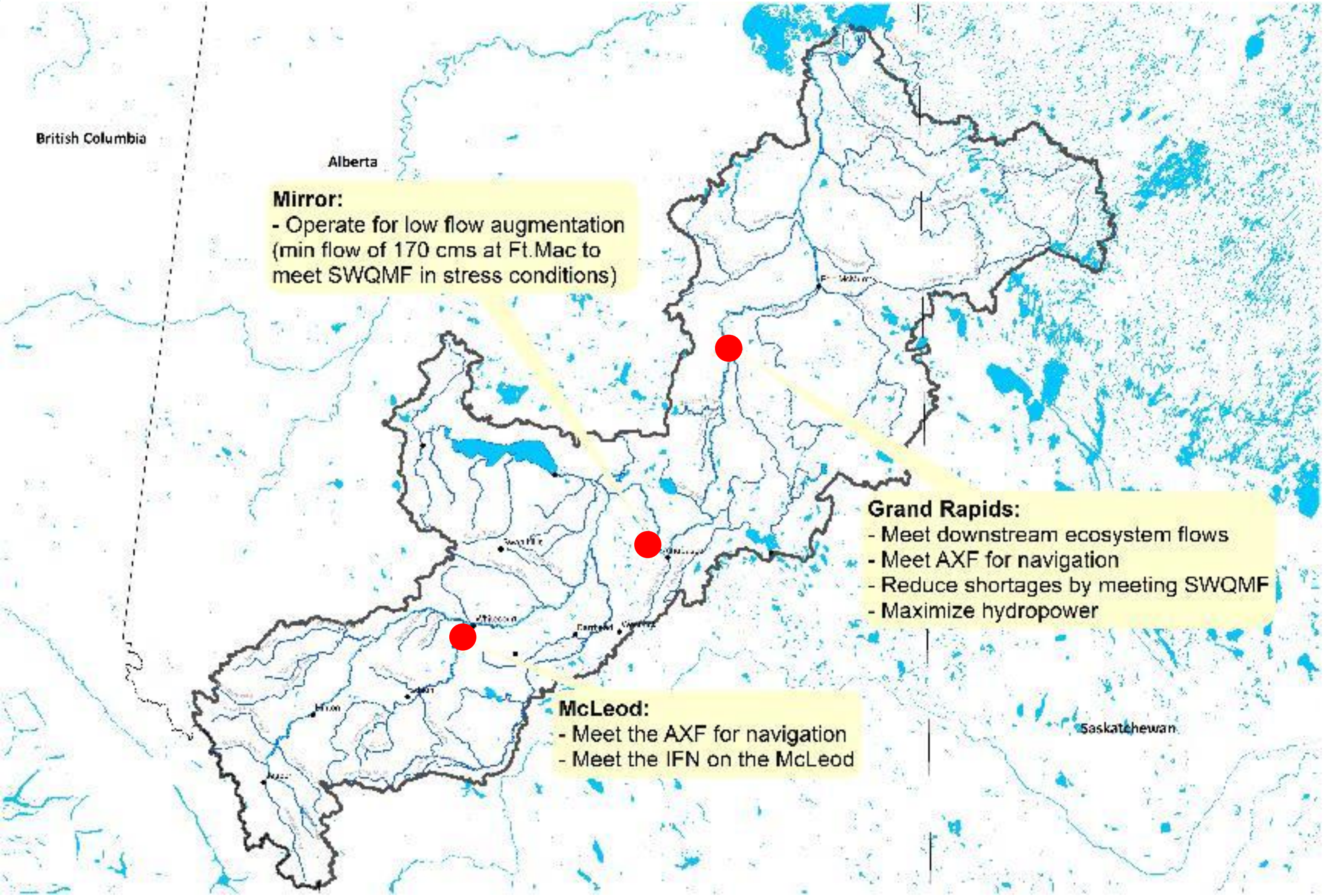
- Onstream tributary, onstream mainstem, and onstream mainstem downstream were all simulated for this strategy

Potential benefits

While acknowledging the many trade-offs that exist, benefits include:

- Storage for flow augmentation (e.g., flows for aquatic health, riparian health, and/or navigation)
- Water supply for licensed demands
- Flood mitigation
- Hydropower generation as a renewable energy source

Strategy overview: On-stream storage



Key modelling results and discussion: On-stream storage tributary (multipurpose storage)

Period and Location	Dry - McLeod	Historic - McLeod	Wet - McLeod
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	43.0 Days	59.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-2.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	-1904.0 Days	-1701.0 Days	-1640.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.38%	2.54%	0.05%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.26%	0.37%	0.68%
Spring - at the Mouth	1.16%	1.10%	0.77%
Fall - at the Mouth	0.25%	0.66%	0.56%
Winter - at the Mouth	0.35%	0.32%	0.65%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.01 m3/s	-0.0 m3/s	0.0 m3/s
Winter - whole system	-0.0 m3/s	0.0 m3/s	-0.01 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: On-stream storage tributary (hydro)

Period and Location	Dry – McLeod hydro	Historic – McLeod hydro	Wet – McLeod hydro
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	1.0 Days	1.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-1.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	15.0 Days	-7.0 Days	32.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	6.67%	13.75%	6.67%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	-0.77%	-0.69%	-0.55%
Spring - at the Mouth	1.11%	0.99%	0.61%
Fall - at the Mouth	0.00%	0.00%	0.00%
Winter - at the Mouth	0.00%	0.00%	0.00%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Winter - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: On-stream storage mainstem (multipurpose storage)

Period and Location	Dry - Mirror	Historic - Mirror	Wet - Mirror
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	-28.0 Days	-4.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-3.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	107.54%	211.42%	106.98%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	-11.52%	-13.42%	-7.95%
Spring - at the Mouth	20.49%	16.95%	0.41%
Fall - at the Mouth	8.53%	8.43%	6.16%
Winter - at the Mouth	50.03%	29.01%	6.66%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.79 m3/s	-0.0 m3/s	0.0 m3/s
Winter - whole system	-2.98 m3/s	0.0 m3/s	-0.02 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: On-stream storage mainstem (hydro)

Period and Location	Dry – Mirror hydro	Historic – Mirror hydro	Wet – Mirror hydro
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	2.0 Days	2.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-1.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	8.25%	16.88%	8.25%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	-2.57%	-2.93%	-1.54%
Spring - at the Mouth	1.03%	1.08%	0.85%
Fall - at the Mouth	0.00%	0.00%	0.00%
Winter - at the Mouth	-1.06%	-1.02%	-1.04%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Winter - whole system	0.24 m3/s	0.01 m3/s	0.24 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: On-stream storage mainstem downstream (multipurpose storage)

Period and Location	Dry – Grand Rapids	Historic – Grand Rapids	Wet – Grand Rapids
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	43.0 Days	59.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-1.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	14.85%	10.96%	4.44%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	-1.79%	-1.44%	-1.22%
Spring - at the Mouth	16.18%	4.48%	1.17%
Fall - at the Mouth	0.00%	-0.02%	0.00%
Winter - at the Mouth	75.90%	0.00%	0.04%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.79 m3/s	-0.0 m3/s	0.0 m3/s
Winter - whole system	-2.94 m3/s	0.0 m3/s	-0.02 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: On-stream storage mainstem downstream (hydro)

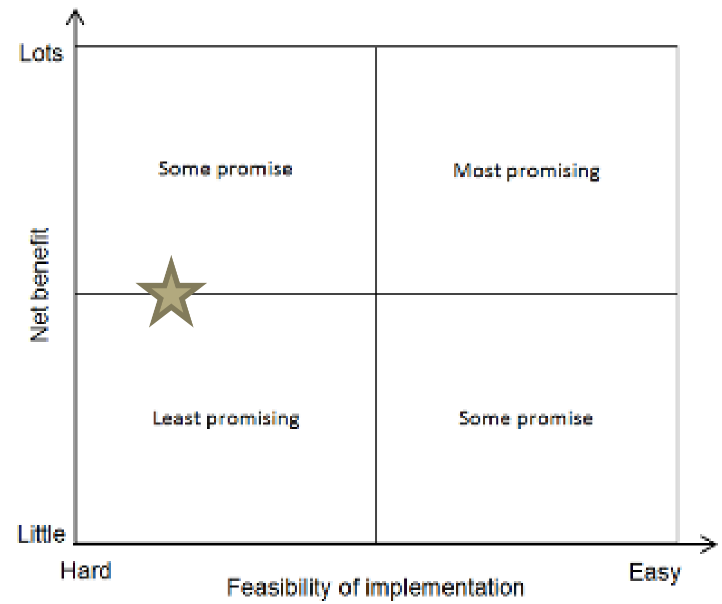
Period and Location	Dry - Grand Rapids hydro	Historic – Grand Rapids hydro	Wet – Grand Rapids hydro
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	1.0 Days	0.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-1.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	4.44%	9.38%	4.44%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	-1.79%	-1.44%	-1.22%
Spring - at the Mouth	3.31%	2.99%	1.17%
Fall - at the Mouth	0.00%	0.00%	0.00%
Winter - at the Mouth	0.00%	0.00%	0.00%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.02 m3/s	-0.0 m3/s	0.0 m3/s
Winter - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: On-stream storage

This strategy was identified as a **some/least promising** strategy.

Net Benefit

- Benefits to the basin that come through a change in the natural flow regime
- Potential for significant changes in meeting IFNs, the AXF, and reducing shortages and downstream flooding
- Potential for significant negative impact on Walleye recruitment
- Potential for beneficial flow augmentation depending on operation and climatic conditions



Feasibility of implementation

- Deemed low feasibility (contingent on site selection, feasibility studies, EAs, adequate engagement, and adequate financial support)
- Substantial costs to build large storage infrastructure as well as numerous feasibility studies and impact assessments
- Environmental concerns surrounding flows to the Peace-Athabasca Delta, sediment transport, fish health and migration, and ice-jamming
- Acceptance of large dams on rivers can be socially challenging

Today's discussion

9:00	Welcome, introductions, and opening remarks	Mike
9:20	Indigenous Sharing Sessions update: key messages that we heard and information to help our thinking on today's discussions	Denise
9:30	Plenary session 1: strategies 1-3: • Review key points for each strategy • Identify actions and enabling conditions • Confirm strategies as most, least, or some promise • Document additional comments	All
10:30	Break	All
10:45	**Plenary session 2: strategies 4-7**	**All**
12:10	Lunch	-
12:50	Plenary session 3: strategies 8-11	All
2:15	Break	All
2:30	Plenary session 4: strategies 12-13	All
3:10	Plenary session 5: gaps identified in water management data, processes and policies • Identify, review and confirm gaps • Identification of critical path gaps	All
3:40	Next steps, and close	Mike

Strategy overview: Off-stream storage

Develop new off-stream storage sites to meet multiple basin water management objectives

Develop new off stream storage sites to meet multiple basin water management objectives such as enhancing industrial water supply, flow regulation for aquatic health, improved riparian health, navigation, and hydropower.

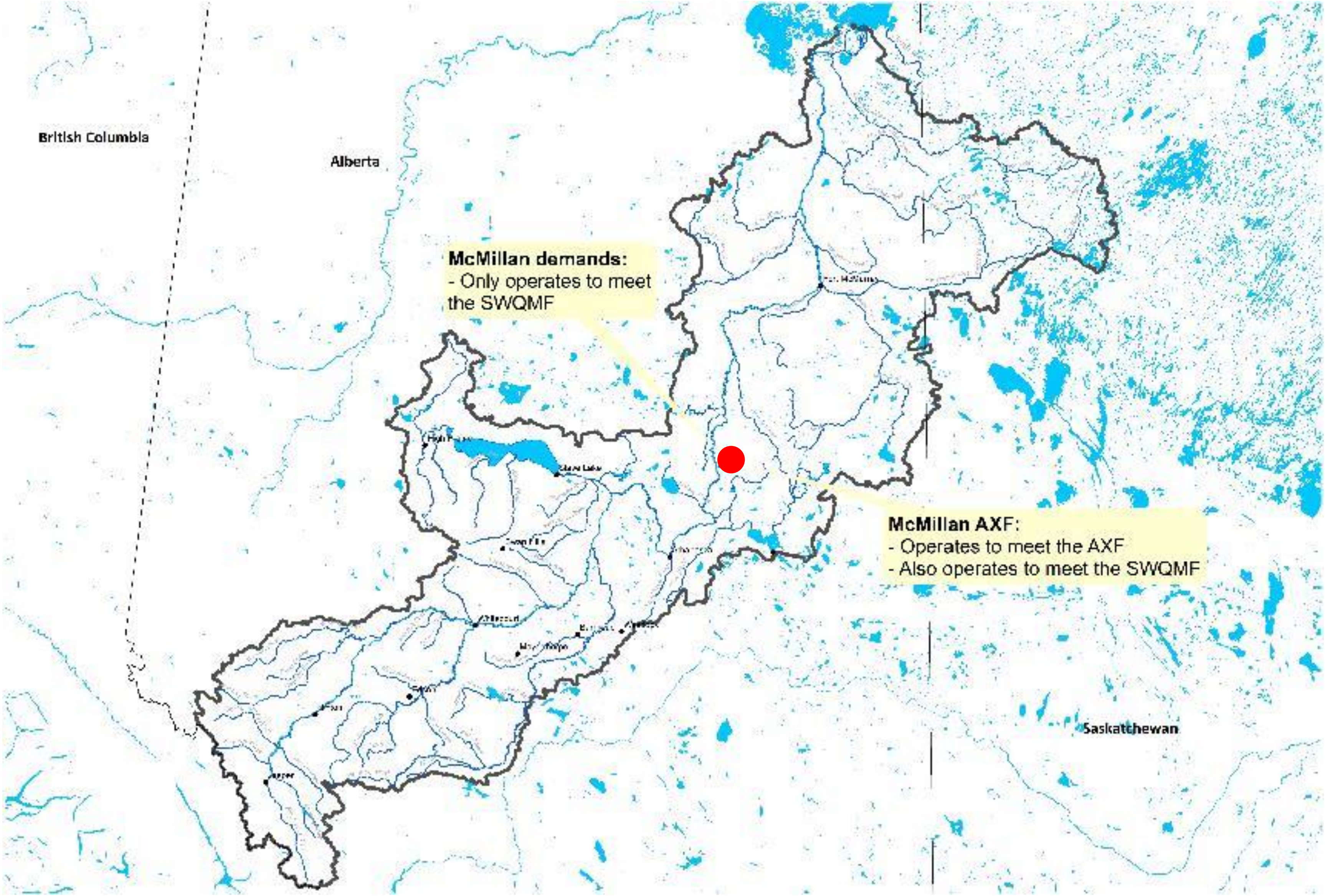
Examples of this strategy:

- There are currently no examples of large off-stream storage in the ARB used to meet multiple basin water management objectives

Potential benefits

- Augmented low flows for aquatic health and riparian health
- Increased water supply for licensed demands
- Decreased shortages
- Improved downstream navigation
- Hydropower generation

Strategy overview: Off-stream storage



Key modelling results and discussion: Off-stream storage (SWQMF)

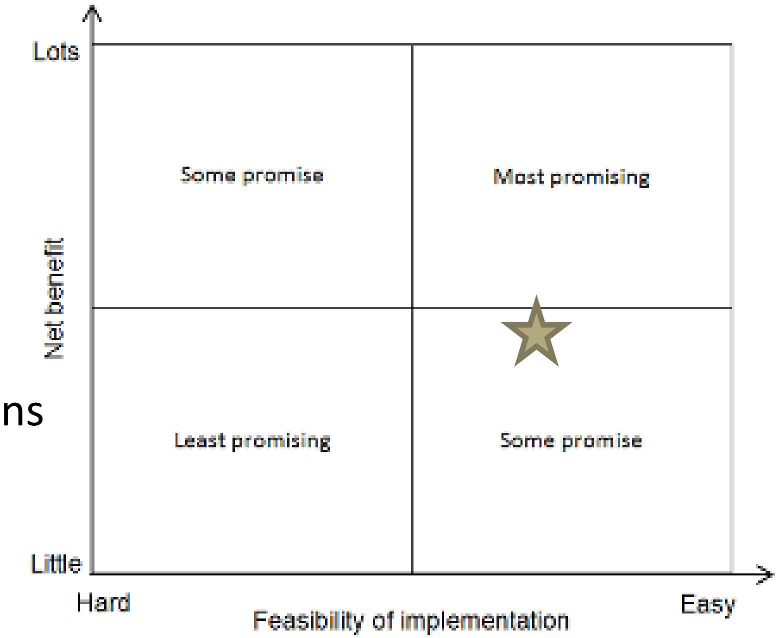
Period and Location	Dry – McMillan demands	Historic – McMillan demands	Wet – McMillan demands
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	-8.0 Days	0.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.00%	0.00%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.00%	0.00%	0.00%
Spring - at the Mouth	-13.45%	0.00%	0.00%
Fall - at the Mouth	0.00%	0.00%	0.00%
Winter - at the Mouth	36.91%	0.00%	0.04%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.13 m3/s	0.0 m3/s	0.0 m3/s
Winter - whole system	-2.09 m3/s	0.0 m3/s	-0.02 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: Off-stream storage (water use for AXF)

Period and Location	Dry – McMillan AXF	Historic – McMillan AXF	Wet – McMillan AXF
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	32.0 Days	51.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.96%	1.17%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.00%	0.00%	0.00%
Spring - at the Mouth	-12.45%	1.02%	0.00%
Fall - at the Mouth	0.03%	0.49%	0.00%
Winter - at the Mouth	36.91%	0.01%	0.04%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.14 m3/s	-0.0 m3/s	0.0 m3/s
Winter - whole system	-2.09 m3/s	0.0 m3/s	-0.02 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Off-stream storage

This strategy was identified as having **some promise**.



Net Benefit

- Low to moderate net benefits for the basin
- Increase in meeting the AXF and SWQMF
- Significant changes in winter streamflow
- Potential for beneficial flow augmentation depending on operation and climatic conditions

Feasibility of implementation

- Moderately feasible to implement as it is off-stream compared to on-stream
- Moderately expensive undertaking relative to some of the more passive strategies considered through this Initiative
- An Environmental Assessment would help to identify any negative consequences to the environment or Indigenous values in the area

Strategy overview: Existing infrastructure

Alter existing water storage infrastructure and/or operations to meet multiple basin water management objectives

Alter operations on the Paddle River Dam and alter the weir infrastructure on Lesser Slave Lake. These modifications would help meet multiple objectives in the basin, including storage for flow augmentation, licence use, flood mitigation, and restoring natural flow regimes downstream.

Examples of this strategy:

- Paddle River Dam, which is currently used for flood control and recreation
- Weir on Lesser Slave Lake, which is currently used to reduce fluctuating lake levels and diminish flood risk

Potential benefits

- Increased storage for flow augmentation
- Increased capacity for flood mitigation
- Increased water supply for licensed demands
- Restored natural flow variability downstream

Key modelling results and discussion: Existing infrastructure (meeting the SWQMF)

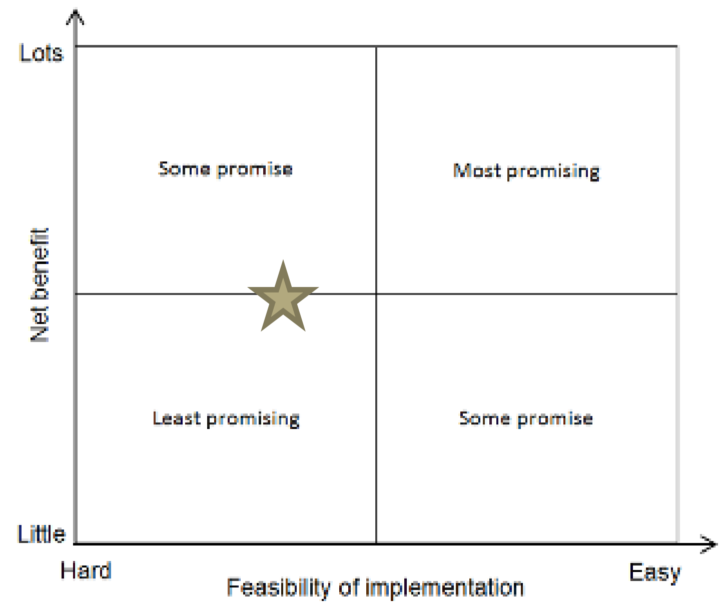
Period and Location	Dry – Existing infrastructure	Historic – Existing infrastructure	Wet – Existing infrastructure
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	-9.0 Days	-4.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	2.0 Days	137.0 Days	502.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-6.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	-606.0 Days	3327.0 Days	1315.0 Days
Annual - Mouth of the Pembina River	55.0 Days	30.0 Days	3.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.00%	0.00%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	-0.74%	0.06%	0.03%
Spring - at the Mouth	-1.02%	-0.14%	-0.18%
Fall - at the Mouth	-0.68%	-0.23%	-0.16%
Winter - at the Mouth	0.08%	-0.40%	-0.62%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.8 m3/s	-0.01 m3/s	-0.0 m3/s
Winter - whole system	-2.93 m3/s	0.0 m3/s	-0.02 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: Existing infrastructure (not meeting the SWQMF)

Period and Location	Dry – Existing infrastructure without SWQMF	Historic – Existing infrastructure without SWQMF	Wet – Existing infrastructure without SWQMF
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	-6.0 Days	-4.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	-1.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	29.0 Days	134.0 Days	495.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-6.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	-262.0 Days	3262.0 Days	1325.0 Days
Annual - Mouth of the Pembina River	55.0 Days	30.0 Days	3.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	-0.12%	-0.06%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.13%	0.06%	0.03%
Spring - at the Mouth	1.21%	0.40%	-0.02%
Fall - at the Mouth	-0.43%	-0.23%	-0.16%
Winter - at the Mouth	0.80%	-0.07%	-0.51%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	14.69 m3/s	5.55 m3/s	0.4 m3/s
Winter - whole system	15.73 m3/s	3.16 m3/s	0.67 m3/s
Fall - whole system	0.02 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Existing infrastructure

This strategy was identified as a **least promising** strategy.



Net Benefit

- Increased flooding hazard at Slave Lake, decreased flooding at Fort McMurray
- Increased IFN violations
- Potentially significant increased shortages
- May not be socially or ecologically feasible

Feasibility of implementation

- Challenging to implement from negative social and recreational impacts associated with a change in water level on Lesser Slave Lake and the Paddle River reservoir
- Proposed operational changes may not be feasible or useful given the small benefit to water shortages that would accrue

Strategy overview: Environmental flows

Establish IFNs for all tributaries in the basin as a precautionary water management measure

Set IFN targets on all tributaries in the basin using the existing Alberta Desktop method. This is intended to proactively manage ecosystem health.

Examples of this strategy:

- The development of the draft Surface Water Allocation Directive (SWAD), which will provide a province-wide, consistent approach to determining water withdrawal applications. This directive is intended to guide establishment of water allocations so that ecosystem health can be maintained.

Potential benefits

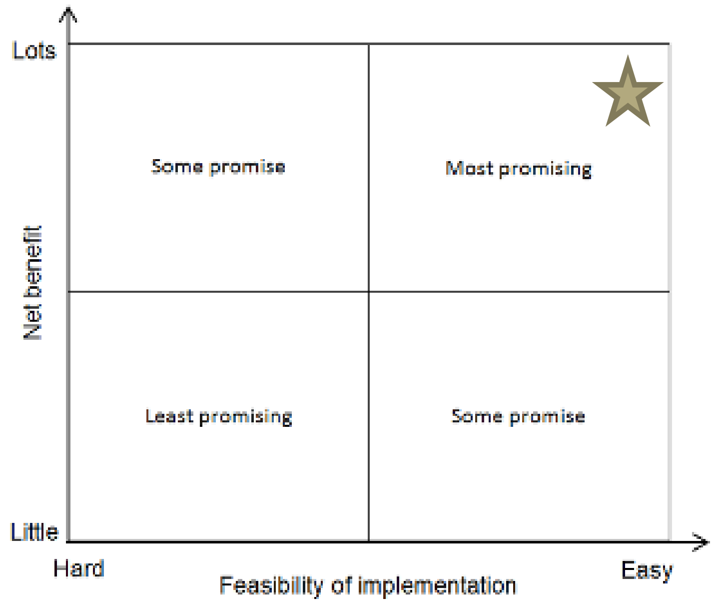
- Increased flows, primarily during low flow periods
- More natural hydrograph
- May support ecosystem health

Key modelling results and discussion: Environmental flows

Period & Location	Dry – Environmental flows	Historic – Environmental flows	Wet – Environmental flows
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	3.0 Days	0.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	-30.0 Days	-16.0 Days	-20.0 Days
Annual - Mouth of the McLeod River	-470.0 Days	-177.0 Days	-156.0 Days
Annual - Mouth of the Clearwater River	-189.0 Days	-37.0 Days	-56.0 Days
Annual - Mouth of the Lesser Slave River	-2661.0 Days	-1481.0 Days	-1953.0 Days
Annual - Mouth of the Pembina River	-577.0 Days	-504.0 Days	-328.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	-13.50%	-7.15%	-7.85%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.70%	0.24%	0.34%
Spring - at the Mouth	1.91%	0.73%	0.69%
Fall - at the Mouth	1.23%	0.31%	0.47%
Winter - at the Mouth	2.48%	1.01%	1.18%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	18.88 m3/s	5.88 m3/s	13.59 m3/s
Winter - whole system	28.38 m3/s	7.09 m3/s	13.66 m3/s
Fall - whole system	23.02 m3/s	5.45 m3/s	10.31 m3/s
Summer - whole system	16.32 m3/s	5.54 m3/s	11.28 m3/s

Screening assessment: Environmental flows

This strategy was identified as a **most promising** strategy.



Net benefit

- Decrease in annual IFN violations
- Increase in walleye recruitment
- Increase in seasonal system shortages

Feasibility of implementation

- The lack of a water management plan may present a challenge with implementation
- The onset of SWAD may make this strategy more feasible to implement
- Need a database of tributaries that have habitat at risk and/or species at risk and limit water allocations, implement IFNs, and/or restrict activities in those areas

Strategy overview: Navigational flows

Implement minimum flows to improve navigation in the lower Athabasca basin

Improve navigation during the open water season on the Athabasca River downstream of the confluence with the Firebag River. The minimum flow is based on the AXF, which is defines a minimum flow of 400 m^3/s between April 16 and October 28th. In this strategy, upstream licence demands are shorted to meet the AXF flow target whenever necessary.

Examples of this strategy:

- Currently there is no established minimum flow for navigational purposes in the ARB

Potential benefits

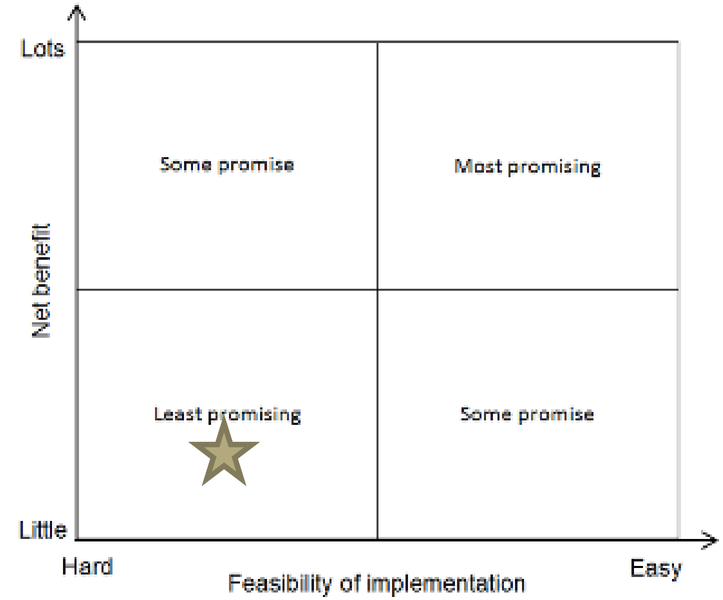
- Increased flows on the Lower Athabasca River
- Improved navigation for cultural and recreational purposes

Key modelling results and discussion: Navigational flows

Period and Location	Dry – Navigational flows	Historic – Navigational flows	Wet – Navigational flows
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	13.0 Days	6.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	-1.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	-10.0 Days	-1.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	-0.29%	-0.48%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.00%	0.00%	0.00%
Spring - at the Mouth	0.03%	0.02%	0.00%
Fall - at the Mouth	0.02%	0.02%	0.00%
Winter - at the Mouth	0.00%	0.00%	0.00%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.67 m3/s	0.45 m3/s	0.0 m3/s
Winter - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Fall - whole system	0.7 m3/s	0.62 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Navigational flows

This strategy was identified as a **least promising** strategy.



Net benefit

- Little benefit for the basin in meeting AXF
- Slightly less IFN violations in dry conditions in Lesser Slave River

Feasibility of implementation

- Requires a greater understanding of navigational needs along different reaches in the Lower Athabasca River, at different temporal scales
- A water management plan that defines minimum flows for optimal and sub-optimal navigation would also be needed for successful implementation
- Involves understanding what constitutes minimum acceptable conditions for navigation as well as optimal conditions
- Difficult to implement as many upstream licences would need to be cut off
- Could be implemented in conjunction with other water management strategies

Today's discussion

9:00	Welcome, introductions, and opening remarks	Mike
9:20	Indigenous Sharing Sessions update: key messages that we heard and information to help our thinking on today's discussions	Denise
9:30	Plenary session 1: strategies 1-3: • Review key points for each strategy • Identify actions and enabling conditions • Confirm strategies as most, least, or some promise • Document additional comments	All
10:30	Break	All
10:45	Plenary session 2: strategies 4-7	All
12:10	Lunch	-
12:50	**Plenary session 3: strategies 8-11**	**All**
2:15	Break	All
2:30	Plenary session 4: strategies 12-13	All
3:10	Plenary session 5: gaps identified in water management data, processes and policies • Identify, review and confirm gaps • Identification of critical path gaps	All
3:40	Next steps, and close	Mike

Strategy overview: Oil sands returns

Treat and release oil sands process water

This strategy assumes water quality guidelines are met, and process water from oil sands operation is treated and released back into the environment. If permitted, the releases should be discharged either during low flow to offset stress on the river or during high flow to optimize dilution and capitalize on the assimilative capacity of the receiving waterbody.

Examples of this strategy:

- No precedent exists for release of oil sands process water into the Athabasca River.

Potential benefits

- Increased streamflow downstream of the release locations
- Reduce tailings volumes stored on the landscape

Key modelling results and discussion: Oil sands returns (at low flows)

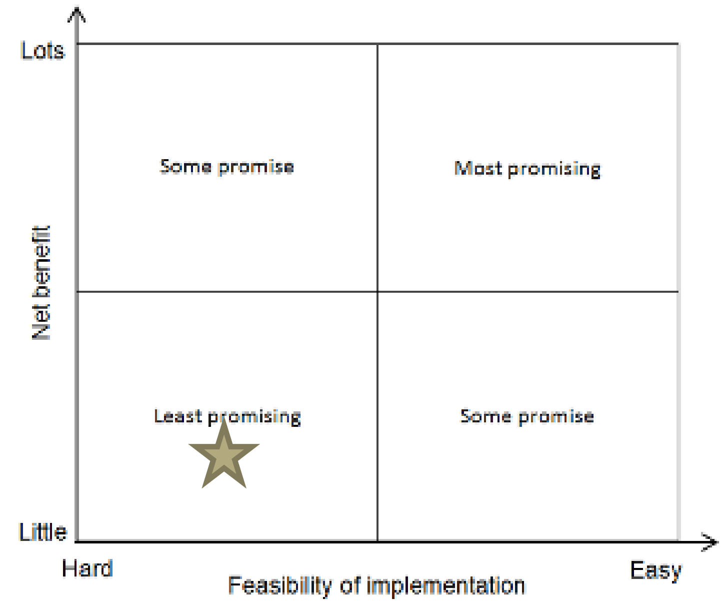
Period and Location	Dry – OS returns (low flow)	Historic – OS returns (low flow)	Wet – OS returns (low flow)
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	0.0 Days	0.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.00%	0.00%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.00%	0.00%	0.00%
Spring - at the Mouth	0.18%	0.16%	0.09%
Fall - at the Mouth	0.00%	0.00%	0.00%
Winter - at the Mouth	0.41%	0.32%	0.23%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Winter - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: Oil sands returns (at high flows)

Period and Location	Dry – OS returns (high flow)	Historic – OS returns (high flow)	Wet – OS returns (high flow)
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	0.0 Days	0.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	-6.56%	-12.92%	-6.56%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.07%	0.04%	0.04%
Spring - at the Mouth	0.02%	0.01%	0.01%
Fall - at the Mouth	0.00%	0.00%	0.00%
Winter - at the Mouth	0.00%	0.00%	0.00%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Winter - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Oil sands returns

This strategy was identified as a **least promising** strategy.



Net benefit

- Little net benefits for the basin
- Slight increase in Walleye recruitment
- Perceived or potential change in water quality downstream of the release locations

Feasibility of implementation

- Currently being examined by an industry and government working group, and COSIA is doing detailed modelling to support the discussion
- Information such as return volumes, specific locations, and temporal release patterns are useful data to further inform this strategy
- The perception around the quality of the treated water is a major concern
- Dependant on technology existing and cost feasibility

Strategy overview: Land conservation

Increase the quantity and improve the condition of conserved and restored land across the basin

Maintain and improve hydrologic function and watershed health by increasing the quantity and improving the condition of conserved and restored land across the basin, particularly in areas of high biodiversity or hydrologic importance.

Examples of this strategy:

- Possible conservations areas include the CPAWS high conservation areas for biodiversity, the CPAWS Net Present Value model areas, the AWA areas of concern, and the DUC key wetland areas

Potential benefits

- Greater infiltration and retention in the soil
- Less ‘flashy’ runoff
- Less flooding
- Higher baseflow
- Improved water quality

Key modelling results and discussion: Land conservation (CPAWS20)

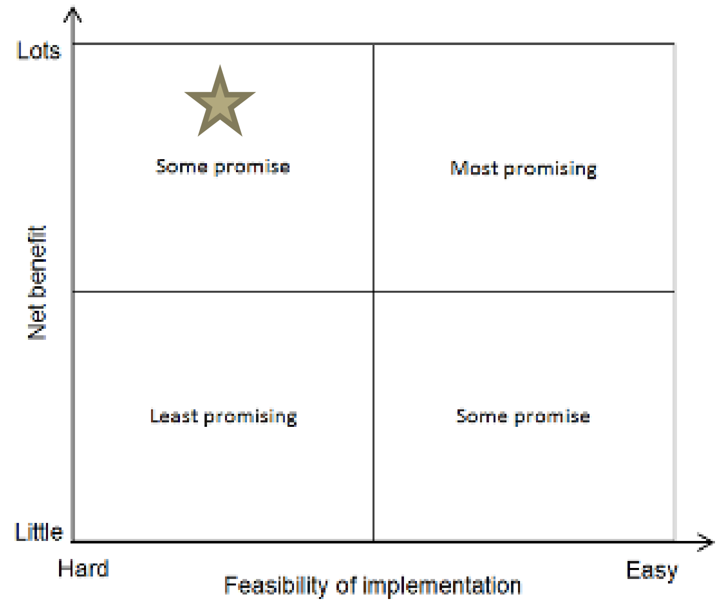
Period and Location	Dry - CPAWS20	Historic - CPAWS20	Wet - CPAWS20
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	-3.0 Days	-3.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	-3.0 Days	1.0 Days
Annual - Lesser Slave River	-1.0 Days	-4.0 Days	-23.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-1.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	94.0 Days	56.0 Days	7.0 Days
Annual - Mouth of the McLeod River	1.0 Days	5.0 Days	5.0 Days
Annual - Mouth of the Clearwater River	311.0 Days	200.0 Days	36.0 Days
Annual - Mouth of the Lesser Slave River	59.0 Days	144.0 Days	118.0 Days
Annual - Mouth of the Pembina River	-73.0 Days	-52.0 Days	-21.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.00%	0.00%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	-0.02%	-0.02%	-0.01%
Spring - at the Mouth	0.05%	-0.04%	-0.01%
Fall - at the Mouth	-0.04%	-0.01%	-0.02%
Winter - at the Mouth	-0.03%	-0.01%	-0.02%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.02 m3/s	0.0 m3/s	0.0 m3/s
Winter - whole system	0.04 m3/s	0.0 m3/s	0.0 m3/s
Fall - whole system	-0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Key modelling results and discussion: Land conservation (CPAWS50)

Period and Location	Dry - CPAWS50	Historic - CPAWS50	Wet - CPAWS50
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	-11.0 Days	-8.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	-1.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	0.0 Days	-3.0 Days	2.0 Days
Annual - Lesser Slave River	-4.0 Days	-22.0 Days	-68.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-5.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	503.0 Days	404.0 Days	407.0 Days
Annual - Mouth of the McLeod River	176.0 Days	128.0 Days	137.0 Days
Annual - Mouth of the Clearwater River	546.0 Days	333.0 Days	153.0 Days
Annual - Mouth of the Lesser Slave River	322.0 Days	601.0 Days	382.0 Days
Annual - Mouth of the Pembina River	-199.0 Days	-160.0 Days	-115.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.00%	0.00%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	-0.14%	-0.05%	-0.09%
Spring - at the Mouth	-0.16%	-0.09%	-0.05%
Fall - at the Mouth	-0.12%	-0.05%	0.01%
Winter - at the Mouth	-0.19%	-0.07%	-0.07%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.04 m3/s	0.0 m3/s	0.0 m3/s
Winter - whole system	0.1 m3/s	0.0 m3/s	0.0 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Land conservation

This strategy was identified as having **some promise**.



Net benefit

- Little net benefits for the basin
- Reduction in flood days
- Significant increase in IFN violations

Feasibility of implementation

- Need to leverage work done in Alberta to identify sites of highest conservation and restoration priority with the greatest positive impact on peatland complexes, tributaries, and hydrological connectivity
- Clear and concise policy should also be developed for management of these areas
- Regular monitoring should be undertaken to evaluate its effectiveness
- Adequate funding needed to support conservation and restoration initiatives

Strategy overview: Forestry practices

Support practices in Forest Management Agreements (FMAs) that minimize hydrologic change

Continue promoting and enforcing timber harvest practices and levels that minimize hydrologic change. Examples of such practices include:

- Timber Supply Review and updates to Annual Allowable Cut
- Minimize Equivalent Clearcut Area
- Enforce riparian reserve zones and management areas

Examples of this strategy:

- FMAs are established
- BMPs are in place

Potential benefits

- Improved water quality (reduction in sediment and nutrient loading)
- Improved riparian and aquatic ecosystem health

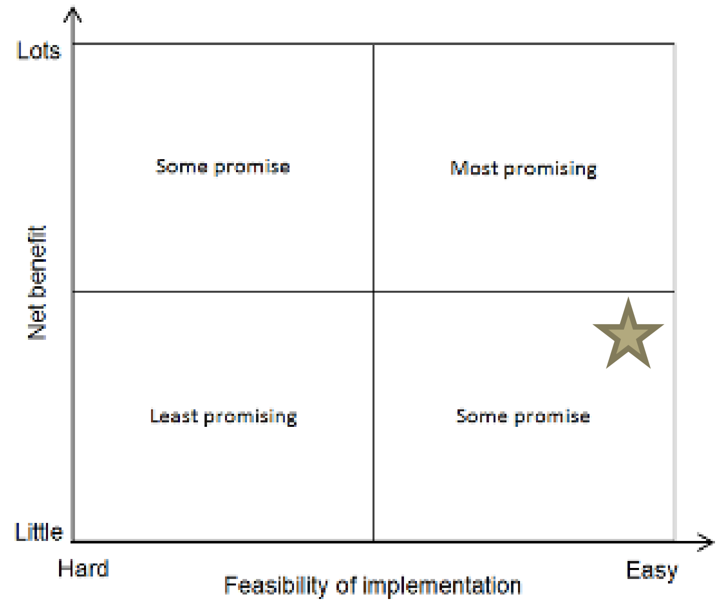
Key modelling results and discussion: Forestry practices

Note that this is modelled as an increase in forest harvest

Period and Location	Dry – Forestry practices	Historic – Forestry practices	Wet – Forestry practices
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	29.0 Days	32.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	1.0 Days	4.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	1.0 Days	0.0 Days
Annual - Athabasca River at Hinton	3.0 Days	19.0 Days	0.0 Days
Annual - Lesser Slave River	43.0 Days	174.0 Days	225.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	1.0 Days	3.0 Days	22.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	-2565.0 Days	-1079.0 Days	-1093.0 Days
Annual - Mouth of the McLeod River	-1140.0 Days	-884.0 Days	-743.0 Days
Annual - Mouth of the Clearwater River	-1109.0 Days	-806.0 Days	-690.0 Days
Annual - Mouth of the Lesser Slave River	-1942.0 Days	-2169.0 Days	-1334.0 Days
Annual - Mouth of the Pembina River	-643.0 Days	-584.0 Days	-405.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.00%	0.00%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.30%	0.16%	0.12%
Spring - at the Mouth	0.39%	0.16%	0.17%
Fall - at the Mouth	0.28%	0.13%	0.18%
Winter - at the Mouth	0.48%	0.22%	0.20%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	-0.11 m3/s	-0.01 m3/s	-0.02 m3/s
Winter - whole system	-0.74 m3/s	0.0 m3/s	-0.03 m3/s
Fall - whole system	-0.03 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Forestry practices

This strategy was identified as having **some promise**.



Net benefit

- Moderate net benefits for the basin
- Increase in flooding at several locations
- Large reduction in IFN violations
- Slight increase in meeting the AXF

Feasibility of implementation

- Improve enforcement of forestry management regulations, though could be done through increased audits and higher fines
- Ensure the widespread use of forestry BMPs
- Incentivize BMPs, broader education, and raise awareness are other means to improve forest management in the ARB

Strategy overview: Wetlands

Avoid further wetland loss and promote more wetland restoration

Avoid wetland loss and promote wetland restoration through the continued refinement, implementation, and enforcement of related legislation, policies, and mechanisms such as the Alberta Wetland Policy. This strategy will maintain or improve the hydrological benefits of wetlands, including groundwater recharge, sustained baseflow, water quality, flow attenuation, and others.

Examples of this strategy:

- Alberta Wetland policy

Potential benefits

- Sustained baseflows
- Improved water quality
- Improved riparian health
- Peak flow attenuation

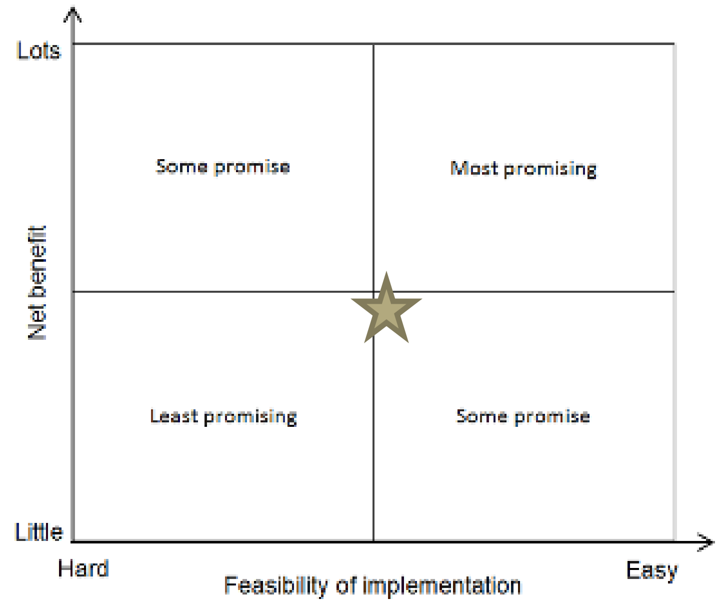
Key modelling results and discussion: Wetlands

Note that this is modelled as a decrease in wetland area

Period and Location	Dry - Wetlands	Historic - Wetlands	Wet - Wetlands
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	N/A	1.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	N/A	0.0 Days	0.0 Days
Annual - McLeod River	N/A	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	N/A	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	N/A	0.0 Days	0.0 Days
Annual - Lesser Slave River	N/A	0.0 Days	-1.0 Days
Annual - Pembina River at Sangudo	N/A	0.0 Days	0.0 Days
Annual - Ft. McMurray	N/A	0.0 Days	0.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	N/A	-721.0 Days	-879.0 Days
Annual - Mouth of the McLeod River	N/A	0.0 Days	8.0 Days
Annual - Mouth of the Clearwater River	N/A	-5.0 Days	-120.0 Days
Annual - Mouth of the Lesser Slave River	N/A	0.0 Days	18.0 Days
Annual - Mouth of the Pembina River	N/A	0.0 Days	-9.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	N/A	0.00%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	N/A	0.01%	0.01%
Spring - at the Mouth	N/A	0.00%	0.00%
Fall - at the Mouth	N/A	0.01%	0.01%
Winter - at the Mouth	N/A	0.01%	0.01%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	N/A	-0.0 m3/s	0.0 m3/s
Winter - whole system	N/A	0.0 m3/s	0.0 m3/s
Fall - whole system	N/A	0.0 m3/s	0.0 m3/s
Summer - whole system	N/A	0.0 m3/s	0.0 m3/s

Screening assessment: Wetlands

This strategy was identified as a strategy having **some promise**.



Net benefit

- Low net benefits for the basin
- Moderate benefits at the local scale
- Reduces IFN violations
- Likely positive benefits to water quality
- Likely positive benefits to baseflow

Feasibility of implementation

- Would be easy if it meant following the Alberta Wetland Policy more rigorously
- Would be challenging if it meant that all wetlands in the ARB must be preserved
- Implement land use planning restrictions to limit residential development and its impacts on lakes and wetlands
- Improve understanding of hydrologically sensitive wetlands
- Additional data and science about how changes in hydrologic connectivity affect water volume are necessary to better inform this strategy.

Today's discussion

9:00	Welcome, introductions, and opening remarks	Mike
9:20	Indigenous Sharing Sessions update: key messages that we heard and information to help our thinking on today's discussions	Denise
9:30	Plenary session 1: strategies 1-3: • Review key points for each strategy • Identify actions and enabling conditions • Confirm strategies as most, least, or some promise • Document additional comments	All
10:30	Break	All
10:45	Plenary session 2: strategies 4-7	All
12:10	Lunch	-
12:50	Plenary session 3: strategies 8-11	All
2:15	Break	All
2:30	**Plenary session 4: strategies 12-13**	**All**
3:10	Plenary session 5: gaps identified in water management data, processes and policies • Identify, review and confirm gaps • Identification of critical path gaps	All
3:40	Next steps, and close	Mike

Strategy overview: Linear connectivity

Reclaim linear features and reduce future linear disturbances in watershed

Reduce the total linear footprint on the landscape through mechanisms such as road and trail deactivation, seismic line reclamation, and restrictions on off-highway vehicle use. Linear features fragment the landscape and have the potential to interrupt hydrologic functions, ultimately affecting streamflow. This strategy reduces this interruption and aims to determine the hydrological impact of linear disturbances in terms of changes to streamflow.

Examples of this strategy:

- Currently this is not a land use planning priority in the ARB

Potential benefits

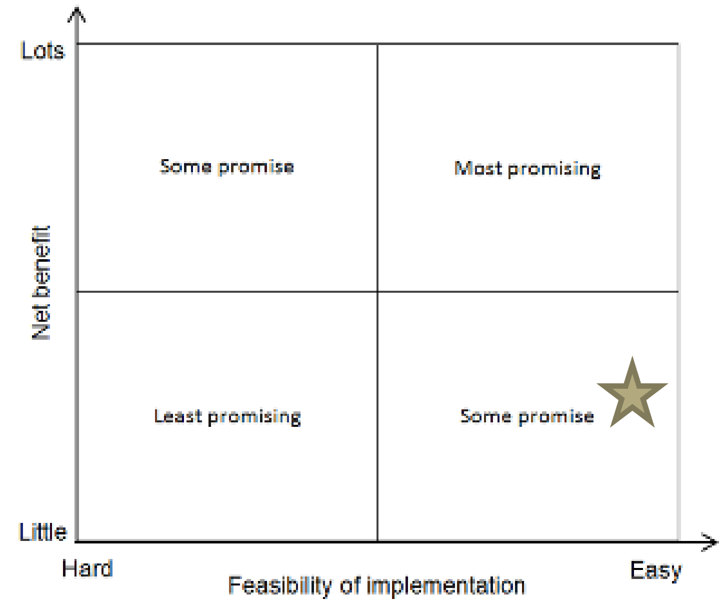
- Decreased spring flows
- Attenuated peak flows
- Increased base flows
- This strategy may be more visible at a local level

Key modelling results and discussion: Linear connectivity

Period and Location	Dry – Linear connectivity	Historic – Linear connectivity	Wet – Linear connectivity
Change in number of days meeting Aboriginal Extreme Flow. *Challenge: Ensure sufficient flow for navigation*			
Annual - below Firebag confluence	0.0 Days	0.0 Days	0.0 Days
Change in number of days over 1:100 flood thresholds. *Challenge: Limit damage from floods*			
Annual - Athabasca River at Athabasca	0.0 Days	0.0 Days	0.0 Days
Annual - McLeod River	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca upstream of Whitecourt	0.0 Days	0.0 Days	0.0 Days
Annual - Athabasca River at Hinton	3.0 Days	0.0 Days	0.0 Days
Annual - Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Pembina River at Sangudo	0.0 Days	0.0 Days	0.0 Days
Annual - Ft. McMurray	0.0 Days	0.0 Days	-1.0 Days
Change in annual instream flow needs violations. *Challenge: Maintain or improve ecosystem health*			
Annual - Mouth of the Lac La Biche River	1.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the McLeod River	-4.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Clearwater River	38.0 Days	21.0 Days	21.0 Days
Annual - Mouth of the Lesser Slave River	0.0 Days	0.0 Days	0.0 Days
Annual - Mouth of the Pembina River	0.0 Days	0.0 Days	0.0 Days
Change in walleye recruitment reduction. *Challenge: Maintain or improve ecosystem health*			
Annual - below Ft. McMurray	0.00%	0.00%	0.00%
Change in seasonal streamflow as a percentage of naturalized streamflow. *Challenge: Minimize the effect of development footprint on basin hydrology*			
Summer - at the Mouth	0.00%	0.00%	0.00%
Spring - at the Mouth	0.01%	0.00%	0.00%
Fall - at the Mouth	0.00%	0.00%	0.00%
Winter - at the Mouth	0.00%	0.00%	0.00%
Change in seasonal system shortages (m3/s). *Challenge: Provide water supply certainty for municipalities and development*			
Spring - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Winter - whole system	-0.0 m3/s	0.0 m3/s	0.0 m3/s
Fall - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s
Summer - whole system	0.0 m3/s	0.0 m3/s	0.0 m3/s

Screening assessment: Linear connectivity

This strategy was identified as having **some promise**.



Net benefit

- Low net benefit to streamflow at the scale of the basin (potentially high benefit at smaller scales)
- Likely environmental and ecological benefits
- Likely improvements in water quality

Feasibility of implementation

- Could be a part of a greater conservation and reclamation land use strategy
- Reduce linear disturbance of development by encouraging industry to collaborate and minimize disturbance

Strategy overview: Oil sands mining reclamation

Continue to set and meet high standards of reclamation of energy footprint to maintain or improve hydrological functions in a watershed

Continue current reclamation practices and enforcement in the energy sector in order to ensure mines are reclaimed in a manner that restores or improves watershed functions.

Examples of this strategy:

- Muskeg River Watershed Integrity Management Framework

Potential benefits

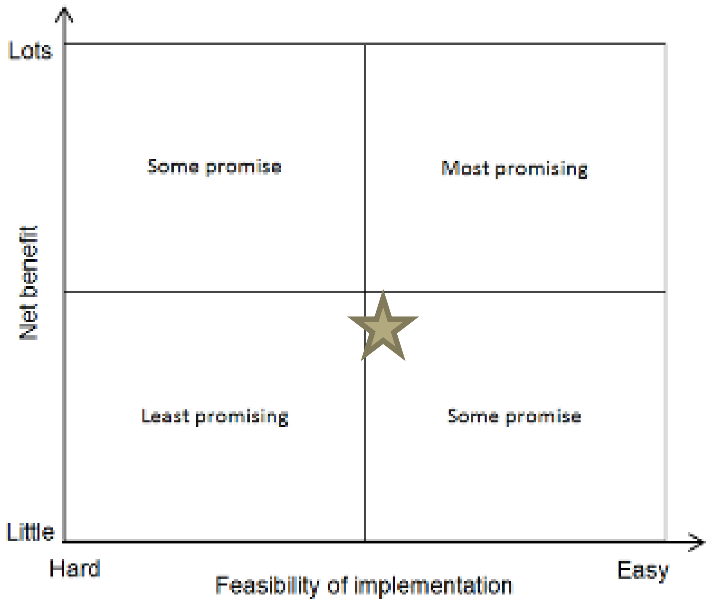
- Reestablishment of hydrological functions
- Naturalisation of the hydrograph
- Improved water quality

Note that there was no modelling done for this strategy.

- Mine scale water management was outside the scope of this project

Screening assessment: Oil sands mining reclamation

This strategy was identified as having **some promise**.



Net benefit

- Detailed modelling should be conducted to thoroughly and more confidently screen the degree of promise that this strategy holds
- Reestablishment of hydrological functions, and naturalization of the hydrograph

Feasibility of implementation

- End-of-life reclamation plans are already in place for existing energy mines

Today's discussion

9:00	Welcome, introductions, and opening remarks	Mike
9:20	Indigenous Sharing Sessions update: key messages that we heard and information to help our thinking on today's discussions	Denise
9:30	Plenary session 1: strategies 1-3: • Review key points for each strategy • Identify actions and enabling conditions • Confirm strategies as most, least, or some promise • Document additional comments	All
10:30	Break	All
10:45	Plenary session 2: strategies 4-7	All
12:10	Lunch	-
12:50	Plenary session 3: strategies 8-11	All
2:15	Break	All
2:30	Plenary session 4: strategies 12-13	All
3:10	**Plenary session 5: gaps identified in water management data, processes and policies** • **Identify, review and confirm gaps** • **Identification of critical path gaps**	**All**
3:40	Next steps, and close	Mike

Running list of gaps: data, knowledge, processes, policy

Data	Knowledge	Processes	Policy
Technology for real-time measurement of winter flows	Understanding the linkage between hydrology (soil moisture) and wildfires	Address how to manage tributaries where there is currently no flow data	Implement a basin wide water re-use policy
Monitoring and data collection of snowpack, tributary streamflow, and meteorological data in the upper portion of the ARB	Mapping of hydrologically sensitivity areas in the basin that supply water to sub-basins and are locally important to communities	Include water incident related reporting and monitoring (industrial incidents) in water data	Establish a water conservation objective for the basin
Awareness of and ready access to all public data sets (e.g., snow surveys)	Development of indicators that correlate changes in flow and impacts in ecosystems	Prioritize reclamation through strong reclamation modelling	Establish a water management plan for the basin
Spill tracking records system and reporting requirements	Understanding of the hydrological effect of watershed and local scale connectivity		
Groundwater withdrawal reporting	Understanding of the hydrological effect of an oil sands mine on sub-basin hydrology		
All water use data for allocation management			

Working towards a recommendation on filling gaps…

Are there any gaps that are not on this list?

Which gaps need attention first (e.g., what are the critical gaps)?

After this meeting we will:

- send out the full table of gaps and commentary with any additional gaps added from today
- welcome your edit/revise/adds to the list
- bring this back to the next meeting with a draft recommendation on which gaps should be filled first

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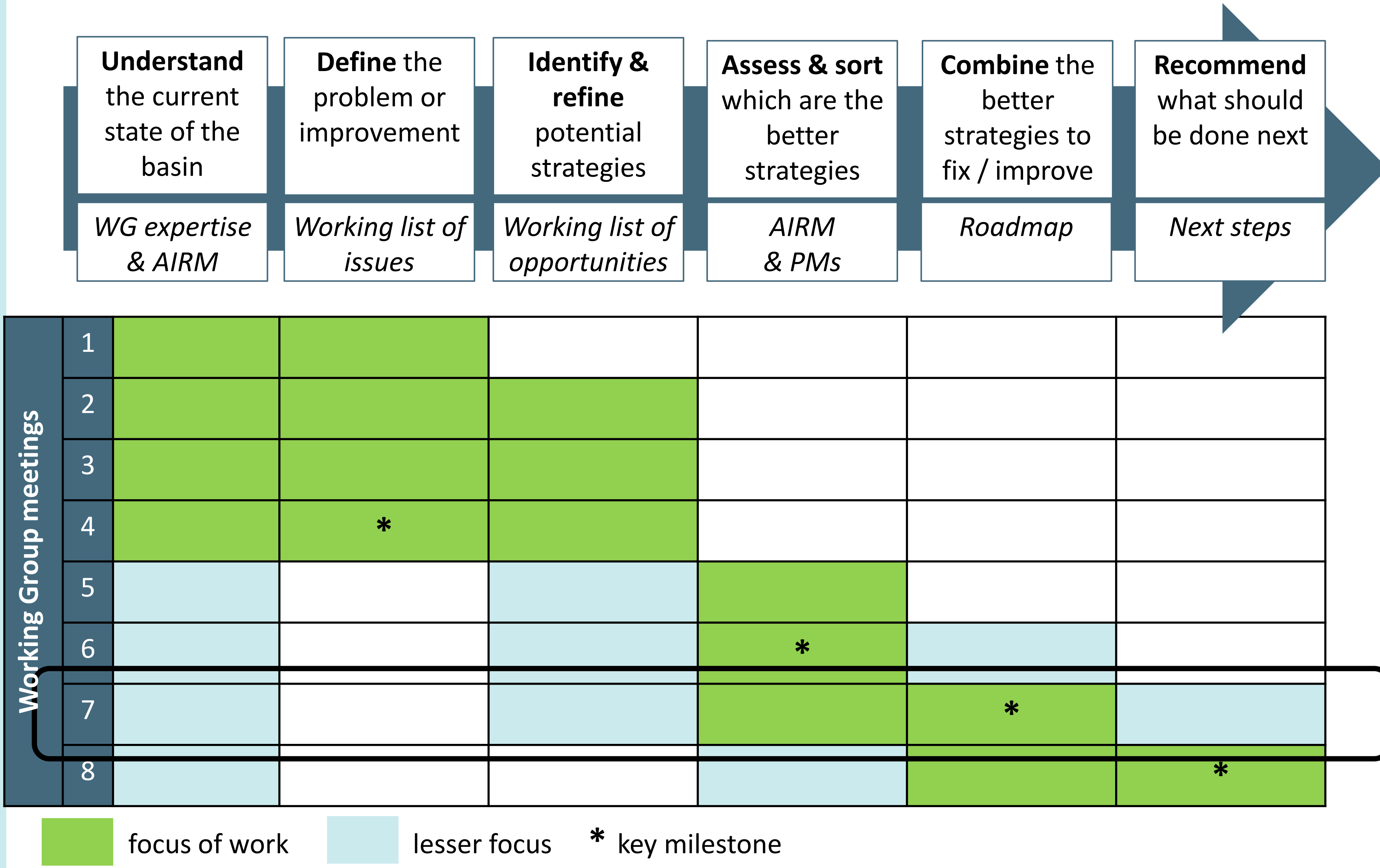
3:40	**Next steps, and close**	**Mike**

Collaborative process to develop the ARB Roadmap



Final Reminders

WaterSMART will draft meeting summary and distribute to Working Group members for review. Meeting materials are also posted on the ARB Initiative website.

- **Meeting (#8): March 14th**
  - Final Working Group meeting for the ARB Initiative
  - Going to try and model a combination of promising strategies and bring that to the next meeting to inform the Roadmap
  - Review ARB Roadmap (basin overview, challenges, strategies, actions)
  - Confirm action items
  - Confirm process to review and finalize Roadmap/final report
  - Review final communication plans

Please contact us if you have any thoughts, questions, comments!

Thank you for all your support and participation

Thank you

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Reference slides