

Draft Meeting Summary

Athabasca River Basin (ARB) Initiative

Working Group meeting #2

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| Date | December 1, 2016 |
| Time | 9:00am to 4:00pm |
| Location | Executive Royal Hotel West, Edmonton |

Attendees

| | |
|--|---|
| Ahmad Asnaashari, AEP- Upper Athabasca | Junye Wang, Athabasca University |
| Allé-Ando Yapo, Teck Resources Ltd. | Kelly Scott, ATCO |
| Andrew Paul, AEP-Fish and Wildlife | Kari McDonald, Westmoreland Coal |
| Anita Selinger, Suncor | Lesley Peterson, TUC |
| Axel Anderson, fRI Research/Alberta Agriculture and Forestry (AAF) | Linda Jefferson, ATCO |
| Carmen de la Chevrotière, AEP – Transboundary Waters | Martin Van Olst, Environment and Climate Change Canada (ECCC) |
| Carolyn Campbell, AWA | Meghan Payne, Lesser Slave Watershed Council (LSWC) |
| Dallas Johnson, Alberta Innovates | Molly Fyten, Lac La Biche County |
| Dan Moore, AFPA/ANC | Nazila Sedaei, University of Alberta |
| Dennis Southwick, NLFF/TUC | Narayan Shrestha, Athabasca University |
| Donna Kanarek, AI-Pac | Patrick Marriott, Alberta Energy Regulator (AER) |
| Ellyn Davidson, CPAWS | Ryan Arcand, Alexander First Nation |
| German Rojas, AEP- Lower Athabasca | Scott Duguid, AEP- Land use secretariat |
| Gerald Courtoreille, Gift Lake Métis Settlement | Zahidul Islam, AEP- Policy |
| Gilmen Cardinal, Bigstone Cree Nation | Claire Jackson, Alberta WaterSMART |
| Janice Linehan, Suncor | Danielle Marcotte, Alberta WaterSMART |
| Jason Ponto, Athabasca Watershed Council (AWC) | Megan Van Ham, Alberta WaterSMART |
| Jessica Watson, West Central Forage Association | Mike Nemeth, Alberta WaterSMART |
| Jim Sellers, Athabasca University | Ryan MacDonald, Alberta WaterSMART |
| JoAnne Volk, Repsol Oil and Gas | Denise Di Santo, Alberta WaterSMART |

Meeting objectives

1. Recap what we heard and key points from Working Group meeting #1
2. Build a common understanding of the basin, understand the linkages and the differences across the basin
3. Provide an update on the working list of basin issues as gathered and heard to date
4. Refine the working list of performance measures (PMs) to reflect basin issues and opportunities
5. Provide an update on the changes from feedback to the draft TOR, and
6. Provide an overview and recap of the modelling objectives and how the model will be used in future meetings.

Meeting Summary

Athabasca River Basin (ARB) Initiative

Current action items

| Action | Responsible | Due | Status | |
|--------|---|---------------------|-------------|----------|
| 1 | Participants interested in joining the data and modelling committee should email Mike, and Mike will contact participants who raised their hands at the meeting | Working Group/ Mike | ASAP | New |
| 2 | Follow up with the MRBB about Indigenous engagement in Saskatchewan and BC as well as any potential data sets | Mike | January 13 | New |
| 3 | Follow up with DFO and AEP regarding previously existing, but no longer used, DFO diversions | WaterSMART | January 20 | New |
| 4 | Follow up via Pat to tap into iFROG work | WaterSMART | January 20 | New |
| 5 | Follow up via Dallas to tap into SAOS work | WaterSMART | January 20 | New |
| 6 | Follow up with AEP to get info on temperature and DO information and data | WaterSMART | January 20 | New |
| 7 | Follow up with Zahid from AEP on these calculations and see how it can or does relate to the already developed PM | WaterSMART | January 20 | New |
| 8 | Follow up with Ahmad from AEP to get list of lakes that are of concern for water levels dropping | WaterSMART | December 20 | New |
| 9 | Send meeting invite for Working Group meeting in March | Mike | December 13 | New |
| 10 | Send meeting #2 summary, slides, and running list of PMs | Mike | December 8 | Complete |

Discussion points

1 Opening remarks

Mike Nemeth convened the meeting at 9:05 a.m., welcomed everyone. Participants introduced themselves, noting their name and affiliation. Mike reviewed the objectives of today and the agenda. He reminded the group of who WaterSMART is (independent consulting company based in Calgary, with a focus on management and technologies to support sustainable water management from a basin perspective).

Mike reviewed the Chatham House Rule, which is designed to increase openness of discussion and will be used throughout this process to ensure participants feel they can speak openly. The Chatham House Rule reads: "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."

The Athabasca River Basin (ARB) Initiative will be developing a Roadmap for sustainable water management throughout the ARB—the ARB Roadmap. The model will be used to reach the goal of building a roadmap for the ARB. A roadmap for this work is defined as a set of strategies and implementable actions, developed by an inclusive basin-wide working group using collaborative modelling and dialogue that provide a recommended path toward sustainable water management in a basin. Roadmaps help inform future planning and management efforts as they relate to water.

A roadmap is not a plan, it is an informed, science-based set of recommendations or strategies that anyone can use. Roadmap components can include general basinwide examples as well as site specific opportunities. Examples of current activities in the basin that could potentially be components of an ARB Roadmap include: conservation of park land in the headwaters, reuse of treated effluent for industrial reuse, ‘recovery rest period’ approach to bring back arctic grayling, 2009 Lesser Slave Lake Watershed Management Plan, recently implemented Surface Water Quality Management Framework (SWQMF), and technologies to reduce water use in the oil sands

Mike reminded the group that the vision for this work is northern Alberta—the whole Slave River system, which includes the Athabasca (current project) and a plan for getting a similar initiative started for the Peace / Slave River Basin Initiative (PSRB), and then connecting the work together. An update was provided on the ARB Initiative. Participation from various groups and communities may look different, but the Initiative will strive to ensure meaningful participation from all groups. Mike reiterated the continued support of AEP in this process, and that AEP is embarking on an internal planning process for 2017 and beyond; through this process they will ascertain how the PSRB fits into their priorities and program deliverables. As a result, AEP is not yet able to support the launch of the PSRB Initiative, it appears it’s not a matter of if; it’s a matter of when they will support it.

Question: What is the link with AEP? Is the Initiative contingent on their support because we need funding?

Response: Yes, funding is a portion of it, but also their participation in the Initiative.

Mike provided an update on feedback from meeting #1. At meeting #1 there was some highly technical discussion at Working Group meetings. It is important to have an open and transparent tool people can understand and trust to help inform interpretation of results. Going forward that information will be made available and documented, however we will be attempting to avoid technical modelling discussions at the full Working Group level. It was suggested we establish a Data and Modelling Committee for periodic conference calls/emails to vet data, modelling logic/assumptions, etc., as needed. Are there volunteers or people interested in joining a data and modelling committee?

ACTION: Participants interested in joining the data and modelling committee should email Mike, and Mike will contact participants who raised their hands at the meeting.

Question: Wasn’t at the first meeting, but noticed on the first meeting notes there was a mention of other technical committees (ecological?) What are the thoughts regarding the other committees?

Response: Committees can be created and evolve as the work takes place. Other committees are certainly an option in the future. At this time there is no need for those committees, but there certainly could be other sub-committees if people are interested in volunteering their time and it

fits into scope and timelines of the project.

We are always striving to ensure we have the fullest representation possible for this work. Not everyone is able to make every meeting because of other commitments. If there is a group currently not represented, which you feel would meaningfully contribute and should be here, please let one of us know. To this end there is a supplementary meeting in Fort McMurray for Working Group participants in the Fort McMurray area. This meeting would be in addition to today and the agenda will be much the same. We hope this dialogue will help inform groups' and communities' decision to participate going forward. This meeting is open to everyone from the Working Group if you wish to attend. Additionally, Sharing Sessions are being planned for interested First Nation and Métis communities over the next ~6 months.

Mike presented a slide showing changes made to the model as a result of suggestions made by participants of the first meeting of the Working Group. A few examples were highlighted and details will be provided toward the end of the meeting.

The key differences between the work of Phase 2 Framework Committee (P2FC) and the ARB Initiative were reviewed in the slides. The link to the SWQMF, that was based on work from the P2FC, and how it fits into this Initiative were also outlined. It was highlighted the ARB Initiative is being informed from the outcomes of the Framework and the Initiative does recognize other work in the basin.

Water quality and linking this work with the Peace-Athabasca Delta (PAD) were touched upon. Water quality is not in the current project scope, in terms of contaminants and detailed water quality monitoring; however there will be flow related water quality Performance Measures (PMs). Linking to PAD is part of the broader vision. We will not be directly modelling the PAD—we will be looking at the changes of flow from the ARB into the PAD.

Question: What is the source of the winter flow?

Response: Right now we're using observations. Going forward we'll be simulating flow throughout the year.

Mike explained there is lots of information being presented and the slides will be distributed with the meeting summary. Some of the material will be reviewed in future meetings and this process is designed to be iterative.

2 Common context: tour of the Athabasca River Basin

Ryan used ALCES Online (part of the integrated modelling tool) to go through a tour of the Athabasca River Basin. This tour showed coverages of the model, including agriculture, transportation, water infrastructure, etc. The tour aimed to provide an overview of the basin geography and current human activity on the landscape. This helps build a common understanding of the basin in terms of its natural features and human land use, and of the similarities and differences in water resources across the basin. This overview highlighted human based activity and noted it was concentrated geographically in the central portion of the watershed.

Looking at the maps this basin is very large basin (over 160,000 km²) and stretches from the Rockies, into the boreal plain, and almost into the shield.

Some key points:

- Headwaters are where the bulk of the water comes from in this snowmelt dominated watershed
- Basin is topographically diverse
- Glaciated landscape in the headwaters. Glacier contribution to the Athabasca is not huge, but there are some very large glaciers
- Lesser Slave Lake is the biggest lake in the system
- A lot of rivers and a lot of lakes cover this system
- There is lots of snow and ice—the Columbia Icefield is at the very top of the headwaters
- Wetlands (boreal plain)—the landscape is very wet, lots of bogs and different types of wetlands, it's a very wetland driven system. This means there are a lot of interesting hydrologic features that are important to consider
- Forests—a lot of forest in the foothills and headwaters, not a lot in the central portion, and then there is a lot in the lower portion of the basin
- Natural sub regions—climatic and topographic region that represents different ecosystems (different parts of the basin that behave differently)
- Jurisdictional—lots of Métis and First Nation settlements, cities, towns, counties and municipal districts, as well as provincial and national parks. These are important jurisdictional considerations
- Energy—one resource development sector; there is also a lot of agriculture in the central portion of the basin. As things like climate change take place we may expect more agriculture in this part of the world, and
- Transportation—a lot of road networks, primarily focused where people live, there are important to consider when we think about runoff and water management. Linear development and effect of this disturbance on the hydrology and other impacts can be modelled.

Question: Why does the headwater generate more water than the rest of the basin?

Response: More snow up in the headwaters, mainly a snowmelt driven system

Question: Wetlands are important storage places for water; how are we looking at hydrological function?

Response: Water storage in wetlands is simulated in the hydrological model. This is completed based on wetland types and simulated for all wetlands identified in the model.

Question: Are there any First Nation (reserves) in the Saskatchewan portion of the basin?

Response: We can look at that but so far we haven't included Saskatchewan information or data.

Question: When you say First Nation settlements do you mean reserves? What about traditional territories?

Response: There are Reserves, as well as traditional territories throughout the basin; some groups from Saskatchewan may have traditional lands in the ARB. The Mackenzie River Basin Board (MRBB) may have information that would help inform the model. It was agreed that an inquiry of data could be made of that group. Traditional territories cover most of the basins. When the settlements are shown they show just the Reserves. The MRBB might be a good, important source of info.

Action: Mike to follow up with the MRBB about Indigenous engagement in Saskatchewan and BC as well as any potential data sets.

Question: What is the percentage of the basin that is disturbed by humans? (today vs. 100 years ago) What is the population?

Response: Total footprint relative to no footprint maybe about 1/3 of the basin. Apart from the national park most of the basin has had some sort of exploration at least (forestry and seismic)

Question: What do we consider the headwaters from a water contribution area?

Response: The park represents about half of the headwaters.

Question: On the transportation slides – there are a lot of roads—are railroads, bridges and culverts represented? The things that add extra stresses to the water?

Response: When we look at future simulations we will look at different scenarios and different plans going forward. Transportation infrastructure and crossings data sets are data from public sources and are available.

Question: Is the government of Saskatchewan aware of the process, do they have an interest?

Response: As far as the MRBB they are aware and are kept updated. They will be more involved when we get to the bigger picture.

Question: Is the fish index data part of this? Can we incorporate that?

Response: Yes, that is incorporated in this work.

Question: Forest cover – can we show forest cover separately, how has that been altered over time?

Response: Anything that has been altered in this dataset is accounted for overtime and simulated for future changes.

Question: With regard to human disturbance coverages, how much of the province's population is in the ARB? How many people live in the whole basin?

Response: A quick calculation was made after the meeting—in 2011 just over 183,000 people lived in the whole basin.

Question: Is there info from ALCES regarding sand and gravel extraction in riparian areas that may impact aquifer and flows?

Response: There is information on sand and gravel extraction in these areas, the scale of influence is outside the scope of this work, but they can have localized impacts.

3 Working list of the ARB's water issues and opportunities

Based on publically available sources Megan went over the running list of issues that the basin is facing. Today we want to have the discussion about the issues, as well as opportunities you see in the basin.

Megan reviewed the running list of issues that fall into five buckets—grouped from WaterSMART's perspective purely to help discussion—these were: water supply, water quality, extreme events, natural system, and anthropogenic system. In the context of this project, an issue is defined as an important concern or problem related to water in the basin that warrants attention. Can be current or future. Can

be reach-specific or basin-wide. Points to something that the Roadmap needs to address / resolve.

For this presentation, the working list of opportunities was reviewed. In the context of this project, an opportunity is defined as a specific action that can be implemented. These can either be to address the basin's issues or to make improvements. Opportunities are strategies that will make up the roadmap and can include:

- Operational changes to existing infrastructure
- Investment in natural infrastructure
- Planning and preparedness
- Investment in new water infrastructure
- Demand management, and
- Policy and practices.

4 Breakout Groups - Session 1: What opportunities need to be referenced or addressed in a Roadmap for Sustainable Water Management in the ARB?

Participants were asked to break into three groups to discuss what opportunities need to be referenced or addressed in a Roadmap for Sustainable Water Management in the ARB.

If you had a roadmap that's already been written what would you want to see in that roadmap? The idea was to brainstorm opportunities that should be referenced in the Roadmap, and use the visual tool to "flag" ARB Roadmap contents.

Participants broke into three groups representing three areas of the basin to include:

Table 1 (Megan and Danielle): Lower Basin

Table 2 (Denise and Ryan): Central Basin

Table 3 (Claire and Mike): Upper Basin.

Below is a summary reflecting discussions at the tables in the readouts as well as points from the flip charts. Opportunities are bolded.

Table 1- Lower Athabasca (Megan and Danielle)

1. **Moberly Rapids, Crooked Rapids, Brule Point, Grand Rapids, and Pelican Rapids Hydropower sites.** Brainstorming quickly began with the suggestion of potential on-stream hydropower dams upstream of Fort McMurray. Five sites were identified in a Hatch report and include Moberly Rapids, Crooked Rapids, Brule Point, Grand Rapids, and Pelican Rapids. Recognized benefits of this opportunity included a renewable energy source that aligns with the province's climate leadership plan, flood control, and water storage. Challenges to this opportunity were raised and included impacts on natural flows in the system (i.e. freshet), impacts to riparian functions, and impacts to fish habitat.
2. **Off stream storage infrastructure.** Off stream storage infrastructure was a suggested opportunity to provide industrial water supply. The group focussed specifically on the oil sands area and on existing tailings ponds. Off stream storage for flow augmentation purposes was also discussed and MacMillan Lake was named as a specific example.
3. **Water reuse.** Reuse was a strong topic of discussion. An example of municipal to industrial reuse was provided as the Suncor refinery water to Goldbar Wastewater Treatment in Edmonton. Another example of reuse included industrial to industrial reuse as Suncor base mine water to Suncor Firebag operations. Difficulties surrounding this opportunity were mentioned and include the need for a

basinwide (even provincial wide) water reuse policy, as well as difficulties of simulating this reuse in the model. Benefits of a basin wide water reuse policy involve considering the trade off and impacts on water reuse applications and on water withdrawals/returns. Another benefit would be reducing water use intensity. An example of basinwide water reuse was the purple pipes project from Regional Municipality of Wood Buffalo (RMWB) to Anzac. These are regional water supply lines for municipal needs.

4. **Protection of specific caribou range areas beyond LARP protection.** Another opportunity suggested was protection of specific caribou range areas beyond the Lower Athabasca Regional Plan (LARP) protection. Specific examples included areas west of Fort McMurray, east of Athabasca River, Richardson, McClelland/Fort Hills area, and the Lake Athabasca Valley.
5. **Better water management information system to support regulatory decision making and policy.** There was unanimous agreement concerning the need for a better water management information system to support regulatory decision making and policy setting. For example, specific lakes may have certain designations that might impact Temporary Diversion Licence (TDL) rulings. Furthermore, it is critical to achieve better real-time flow measurements during low flow winter periods. Finally, install gauge stations on more tributaries, and make the data accessible. Data gaps (accessibility or lack of data) is a big challenge in the Lac La Biche area.
6. **Develop a navigation model, using bathymetry to understand navigation channels and their changes through time to assess options.** Another topic of discussion surrounded navigation. It was mentioned a potential opportunity could be re-dredging of the lower Athabasca River to enable navigation (access) to First Nations and Métis communities and traditional territories. Alternative means of navigation were suggested to avoid dredging activities, for example, the use of different water crafts that can maneuver in shallower waters, or road navigation via building an all-season permanent road to Fort Chipewyan. An opportunity here could be to better develop navigation modelling, using bathymetry to understand navigation channels and their changes through time.
7. **Potential actions to help mitigate the drying of the Peace-Athabasca Delta (PAD).** Another opportunity was potential actions on the Lower Athabasca River and/or Peace River to help mitigate the drying of the Peace-Athabasca Delta (PAD). This mentioned infrastructure to potentially help regulate flows, pumping systems to help augment flows, or even weirs to raise lake levels.
8. **Access management to help address linear disturbances.** Access management to help address linear disturbances was another opportunity mentioned. This includes planning, minimizing disturbances, minimizing crossings, and mandating best-practices to have the least impact on hydrology. For example, building access roads to optimize reclamation.
9. **Reclamation prioritization through strong reclamation modelling.** Prioritizing reclamation through strong reclamation modelling was another potential opportunity. For example, identifying sites of highest priority that may have the greatest positive impact on peatland complexes, tributaries, and connectivity is a big opportunity in the basin. There is potential there to build off the work from the Watershed Resiliency and Restoration Program (WRRP) project. Increased reclamation compliance was also mentioned. An opportunity could be to revisit older reclamation plans and match their intent and details with current policy goals and practices.
10. **Revisit policy around sand and gravel extraction in flood plains.** Revisiting flood plain policies, in regards to sand and gravel extraction, were another mentioned opportunity. We need to look into the impacts of sand and gravel extraction on flood plain functions and revisit relevant policies.
11. **Apply Room for the River philosophies and principals in communities within the ARB.** There could be an opportunity to apply Room for the River philosophies and principals in communities within the ARB. For example Fort McMurray could apply these practices to reduce the risk of flood damage,

especially with amplified risk from climate change. We could ensure municipal planning incorporates Room for the River practices.

12. **Find a technology for real-time measurement of winter flows.** There is a big data gap, therefore a big opportunity in the basin, to find a technology for real-time measurement of winter flows, typically under ice. It is crucial to obtain actual flow data during low flow periods—currently we only have one measurement per month to approximate flows during the winter period.
13. **Find alternatives to freshwater use in SAGD facilities.** There is an opportunity to find alternatives to freshwater use in SAGD facilities. For example, saline groundwater could be used; however, a big challenge concerns gaps in groundwater licensing.
14. **Land use planning restrictions to limit residential development impacts on lakes and wetlands.** Another opportunity could be land use planning restrictions to limit residential development impacts on lakes and wetlands specifically in the Lac La Biche area.
15. **Mitigating ice-jam flooding in Fort McMurray.** This is a big opportunity that was mentioned. Whether it is more dyking (close to the Snye River), flow regulations, or Room for the River practices, there is an opportunity to mitigate this risk (specifically for ice-jam floods).
16. **Install weirs to raise the lake levels for ecological and traditional uses.** Another opportunity raised was installing weirs on specific lakes (Mamawi Lake was mentioned) to raise lake levels for ecological benefits and traditional uses.
17. **Recreational opportunities in the basin.** This was briefly mentioned towards the end of the discussion. There is an opportunity to foster recreation/tourism in the basin.

Table 2- Central Athabasca (Denise and Ryan)

1. **Sub-basin planning for water management.** Sub-basin planning is needed to better manage water in the central part of the basin and throughout the watershed. This would include holistic water management planning and regulation that recognizes water connectivity through small tributaries and wetlands. Water management is needed for lakes as well as rivers. Create implementation plans for holistic water management. This may include managing flow and lake levels (e.g., restrict flows into and out of lakes/reservoirs for water management and instream flow requirements).
2. **Account for water collection at local sites in rural areas.** Acknowledge any unlawful practice of water collection at local sites in rural areas and add this practice to the regulatory process to account for water collection as an allocation. At this time, this is not part of the accounting scheme and needs to be addressed.
3. **Off-stream storage for oil and gas operations.** Off-stream storage is needed to address the taking, or the perception of taking water without a licence, by oil and gas service industries.
4. **Reuse of industrial effluent.** Return flows from industry and other operations that create contaminants should be repurposed for other industry use (reuse by industry). For example, Swan Hills was considering selling this water to industry.
5. **Strategic, efficient and purposeful water allocation.** The water licensing system should connect where and how water is used – it is important over the long term to be more strategic, efficient and purposeful in the allocation and use of water.
6. **Water conservation.** This provides an opportunity to educate and address individual's actions and practices.
7. **Irrigation agriculture.** Climate change could mean more arid conditions and could result in the need or opportunities to use irrigation for farmland (not currently occurring in this area of the basin), so this potential, future water need should be addressed.

8. **Water storage for flow augmentation and regulation.** Basin water storage is needed to augment summer low flows. Also, regulate water use during critical seasonal and low flow periods, to maintain water table as well.
9. **Propose Instream Flow Needs (IFNs) on tributaries as needs dictate.** Define IFNs on a seasonal basis—what is needed in terms of quantity for the watershed—and manage water resources accordingly.
10. **Examine cumulative impacts of actions on water.** Hydrological change may bring a stronger need to examine cumulative impacts of actions on water. Examine the changes to the hydrological regime over the past 100 years and use this to predict future changes and cumulative effects.
11. **Re-naturalize or dredge Buffalo Bay.** Buffalo Bay has issue of sedimentation of the channel connection and this should be addressed; it may need to be re-naturalized or dredged.
12. **Reduce linear disturbance and resultant impacts on water flow.** Road sharing and decommissioning (e.g., revegetate redundant roads) are needed to reduce linear disturbance and resultant impacts on water flow, infiltration, and quality, particularly in the Swan Hills area. Other linear disturbances include channelized and straightened channels for water conveyance (designed to get water off the land efficiently). This is an opportunity to re-naturalize the channels and the river system. Get impacting companies to synergize their efforts to remedy the impacts.
13. **Ensure adequate reforestation and buffer requirements for logging activities.** Reforestation and buffer requirements are needed to reduce sedimentation, and these best management practices offer other habitat and water quality and quantity (hydrological connection) benefits.
14. **Use the weir at Lesser Slave Lake to manage lake levels.**
15. **Water use education.** Awareness and education are important for water use efficiency and management.
16. **Hydropower development.** It was mentioned the 2010 Hatch report made suggestion of two potential sites for hydroelectric dams in the central basin.

Table 3- Upper Athabasca (Claire and Mike)

1. **Treated effluent to hydraulic fracturing companies.** Treated effluent could come from industrial and municipal sources; it could be used in fracking operations in the upper Athabasca or Peace River basins.
2. **'Water needs assessment' with First Nations communities.** A long term needs assessment, over a 50 year time frame, to understand future infrastructure needs and plan for water management during times of drought. These have been done in southern Alberta; assessments in the north could follow a similar template. These assessments help to develop a community water profile.
3. **Clarify policy around water reuse.** Change, clarify, or make new, clear policies for decisions on water, specifically regarding reuse and re-connecting industrial land pieces post reclamation. The existing *Water Act* should cover the legislation to enable policy, but the policy needs to be clear.
4. **Look at alternatives to dams for electrical generation** (e.g. nuclear?).
5. **Obed site: run of the river solution.** A former coal licence is looked at to generate electricity by running water through an existing storage off-stream and hydro turbines.
6. **Improve actual water use data for allocation management.** Look at improvements to actual water use and data availability through the water use reporting system. Better actual water use reporting and data will help in allocation management and understanding water licence holders may not be using their full allocated amount. If actual water use was known for all users future licencing could

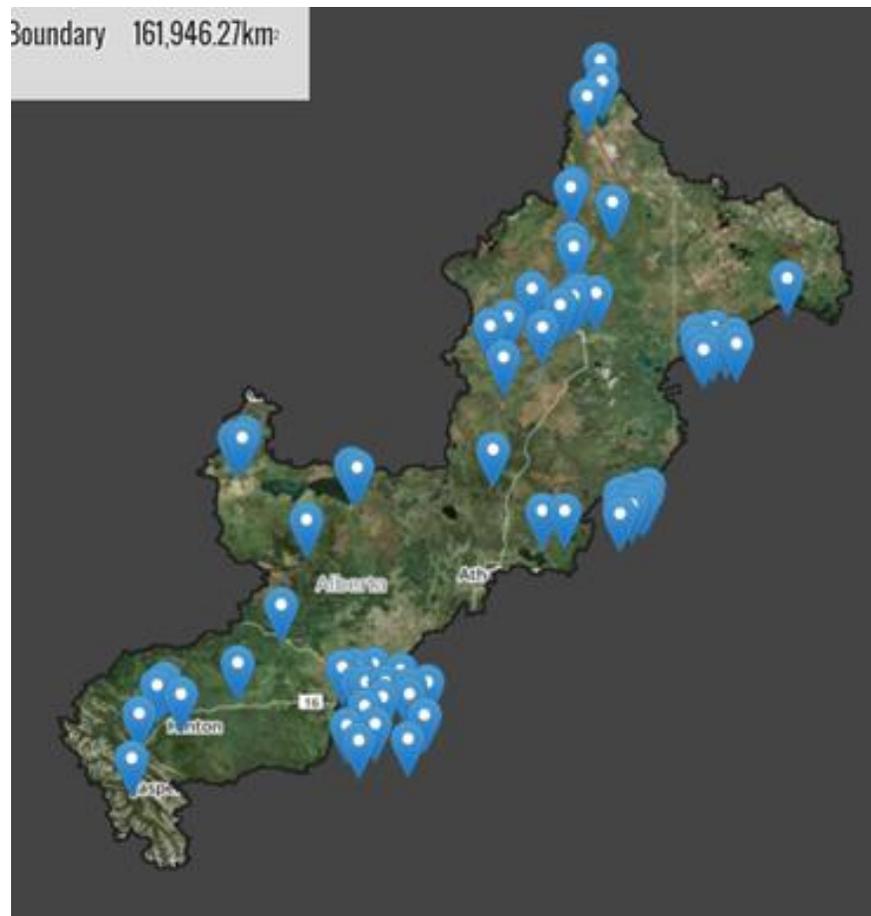
be better understand.

7. **Hydropower sites.** Hatch published a report in 2010 that outlined all potential hydropower sites throughout the province. Sites were identified based on hydropower potential—there were 17 sites identified on the Athabasca and its major tributaries. There was concern expressed over the impacts hydropower facilities can have on a river (e.g., fish passage, changes in flow, etc.). All energy development will have its trade-offs; with hydropower the trade-off discussion should include positive and negative trade-offs as facilities can often be multipurpose (e.g., flood control, storage, low flow augmentation, etc.) depending on the type of facilities (e.g., large storage versus run of river). These should be multi-use facilities, have fish passage and be developed to enable preservation of river function.
8. **Decommissioning old/no longer used infrastructure in the basin.** E.g. dams, diversions, culverts, etc.
9. **Enhance monitoring and data collection of hydrological data in the upper watersheds of the ARB.** Would be beneficial to have more data and monitoring and to have it shared and available to everyone.
10. **Establish parks or conservation areas.** Look at conserving areas with high biodiversity / hydrological importance (e.g. CPAWS high conservation areas for biodiversity). A suggestion was made for a conservation area in the Gregg River area.
11. **Proactive designation of trails and recreational areas.** We should learn from experiences in Southern Alberta and get ahead of the problem in order to minimize linear disturbances and impacts from recreation. The Athabasca River Basin is a convergence zone of linear disturbance pressures, with recreational pressures coming from the south and industrial pressures coming from the north. It is important to recognize both of these pressures as this relates to future projections and cumulative effects in the area.
12. **Apply BMPs to land use.** Look at State of the Watershed (SOW) reports from the AWC to access areas with a lot of disturbance (areas under pressure).
13. **Compile and apply the knowledge from TLU and TK studies.** Compile knowledge from Traditional Land Use (TLU) and Traditional Knowledge (TK) studies completed by industry all along the Athabasca River. Capture the information in a central, publically accessible way for planning and management considerations. With leadership changes in First Nations communities sometimes the transfer of this knowledge is a challenge. It may be a possibility to look at leveraging the commitment from the Alberta-NWT bilateral agreement on how to do this.
14. **Find and include any DFO issued diversion licences.** Determine where there are previously existing, but no longer used, Department of Fisheries and Oceans (DFO) diversions from tributaries. Review licences to know where water could still legally be diverted; this information is stored in a federal database. Compile this information and ensure any active licences are included that are not in the provincial database.

ACTION: Mike to follow up with DFO and AEP regarding previously existing, but no longer used DFO diversions.

15. **Perform a community water audit.** This could be done using tools for source water protection as previously used with INAC (Indigenous and Northern Affairs Canada). The tools allow for an audit for communities/industry to understand water diversions and uses and how to improve water use (e.g., CEP plans). Water audit needs to address water use and losses (leaks, etc.), to improve the system. There was a suggestion to expand the audit to consider ecosystem needs as well.

16. **Identify areas of 'general' restoration.** Potential to work off of a pilot in the Bow Basin from the WRRP work on identifying high value restoration and conservation projects.
17. **Improve municipal water management practices.** Could include metering, stormwater use, lawn watering, low flush toilets, general conservation, etc.
18. **Include water incident related reporting and monitoring (industrial incidents) in water data.** Currently these don't go into any databases. These reports contain a great deal of data, and are often relevant for longer than just when the incident was reported.
19. **Enable transfers of old unused licences.**
20. **Develop a basin-wide water management plan.**
21. **Limit Temporary Diversion Licences (TDLs) in high value tributaries.** Develop a database of this knowledge. Limit TDLs where species at risk are identified and restrict activities in those areas.



The image above spatially shows the opportunities from all three groups. Opportunities on the right side in the dark grey area are opportunities that could apply basin-wide. Other points on the map are opportunities that are location specific.

5 Update on working list of the ARB draft performance measures (PMs)

Ryan and Danielle provided an overview of the current list of Performance Measures (PMs). For this work, a PM is any visual that shows the status of an interest to a Working Group participant (e.g., fish species, navigation, streamflow). Issues are reflected in the PMs. PMs will be used to show the direction and magnitude of change on an issue of interest in response to a simulated change in the system. Base case is where we are today. “How the needle moves when we simulate something” – direction and magnitude are important to look at when looking at simulation results.

A print out was provided on tables as a walk through list of PMs. They are not final, we are looking to vet them and refine as needed. All scenarios being shown are mocked up for visual purposes and do not use real data.

Current list of PMs grouped into:

- Water management
- Ecological
- Social

Question: How do you evaluate the different scenarios? Water demand water use? One scenario at a time?

Response: You can look at one scenario at a time or multiple (3-4). Graphs can get busy if you look at too many at the time.

Question: Temperature data graph was shown at a confluence near Fort McKay. Why there and can this be done elsewhere in the Basin?

Response: Yes, we have data for that site so we chose to show this as the data was there so we could draft the PM. Yes, other areas of the mainstem where temperatures can be shown at other confluence sites, and we can choose any where we have data.

Question: How do you define a shortage?

Response: Any amount of water over the amount that the model can give; this can be defined in a number of ways.

Question: Water demand numbers come from?

Response: Actual use or, in the case that there is no reported use data, we are using allocation.

Question: In the OASIS model example (plot) how to you compare different scenarios?

Response: The different scenarios are all shown on one graph.

6

Breakout Groups - Session 2: What PMs are needed to represent and show movement on the issues that have been identified?

Participants were asked to break into three groups again, to discuss what PMs are needed to represent and show movement on identified issues. The discussion should include review and refinement of the PMs drafted based on meeting #1 input, and to identify new PMs needed to effectively visualise and quantify the issues and opportunities discussed earlier.

Participants created three sub-groups representing three areas of the basin to include:

Table 1 (Megan and Danielle): Lower Basin

Table 2 (Denise and Ryan): Central Basin

Table 3 (Claire and Mike): Upper Basin.

The following is a summary reflecting the discussions at the tables in the readouts as well as points from flip charts.

Table 1 (Megan and Danielle)

- Started by identifying issues in the basin. Firstly, the issue of climate change impacts on flow was mentioned. “Reduction” in flow volumes should be “change” in flow volumes, since there could be a shift in seasonal flows, changes from snow to rain, changes in overall annual flow, etc.
- Discussion around the issue of sedimentation at water intake points. Recognition we are not modeling sediment—table agreed this is likely a reflection of design/maintenance issues, rather than a basin water management issue.
- Navigation is an issue in specific parts of the basin (downstream of Fort McMurray, in the PAD, at the mouth of some tributaries, and at Lesser Slave Lake).
 - PM: Aboriginal Navigation Index (ANI) has correlated navigation to flow downstream of Fort McMurray. We can use this.
 - PM: Lesser Slave Lake navigation is correlated to lake levels. Follow up with Meghan Payne.
- Sustainability of fish populations and availability of fish habitat. Fish populations and habitat can be affected by changes in flow, changes in winterized cover, and changes in temperature.
 - PM: Specific work was done in the LAR (P2FC) correlating fish habitat to flow. We can build off this.
 - PM: Coarser work correlating flows to fish habitat (Fish Habitat Index [FHI] for February and August) was completed in other sub-basins. Follow up with Andy Paul. Apply at HUC8 level.
 - PM: A flow instability index (or “flashiness” indicator) was also created (follow up with Andy Paul). This may be useful to look at as well. Apply at HUC8 level.
 - Fish Sustainability Index (FSI) indices are also available through ALCES Online.
- Maintenance of ecosystem health was another issue mentioned.
 - PM: Look at applying the Alberta Desktop Method.
- How will integrated water management, in particular water reuse and water return policy, impact the basin once the policy mechanisms are specified?
 - PM: Such an impact could ultimately be detected through changes in water use. Goals of a water reuse policy might include; reducing water shortages/providing water supply; protecting the environment; allowing development to reclaim and reconnect closed loop systems; maintenance of water quality.
- Land disturbance.
 - It was requested to see a PM of land disturbance/reclamation → this could potentially be modelled as a scenario rather than a PM. As long as there is a way to reflect mine closure plans.
 - Similarly change in wetland footprint could be modelled as either a PM or a reclamation scenario.
- Another issue raised was the hydrological impacts of fragmentation of peatland wetlands due to

road crossings and recreation.

ACTION: follow up via Dallas to tap into SAOS work.

ACTION: follow up via Pat to tap into iFROG work.

- Final issue mentioned concerned off-stream storage. Some operations already have off-stream storage and it is mandated in some places. Does the model reflect that accurately?

NOTE*** on “buckets” of issues, use the term human or social, instead of anthropological.

- Discussion turned to existing list of PMs and potential changes. It was noted PM #14 (flooding) should clearly state it is freshet/precipitation caused and ice-jamming is not reflected in this PM. A toggle to the PM was requested so the user can switch between 1:25, 1:50 and 1:100 year flood thresholds.
- PM #10 (Dissolved Oxygen)
 - Develop this PM in locations where DO is an issue (not an issue in Fort MacKay area).
 - ACTION: Follow up with Donna/Dan.
- PM #2 (Net water use upstream of Fort McMurray)
 - ACTION: Follow up with Pat to verify how this is represented versus the framework.
- PM #1 (Seasonal shortages)
 - Visually separate the mainstream shortages from tributary shortages (i.e. break it down further on the map).
 - Adjust colour coding to be more intuitive (i.e. Green = good, Yellow = getting worse, Red = bad). There should not be any clear colour.
- Other comments included:
 - Use cms (m³/s) units for most PMs.
 - Follow-up with Carolyn to go over what’s in the base case.
 - Follow-up with Andy Paul in regards to using different locations/thresholds for the stream temperature PM, and in regards to modelling the registrations and lake stabilization licences.

Table 2 (Denise and Ryan)

- Other issues include shoreline development on south shore of Lesser Slave Lake and on shores of some smaller lakes in the central basin.
- Navigation is an issue on smaller tributaries in some areas of the central portion of the basin. This is due to many factors and may become more problematic in future drier conditions.
- Phosphorus loading from agriculture runoff needs to be addressed. The soil water assessment tool (SWAT) could be used to predict phosphorus and sediment loadings in runoff. Oil and gas development impacts on Swan River and Agriculture runoff impacts in the South Heart River basins are examples of known issues that could benefit from this assessment.
- Water reuse of runoff should be examined as an issue to be addressed.
- Environmental base flows are needed to be identified and enforced throughout the basin. These flows need to be defined to address aquatic health and, in particular, the impact on fish as populations have been and continue to be impacted (e.g., whitefish and walleye; Northern pike

throughout the basin; and Arctic grayling at Swan River and Sawridge Creek).

- Other issues particularly of the South Heart area include: Wanagame Lake with South Heart Dam has poor water quality with decreased dissolved oxygen as a result of agricultural runoff, and it is noted that Peavine community lost land due to the dam and reservoir. Blue green algae are a problem in this reservoir and other stagnant water bodies and lakes.
- Beaver management on small tributaries is needed to ensure flows for water supply and aquatic health (identified as community-based issues at Gift Lake and Bigstone Cree communities). Note that in other places in the central basin, agricultural areas may benefit from beaver dams—slowing flows and retaining water and the beaver is regarded as a benefit.
- Lack of buffers and riparian areas degradation are a problem as these are contributing to sedimentation, water quality is impacted negatively as water is not filtered through intact areas. Use restoration techniques, including bioengineering best management practices to address this issue and monitor and measure the mitigation effects.
- Private land practices are adding to sedimentation; improve private landholder engagement.
- Reuse for industry policy and regulations are needed so as to match quality to use and be more efficient in the use of water in the basin.
- Monitor and create ways to manage water use. Municipalities could incentivize conservation.
- Protection of wetlands and wetland complexes such as those near Buffalo Bay is needed. Recognize the importance of wetland connectivity and relationship to hydrologic function and flow.
- Maintain water flows and water table levels; for example, Gift Lake and Gift Lake River are areas of concern.
- Add or expand as PMs: Ecological considerations to be examined using walleye recruitment data for local conditions. For example, the Fish Sustainability Index (FSI) exists and could be helpful to inform this as a PM.
- Nutrients could be added as PM. Phosphorus is a nutrient that should be examined in lakes as well as other water bodies. For example, Baptiste Lake has years of record of data that may inform how to examine phosphorus and make this into a PM. Also, best management practices for phosphorus management could be implemented based on land use type, and effectiveness could be tracked to determine cumulative benefits (positive effects on phosphorus reduction) over time.
- Spill tracking records system and reporting requirements, along with monitoring, is needed to inform cumulative effects over time. Build data sets and trust over time for improved water planning and management.
- Manage and make information accessible to community level decision makers and at other scales.
- Use linear disturbance per square kilometer as a PM, particularly focusing on critical areas for habitat and other types of critical areas for water and impacts on flows. Some of this information is available through the Water Planning and Advisory Councils (WPACs).

Table 3 (Claire and Mike)

Question: Are PMs retrospective?

Response: Yes, PMs can be used to look at the past (historical hydrology), but generally they will

be used to look at the system (demands, infrastructure, land use) as it is today. We'll be looking at future flows (due to changes in climate, landscape, and/or demands); PMs are used to compare a simulation of today and a possible simulation of a tomorrow.

Question: Is fire a factor that will be looked at? When a fire hits it is a big user of water in an area.

Response: Fire can be looked at with respect to landscape changes. Currently water use for forest fires isn't accounted for, but it is something that could be looked into by adding a demand in the model.

Question: Should shortages be looked at weekly, is that too granular?

Response: Shortages can be looked at in more detail in the model; the shortage PM shows shortages at a large scale for comparative purposes between different model runs.

Question: Will the model show effects of climate change on vegetation (e.g., vegetation growth changes, shifts in vegetation cover)?

Response: Yes, the model can simulate effects of climate change on vegetation; this is something that can be assessed when discussions and modelling occur around landscape change.

- It would be useful to look at water supply changes when peatlands or wetlands are lost (note: peatlands don't release as much water as prairie pothole systems and other wetlands).
- PM 10 and 11: For Dissolved Oxygen (DO) and stream temperature, the Freeman site was brought up as a good representative part of the upper portions of the watershed. Currently there is only one DO PM, it shows DO at Fort McKay. This is too far downstream, generally DO is not an issue in the lower Athabasca, but it is an issue in the upper Athabasca. There used to be five DO monitoring sites along the river located at Windfall, Smith, Hinton, Athabasca, and Obed. An additional DO PM prior to Grande Rapids would be useful. There has been a lot of DO modelling on the mainstem in the past done with the pulp mills.
- Regarding temperature – we should touch base with a fisheries biologist in the headwaters to understand local changes in cold water fish. This information could help refine a temperature/fish PM for the headwaters areas; two types of fish of particular interest are the grayling and Athabasca rainbow. There may be an opportunity to partner with the NWT to monitor where the NWT has concerns as well. A good point to look at stream temperatures would be on the Athabasca at the Freeman River confluence, near Fort Assiniboine. This would be a good place to have DO information as well as a PM for fish.

ACTION: follow up with AEP (Myles) to get info on temperature and DO information and data.

- Issue raised meeting of Instream Flow Needs (IFNs): Is there a formula used to calculate IFN for TDLs? Could this be used to put in basin wide IFN calculations or on all the major tributaries? If IFNs were implemented all along the Athabasca and on major tributaries how would that change shortages? How would that impact fish etc.? What kind of management techniques can be used to meet IFNs?
- Possible new PM: showing the possible change in growing degree days or another indicator of future heat units would be useful to inform discussions around changes in irrigation and/or crops in the basin.

- Man-made impacts on the PAD. How will we know if the opportunities address man-made degradation to the PAD? (i.e. if opportunities work to counter-act man-made degradation to the PAD).
- Town of Whitecourt/Millar Western Plant—spurs added in the river to prevent erosion, there is worry that the mill will be washed away. Beaver Creek used to run through where the mill is now.
- PAD PM—is there a threshold here (or elsewhere) to indicate health of the PAD? Not directly, but we have a PM that shows changes in flow to the PAD.
- Possible glacier PM – to show a mass balance or changes in percent contribution of glaciers (and other streamflow contributors) to the Athabasca over time.
 - This PM has been developed and can show changes in percent contribution from different sources.
- A graph showing change in time of spring freshet. This can be viewed in graphs within the model, which can show the change annually.
- PM #8—could this PM be calculated differently or a new PM developed to align with the water quantity index? This index is used as part of AEP state of the environment reporting, is it possible to calculate PM #8 differently to reflect this? This might be possible; we can look into it if AEP can provide the information and calculations.

ACTION: Mike to follow up with Zahid from AEP on these calculations and see how it can, or does, relate to the already developed PM.

- Upstream oil and gas access – Access to water is contingent on an upstream flow meter. Instream flow must be met otherwise water cannot be withdrawn and there is a shortage in the model.
- Lake level decline seems to be an issue in a number of lakes in the ARB that are being monitored. Data sets are relatively short (20-30 years) and may not reflect natural longer term climate cycles (~60 years) that have shown to heavily influence lake levels in other areas. If the lakes are being explicitly modelled in the model then lake levels should be looked at in those lakes.

ACTION: Mike to follow up with Ahmad from AEP to get list of lakes that are of concern.

7 Update on the TOR and modelling information for this work

Denise reviewed the draft terms of reference (TOR), which defines the scope and collaboration on the project. The TOR specifies the projects outcome: to balance the interests and needs of the basin. Denise asked for any and all feedback on the revisions made to the TOR. She also mentioned any comments today and through until the January meeting may be incorporated as desired changes to the TOR. There may not ever be a final copy of the TOR—it is a living document and all changes will always be reported back to the Working Group.

Question: Will we share the meeting notes from today at/before the Fort McMurray meeting on January 17' 2017?

Response: Yes, we will send these notes to every Working Group member, including those who will be attending the Fort McMurray meeting.

Claire provided a quick review of what was covered last meeting, as well as a quick modelling 101 and what we should expect in future meetings. She made note of the fact that last meeting was very technical and we may have lost some people, so we are taking a step back in today's meeting. Claire also noted the model is a scale-appropriate tool we can use to understand the current system. No model is 100% correct, just correct enough to inform and facilitate discussions. Claire mentioned that we will stay "out of the weeds" at the Working Group meetings (in regards to the details on how the integrated model was built) but those details are available if someone is interested. As a Working Group participant, you do not need to know how exactly the model works, unless you want to, in which case you can join the modeling sub-committee. At the Working Group meetings we will mainly focus on the inputs and outputs to the model.

Claire explained how we can use the model to look at different scenarios and how they will move the needle on certain PMs, when comparing to the base case. We can examine in what direction the PM has changed and to what magnitude. Specifically, at the next meeting we will be looking at climate change scenarios and how climate change may affect the system. Claire showed an example of the shortage PM and how the shortages increase under climate change. She then showed how a climate change mitigation scenario can be explored in the model to see if it will help decrease our shortages and bring us back closer to the base case.

Question: One of the principals of the TOR is to avoid significant harm to the environment. Where does that fit in with modelling different scenarios?

Response: The roadmap developed together as an outcome of this project won't say this is what will happen, it will say this is what could happen, and additionally it will reflect the trade-offs surrounding each specific strategy. For example, strategies that involve infrastructure projects (i.e. dams) will identify the potential associated environmental, social, and economic impacts that can be considered as trade-offs for that strategy.

Mike then explained the model simulates surface water quantity on a daily time step and is driven by operating rules that can be changed by the user. The main stem Athabasca is being modelled as well as the specified tributaries in the TOR. He reminded everyone this is an iterative process. He then briefly updated the Working Group on updates made to the model since the last meeting. Mike reviewed the slides showing the model updates, which include:

- Incorporated water quantity objectives from the Muskeg River Interim Management Framework for Water Quantity and Quality.
- Incorporated weekly flow triggers and cumulative water withdrawal limits below Fort McMurray as per the SWQMF under LARP.
- Added labels (licensee names) to nodes in the model.
- Added the registrations into the model by sub-basin.
- Compared simulations of full allocation and actual usage volumes with projections from water use in for oil sands mining used in P2FC (Golder, 2009).
- Compiled a list of control structures existent in the ARB and added structures to model as needed.
- Followed up with licensees to confirm use in model and determine whether it is necessary to ungroup certain demands.
- Checked if there were other environmental flows to be incorporated into the model.

- Checked for actual use for environmental management water licences.
- followed up on a GIS stream order layer to manage TDL shutoffs, and
- Added tributaries to align with water quality modelling being done by AEP/JOSM.

Question: Will you be asking other operators to confirm water licenses?

Response: Yes, we will check in with contacts at Syncrude and can also check with COSIA.

Question: Not all PMs can be addressed by the model so we can document and move those forward. How do we do that? For example, policy discussions might be needed. Roadmap and policy changes and legislation that could be done, what how and what are benefits and trade-offs.

Response: Yes, we can keep a list of these and structure our lists of outcomes to ensure they are part of that record. This will also be a way to capture the knowledge of the expertise in this room and key considerations around opportunities.

8 Next Steps and Close

Mike ended the day with some closing comments. He asked for any thoughts or comments for what people wanted to see/address in the third (next) meeting. There were no comments.

Next meeting is January 26, 2017.

Mike invited everyone to the supplementary meeting in Fort McMurray on January 17, 2017 if people want to attend, although it will cover much of what was covered today. He finished by asking for any schedule conflicts during the weeks of March 13 and March 20, 2017 for the fourth meeting. Potential conflicts mentioned were the Alberta Chapter of Wildlife Conference on the March 17 and school breaks. St. Patrick's Day would not be a preferred day. Mike will look into potential dates and send a meeting invite for a time in March.

Final comments and reminders included:

- Mike made a few summary remarks, noting how valuable today's discussion was.
- Slides and meeting summary will be circulated to participants for information and comment, and the project team will follow up with individuals on specific discussion points.
- Participants were encouraged to contact the project team with ideas and suggestions for the project, model inputs, and data.
- We will be contacting those interested in the data and modelling committee.
- Mike will send out invites for the fourth Working Group meeting in March 2017.
- We look forward to seeing everyone at the January 26 meeting. Also looking forward to seeing people if they choose to attend the January 17th meeting in Fort McMurray.

Mike acknowledged today's excellent contributions and thanked everyone for their support, enthusiasm and input, and adjourned the meeting at 3:45pm.

The background of the slide is a photograph of a river with clear, turquoise water. The far bank is lined with a dense forest of tall evergreen trees under a cloudy sky. A semi-transparent light blue vertical bar is on the right side of the image, containing the title and meeting information.

Sustainable Water Management in the Athabasca River Basin Initiative (ARB Initiative)

**Working Group meeting #2
December 1, 2016**

About Alberta WaterSMART

OUR MISSION

We are committed to improving water management through better technologies and practices, for the social, economic and environmental benefit of current and future Albertans, and sharing our solutions with Canada and the World.

ACHIEVED THROUGH

Project development and execution

Identifying opportunities and innovative solutions to work toward a vision of improved water management

Collaboration and communication

Valuing collaboration and engagement by bringing diverse individuals and organizations together, to work toward common goals and accommodating multiple interests

Water strategy

Conducting effective projects on water strategy for corporations, consortiums and other organizations

Supported by people knowledgeable in all aspects of water management at local, regional, and global levels

Welcome and introductions

| Today's Agenda | | |
|----------------|--|-------------------|
| 9:00 | Welcome, introductions, and opening remarks | Mike |
| 9:30 | Common context: Tour of the Athabasca River Basin | Ryan |
| 10:00 | Update: Working list of the ARB's water issues and opportunities | Megan |
| 10:15 | Break | - |
| 10:30 | Breakout groups: What opportunities need to be referenced or addressed in a Roadmap for Sustainable Water Management ? | All |
| 11:45 | Readouts to plenary | Group Reps |
| 12:00 | Lunch | - |
| 12:45 | Update: Working list of the ARB's draft performance measures (PMs) | Ryan and Danielle |
| 1:15 | Breakout groups: What PMs are needed to represent and show movement on the issues that have been identified? | All |
| 2:30 | Readouts to plenary | Group Reps |
| 2:45 | Break | - |
| 3:00 | Update on the changes from feedback to the draft TOR | Denise |
| 3:15 | Modelling reminders: How the modelling will be used to develop the Roadmap and at the next meeting | Claire |
| 3:55 | Next steps, and close | Mike |

Chatham House Rule

Be bold; be innovative; focus on fixing the problem, not the blame!

- Chatham House Rule applies

The **Chatham House Rule** is a system for holding debates and discussion panels on controversial issues, named after the headquarters of the UK Royal Institute of International Affairs, based in Chatham House, London, where the rule originated in June 1927.

It is designed to increase openness of discussion.

The Chatham House Rule reads as follows:

“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.”

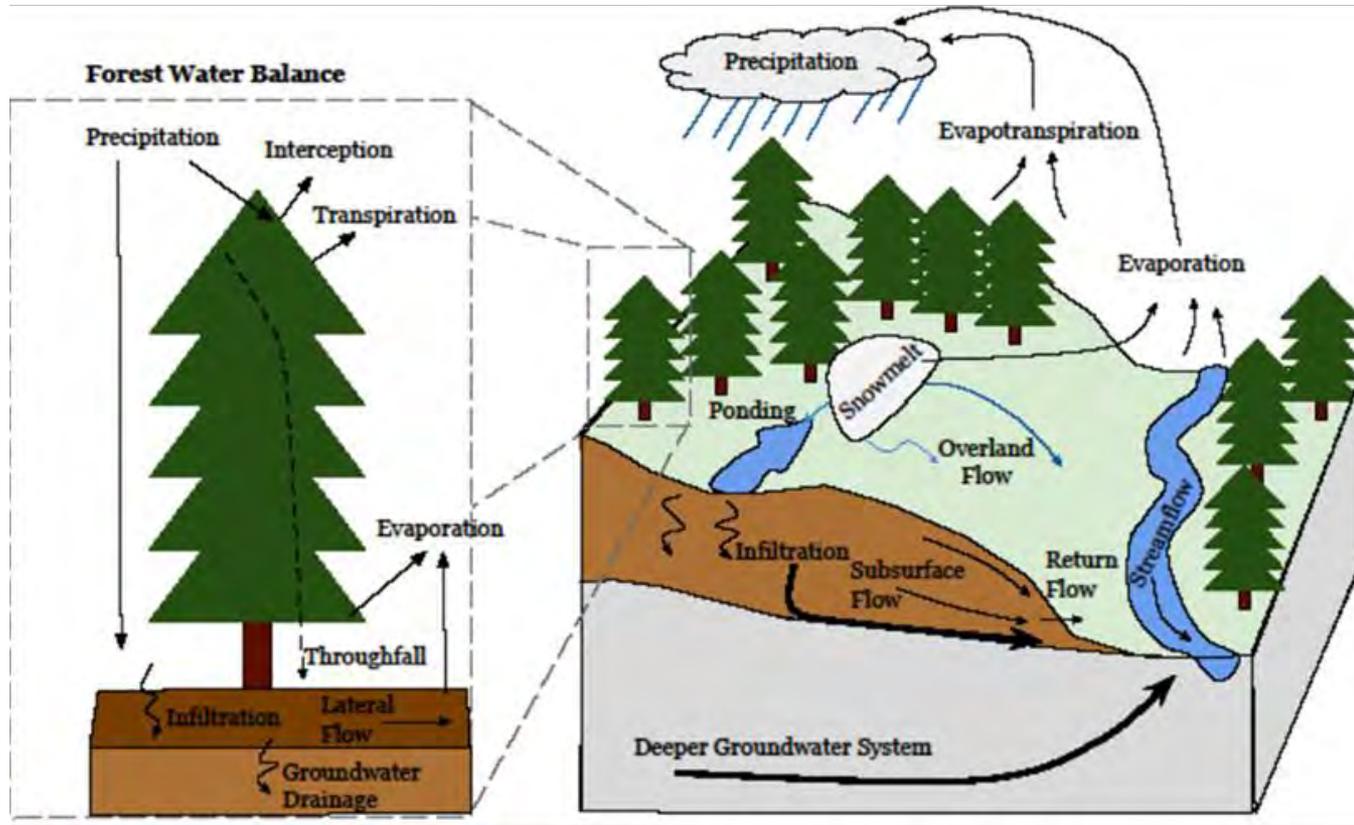


Keep in mind...

- There is lots of info here....slides will be sent out after today
- Everything here can be shared publically
- Can ask questions as we go through the slides and during the working sessions today
- Some of the material will be reviewed in future meetings
- This process is iterative - it is on going work
- The integrated model is built and represents the system based on available data and information to date

Reminder: Model and data platform

- The integrated model is a representation of a large complex system



- No model is 100% correct – the intent is to have a model that is correct enough to facilitate informed discussions
- The model is a scale appropriate tool for the Working Group to understand the current system and explore how it might change.

Reminder: Goal for this work is an ARB Roadmap

A Roadmap is:

a set of strategies and implementable actions, developed by an inclusive basin-wide working group using collaborative modelling and dialogue, that provide a recommended path toward sustainable water management in a basin. Roadmaps help inform future planning and management efforts as they relate to water.

This current scope of work will build a “Roadmap for Sustainable Water Management in the ARB” (ARB Roadmap).

- Starting with surface water quantity
- Additional components of the Roadmap can be built on this surface water quantity Roadmap work (e.g., water quality)

South Saskatchewan River Basin (SSRB) Adaptation Roadmap

Increasing degrees of adaptive capacity 



- Achieve CEP Plan targets
- Assign and transfer water allocations
- Share water within IDs
- Upgrade critical water management infrastructure
- Release functional flows (Oldman)
- Build flood defence berms where necessary
- Institute Ghost Reservoir flood operations agreement
- Develop large scale flood mitigation facility on the Elbow
- Replace Glenmore stop logs with operable gates

- Institute a long term watershed management agreement with TransAlta for the Bow
- Raise winter carryover in irrigation serving reservoirs
- Further shortage sharing within and between IDs
- Develop shortage sharing frameworks by basin
- Restrict greenfield development in the floodplain
- Increase St Mary operating FSL by 1M
- Effectively implement Alberta's wetland policy
- Improve and resource forecasting
- Adjust Dickson Dam operations (for WCO, supply, functional flows)
- Advance conveyance opportunities (Room for the River)
- Advance natural detention opportunities (Room for the River)
- Apply land use best management practices
- Promote further municipal conservation

- Redesign operations of all upstream Bow reservoirs for water supply purposes
- Expand and balance Chin Reservoir (Oldman)
- Build new SAWSP and Acadia off stream storage
- Pursue more extensive relocation and buyouts in floodplain
- Build series of new off stream storage in the Oldman basin
- Build series of new offstream storage in the Red Deer basin

- Build new storage low in the Bow basin (~Eyremore)
- Build new off stream storage in the WID (~Bruce Lake)
- Build new on stream storage in the Southern Tributaries (~Kimball)
- Build new on stream storage low in the Red Deer basin (~Ardley)
- Reduce minimum flows through municipalities as an exceptional measure

Blue highlights the most promising strategies within a level

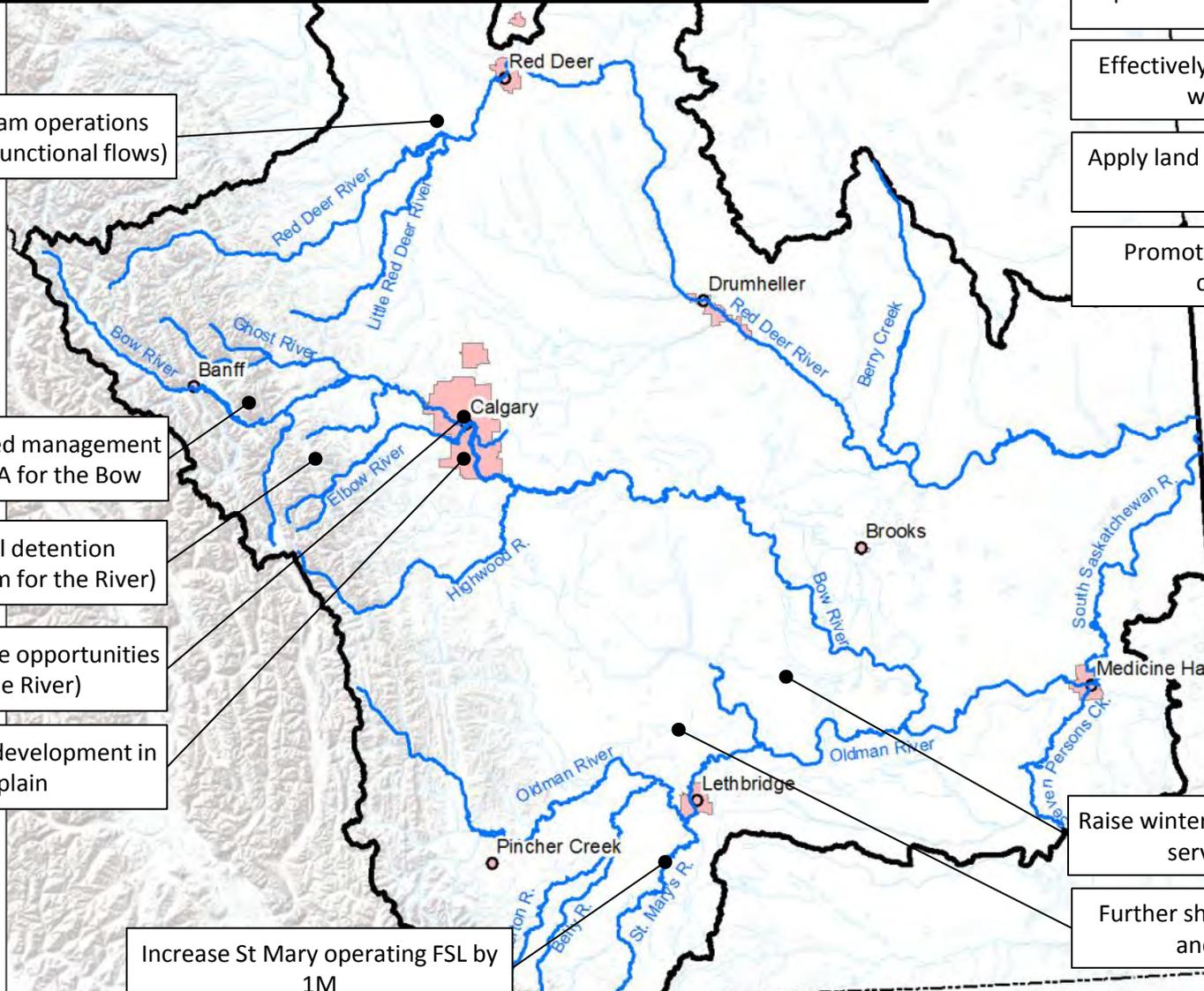
SSRB Adaptation Roadmap Level 1

Challenges and opportunities are basin specific, and will vary compared to similar work in other parts of Alberta and the world.

SSRB wide

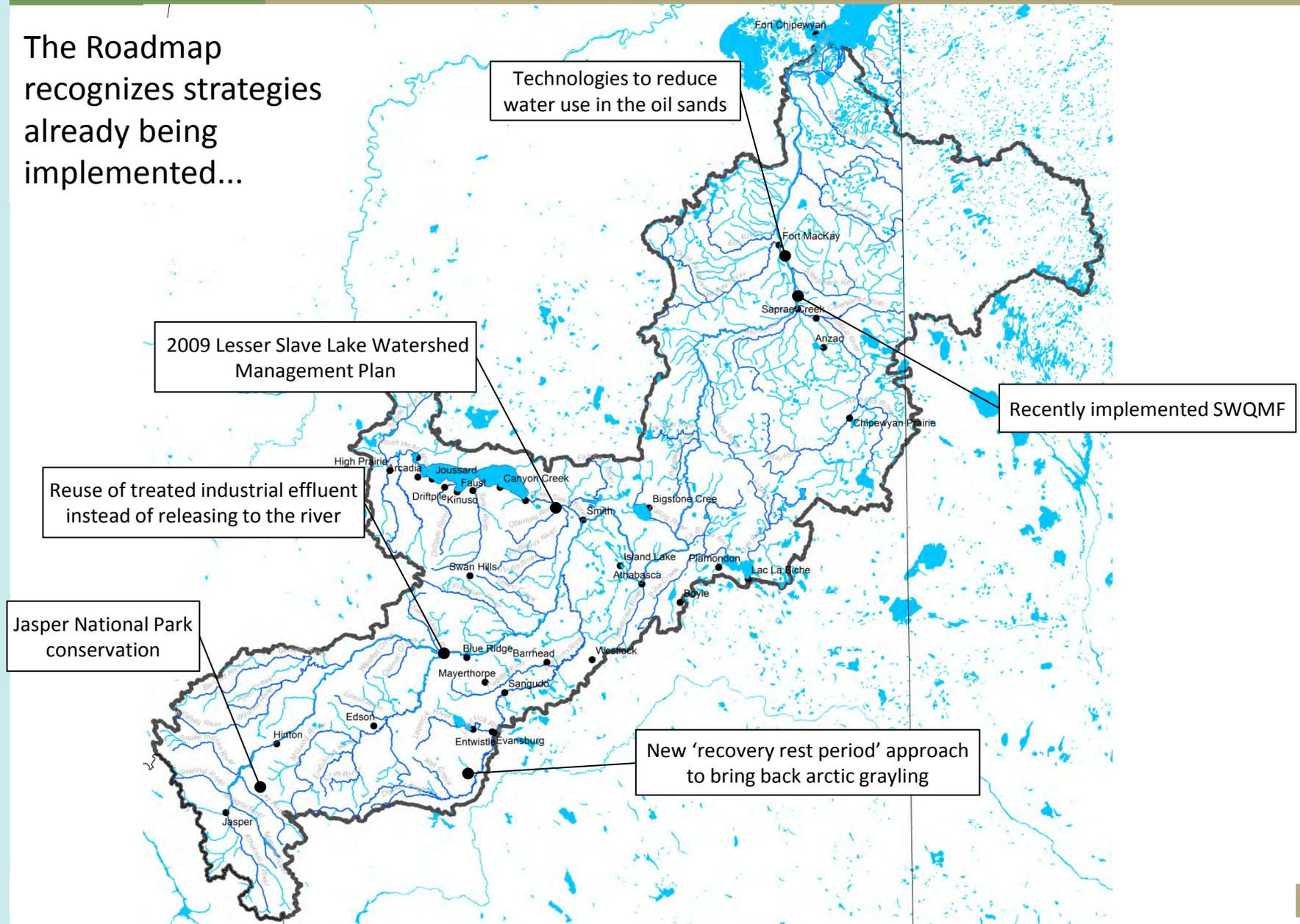
- Develop shortage sharing frameworks by basin
- Improve and resource forecasting
- Effectively implement Alberta's wetland policy
- Apply land use best management practices
- Promote further municipal conservation

AB



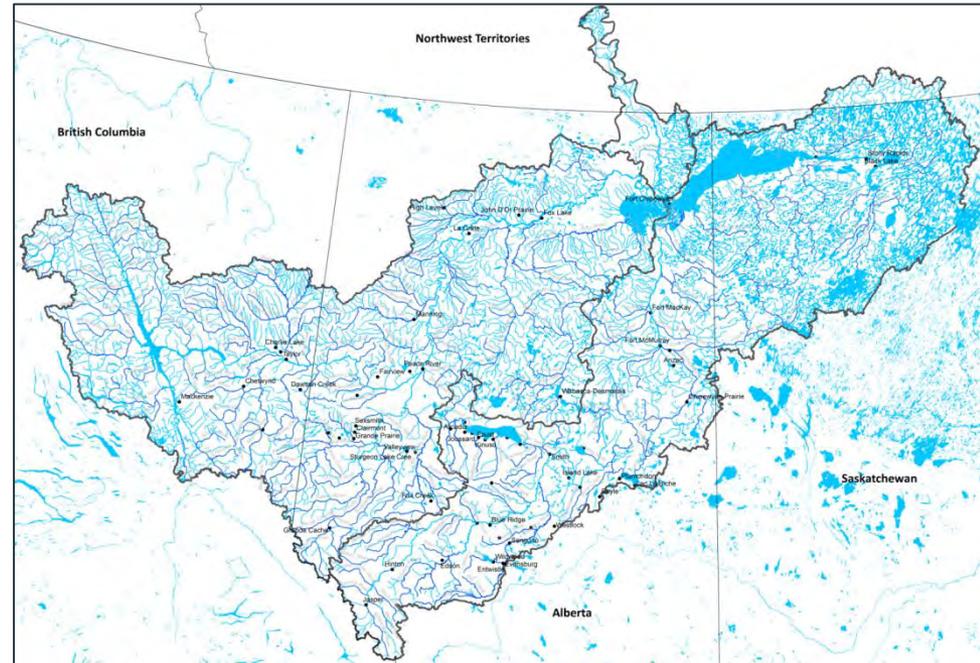
Activities in today's water management system

The Roadmap recognizes strategies already being implemented...



Vision: Roadmap for sustainable water management in northern Alberta

Athabasca River Basin (ARB) Initiative
+
Peace-Slave River Basin (PSRB) Initiative
=
Collaborative review of water
management issues and opportunities
for the **WHOLE** Slave system in Alberta
↓
**Roadmap for sustainable water
management in northern Alberta**



- Begin with focus on surface water quantity management
- Observe boundary agreements and existing water law
- Engage in collaborative and proactive water management for the basin

Athabasca River Basin (ARB) Initiative: progress

Project funding to date (\$1,250K of \$1,750K) from:

- AI-EES, ATCO, Suncor, Repsol, AEP Policy; AEP Monitoring and Science

Letters of support from:

- ATCO, Shell, Suncor, Teck
- AEP Policy, AEP Monitoring and Science
- WPACS: LSWC, BRBC
- Alberta Newsprint Company, Westmoreland Coal, Alberta Forest Products Assoc., Al-Pac

Participation in first two working sessions:

- ~ 4 First Nations and Métis groups
- ~ 7 Federal and Provincial government agencies
- ~ 6 Municipalities, municipal districts, and counties
- 2 Watershed Planning and Advisory Councils (WPACS)
- ~ 7 ENGOS/NGOs groups
- ~ 10 Industry (companies and groups)

Status update:

- First working group meeting was well attended and productive
- The second and third working group meetings are scheduled for Dec 2016 and Jan 2017
- To our knowledge, the integrated model has been further advanced than any other model at this scale
- Participants have actively identified basin water issues
- Participants are developing Performance Measures to visualise issues and evaluate strategies

Project timeframe: May 2016 to December 2018

Peace-Slave River Basin (PSRB) Initiative: progress

Fully scoped project:

- Preliminary basin issues and opportunities
- Leverage ARB Initiative project lessons and resources
- ~\$1.6M budget, 22 months
- AI-EES structure

Expressions of commitment from range of participants:

- AI-EES
- MPWA
- ATCO
- Seven Generations
- Aquatera

Confirms value of covering the WHOLE Slave system:

- Water issues in the Peace-Athabasca Delta (identified as key for most ARB participants)
- Transboundary considerations
- Hydropower development in B.C. and Alberta

Status update:

- Project is ready to launch
- Alignment with needs of the basin continues to be a priority
- AEP is embarking on an internal planning process for 2017 and beyond; through this process they will ascertain how PSRB fits into their priorities and program deliverables
- As a result, AEP is not yet able to support the launch of the PSRB Initiative

Project timeframe: Needs to be launched in early 2017 to maintain momentum and participant interest

Update on feedback from meeting #1

Very technical discussion at Working Group meetings

- 1st meeting had lots of technical discussion- important to have an open and transparent tool that people can trust and understand to help inform the interpretation of the results.
- Technical model information is available and documented, but we will be attempting to avoid technical modelling discussions at the full Working Group level.

Suggestion to establish a “data and modelling committee”

- Periodic conference calls/emails to vet data, modelling logic/assumptions, etc., as need.
- Modelling and data will still be made available, and updates provided to the Working Group.

Are there any volunteers or people interested in being part of this committee?

Update on feedback from meeting #1

How to best achieve meaningful participation

- Always striving to make sure we have the fullest representation possible for this work.
- Not everyone is able to make every meeting because of other commitments.
- If there is a group currently not represented you feel would meaningfully contribute and should be here please let one of us know.
- Supplementary meeting in Fort McMurray for Working Group participants in the Fort McMurray area.
 - This meeting would be in addition to today, the agenda will be much the same.
 - We hope that this dialogue will help inform groups and communities decision to participate going forward.
 - This meeting is open to everyone from the Working Group if you wish to attend.
- “Sharing sessions” planning for interested First Nation and Métis communities over the next ~6 months.

Update on feedback from meeting #1

Water quality and the ARB Initiative

- Under the current scope of work, water quality will be modelled as it relates to ecosystem water quantity (i.e., temperature and dissolved oxygen).
- Water quality (e.g., contaminants) can be included in future work of this nature (building on the surface water quantity Roadmap work)

Linking this work to the Peace-Athabasca Delta (PAD)

- We are not waiting to start the PSRB work to look at the PAD
- Looking at changes in flow from the Athabasca to the PAD, and using PMs that show relationships to flow and interests in the PAD (e.g. Walleye recruitment)

The ARB Initiative provides a base of knowledge and tools that can be built upon

Thank you for your feedback on the model

Based on feedback from the last Working Group meeting we:

- incorporated water quantity objectives from the Muskeg River Interim Management Framework for Water Quantity and Quality
- incorporated weekly flow triggers and cumulative water withdrawal limits below Fort McMurray as per the SWQMF under LARP
- added labels (licensee names) to nodes in the model
- added the registrations into the model by sub basin
- compared simulations of full allocation and actual usage volumes with projections from water use in for oil sands mining used in P2FC (Golder, 2009).
- compiled a list of control structures existent in the ARB and added structures to model as needed
- followed up with licensees to confirm use in model and determine whether it is necessary to ungroup certain demands
- checked if there were other environmental flows to be incorporated into the model
- checked for actual use for environmental management water licences
- followed up on a GIS stream order layer to manage TDL shutoffs
- added tributaries to align with water quality modelling being done by AEP/JOSM

If you see something on this list that you are interested in then please follow up with one of us during a break or after the meeting and we can provide details on the update.

ARB Water Management

Recognizing past and current work

This Initiative recognizes the work completed and underway... including:

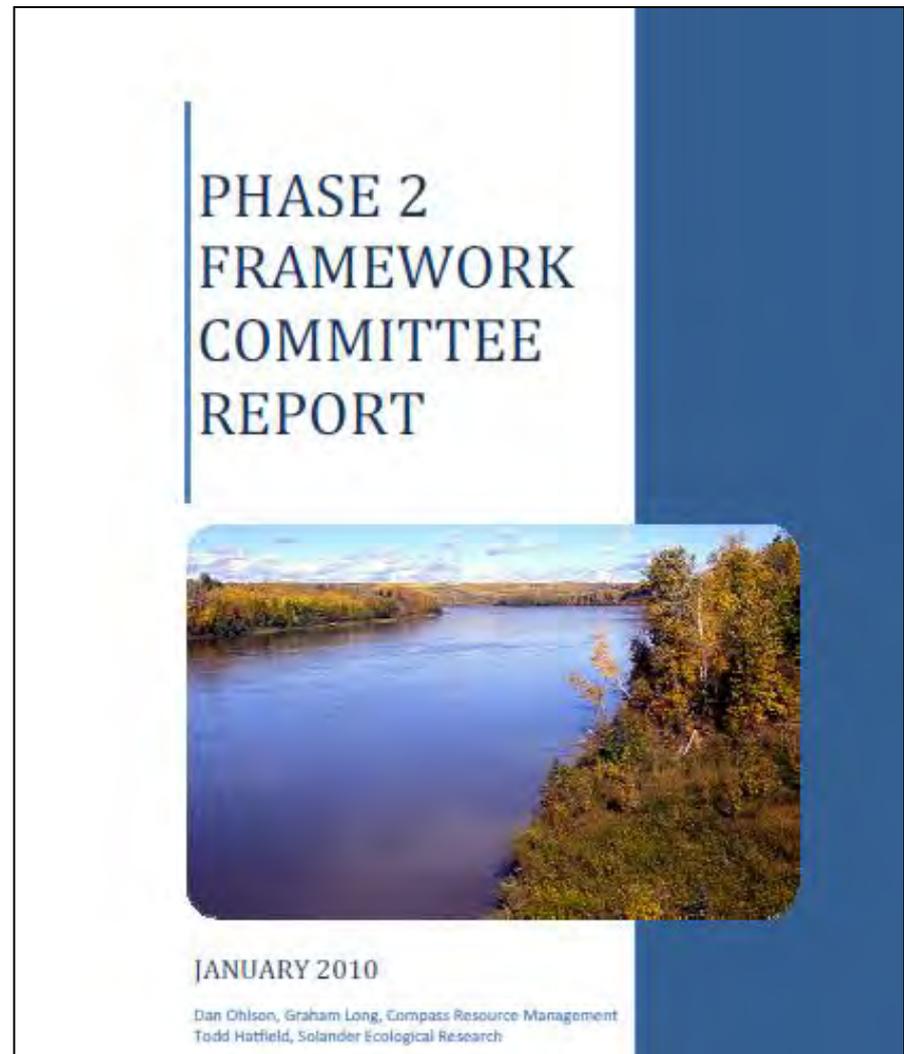
- Northern Rivers Basin Study
- Phase 2 Framework committee (P2FC) and Surface Water Quantity Management Framework
- Lower Athabasca Regional Plan and related frameworks
- Athabasca River Basin flood mitigation study
- State of the Basin reports

What's missing:

A basin wide collaborative effort to inform decision making and create a common understanding of the issues and opportunities across the Athabasca Basin for proactive water management.

Phase 2 Framework Committee (P2FC)

The Phase 2 Framework Committee (P2FC) was a multi-stakeholder committee established in 2008 to develop recommendations for a Phase 2 Water Management Framework to prescribe when, and how much, water can be withdrawn from the Lower Athabasca River for cumulative oil sands mining water use.



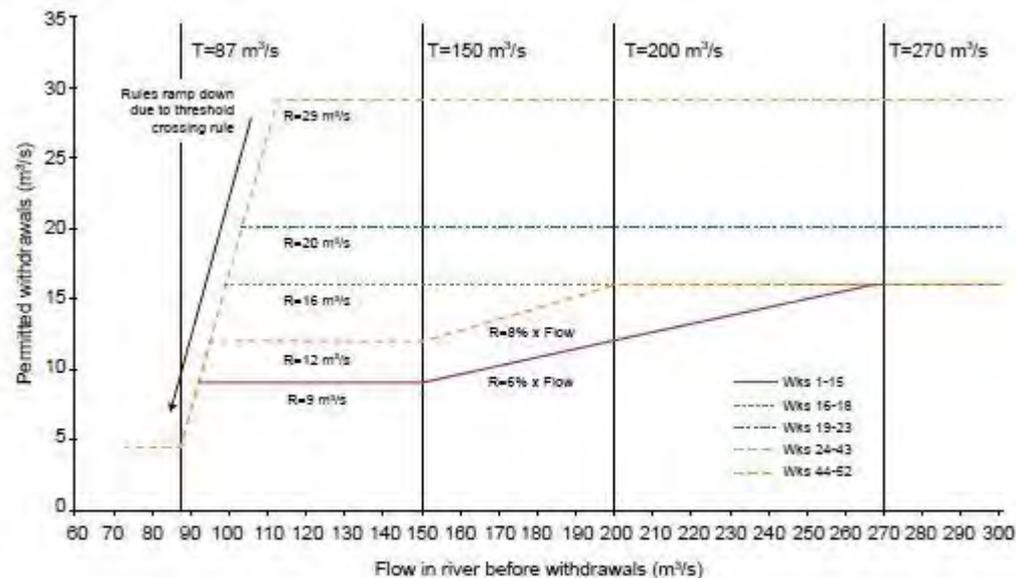
P2FC and the ARB Initiative- similar but different

| | P2FC | ARB Initiative |
|------------------|---|---|
| Objective | <ul style="list-style-type: none"> Find a set of rules that could effectively manage long term, cumulative oil sands mining water withdrawals. | <ul style="list-style-type: none"> Understand and explore proactive opportunities to respond to changes in climate, landscape, and growth for the whole Athabasca basin. Build a “Roadmap for Sustainable Water Management in the ARB” (ARB Roadmap) for surface water quantity through collaborative modelling and discussion, for the whole ARB. |
| Scope | <ul style="list-style-type: none"> Oil sands mining water withdrawals from the Lower Athabasca River to maintain ecosystem functions through seasonal flow. Assessed changes from climate change projections, and changes to Aboriginal Navigation Index, fish habitat. | <ul style="list-style-type: none"> Flow quantity in the whole Athabasca River main stem, and the major tributaries up to Embarras Airport. Focus on surface water river management, landscape and climatic change; water quality as it relates to water quantity; groundwater contribution to streamflow; changes in flow from the Athabasca River and that can related to the Peace-Athabasca Delta (PAD). Plans to build on this work by looking at the whole Slave River system, including the PAD. |
| Outcomes | <ul style="list-style-type: none"> Recommendations for a Phase 2 Water Management Framework to prescribe when, and how much, water can be withdrawn for cumulative oil sands mining water use. Lower Athabasca Region Surface Water Quantity Management Framework (2015) updated and replaced the 2007 Water Management Framework based in part on these recommendations. | <ul style="list-style-type: none"> ARB Roadmap that will provide a path forward with actionable and implementable strategies to support sustainable water management across the ARB based on potential future climate and landscape changes. A collaborative Working Group from around the ARB with an integrated modelling tool that can be used to assess future options to adapt to and manage changes in water resources proactively, inclusively, and inform decision making. |

How the ARB Initiative builds on the P2FC

Phase 2 Framework Committee:

Outcome(s):



T = Weekly Flow Trigger; R= Cumulative Water Withdrawal Limit
Source: Cumulative Environmental Management Association 2010

ARB Initiative:

- Uses the weekly flow triggers and cumulative water use limits on the Lower Athabasca River from the P2FC work and the AEP SWQMF.
- These flow triggers are 'minimum flows' that the model must meet.
- A PM is developed to see how often this flow is exceeded in any given week over the year based on the above chart.

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| 3:55 | Next steps, and close | Mike |

Tour of the Athabasca River Basin

We will use ALCES Online (part of the integrated modelling tool) to go through a tour of the Athabasca River Basin

We will look at:

- Basin geography
- Current human activity on the landscape

Why:

- To build a common understanding of the basin in terms of its natural features and human land use
- To establish a common understanding of the similarities and differences in water resources across the basin

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ARB issues and opportunities will form the Roadmap

Issues

An important concern or problem related to water in the basin that warrants attention.

- Can be current or future.
- Can be reach specific or basin-wide.

What the Roadmap needs to address / resolve

Opportunities

Specific actions that can be implemented.

- To address the basin's issues.
- To make improvements.

The strategies that will make up the Roadmap

Working list: ARB's water issues (I)

Issues: Water Supply

Reduction in water quantity due to climate change.

- Start and end of annual freshet.
- Changes in snowpack and effects on seasonal and annual flows.
- How longer climate cycles (e.g., 60 years) could change seasonal and annual flow conditions.
- How snowmelt, glaciers, baseflow contributions to streamflow may change.

Reduction in water quantity due to landscape changes.

- How wetland loss and retention influences hydrology and streamflow.
- Effect of large scale forest disturbance on hydrology and streamflow.

Reduced streamflow downstream due to municipal and industrial withdrawals.

Continued...

Working list: ARB's water issues (II)

Issues: Water Quality

Non-typical changes in water temperature.

- If temperature and temperature fluctuations on the Athabasca main stem are changing.
- Movement in the timing of peak temperatures.
- Impacts on cold water fish species health and spawning.

Lower dissolved oxygen.

- Concentrations falling below federal water quality guidelines in the summer.
- Reduction in dissolved oxygen from industrial activities.
- Impact on fish and other aquatic organism.

Issues: Extreme Events

Large scale forest disturbance could lead to increased volatility in water flows.

Development has increased the amount of flash flooding in Lesser Slave Lake area.

Less frequent flooding in the PAD (e.g., ice jams).

More frequent conditions under which ice jams form at Athabasca and Fort McMurray.

Continued...

Working list: ARB's water issues (III)

Issues: Natural System

How often the current surface water allocations could prevent the ability to meet minimum surface water flows required to maintain healthy aquatic environment.

Lack of flooding has resulted in increased willow growth and island formation.

Changes in water levels and soil moisture regimes resulting in dry creeks, dry wetlands.

Reduction in sustainability of fish populations due to reduced flow, flow instability, water temperature, compromised link between ARB and PAD.

Declining fish populations harming waterfowl populations and traditional use.

Impact of withdrawals (e.g., coal mines) on the health of headwater tributaries

Issues: Anthropogenic System

Declining water levels inhibiting boat transportation.

Declining water levels resulting in sediment being drawn in during water intake.

Impact of current allocations on Treaty Rights; and how that may change under future scenarios.

Risk of water shortages to water licence holders.

Risk of insufficient storage to water licence holders.

Potential types of opportunities

Operational changes to existing infrastructure



Investment in new water infrastructure

Investment in natural infrastructure



Demand management

Planning and preparedness



Policy and practices

Working list: ARB's water opportunities (I)

Opportunities: Water Management System

Consider how to meet the current Water Management Framework in the Lower Athabasca by either building the required storage amount over time or through equivalent means, such as: water sharing agreements, technological improvements in water use efficiency, curtailing production, and alternate drought response measures.

Consider how changes in river dredging practices play into navigation and water intake quality.

Explore an “Aboriginal Base Flow” (ABF) to set the minimum water level/flow required for Treaty Rights and traditional uses.

Explore an Ecosystem Base Flow (EBF) in the Athabasca River.

Explore setting precautionary water withdrawal limits to limit impact on water-based recreation and navigational uses of the Athabasca River.

Re-evaluate water storage options on and off-stream in the basin.

Continued...

Working list: ARB's water opportunities (II)

Opportunities: Water Management System (cont.)

Explore hydropower facility development on the Athabasca to support increased economic development and the government's climate change plan for Alberta.

- Concerns regarding the impacts of dams include: forced relocation, loss of homes and personal property, decreased availability and resources for hunting, food gathering and fishing areas, loss of trap lines.
- Properly manage hydroelectricity production, recognizing that maximizing hydroelectricity production often fails the need for the Crown to seek balance in competing values.

Opportunities: Data, Information and Knowledge

Address the gaps and limitations in water use and flow variation data to support proper understanding of water resources in the LAR.

Address how to measure, model and manage tributaries without gauge stations.

Consider the water aspects in developing a system of Ecosystem Management that also considers Traditional Knowledge and Use.

ARB issues and opportunities will form the Roadmap

Issues

An important concern or problem related to water in the basin that warrants attention.

- Can be current or future.
- Can be reach specific or basin-wide.

What the Roadmap needs to address / resolve

This afternoon's breakout discussion

Opportunities

Specific actions that can be implemented.

- To address the basin's issues.
- To make improvements.

The strategies that will make up the Roadmap

This morning's breakout discussion

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Breakout Groups

What opportunities should be referenced or addressed in a Roadmap for Sustainable Water Management in the ARB?

Discussion focus:

- Brainstorm opportunities that should be referenced in the Roadmap- ***What would you hope to see in an ARB Roadmap for sustainable water management?***
 - ***What issues does each opportunity address?***
 - Discuss how opportunities could be implemented and information needed to model them.
- Feel free to move between tables
- Scribes will record notes on flip charts

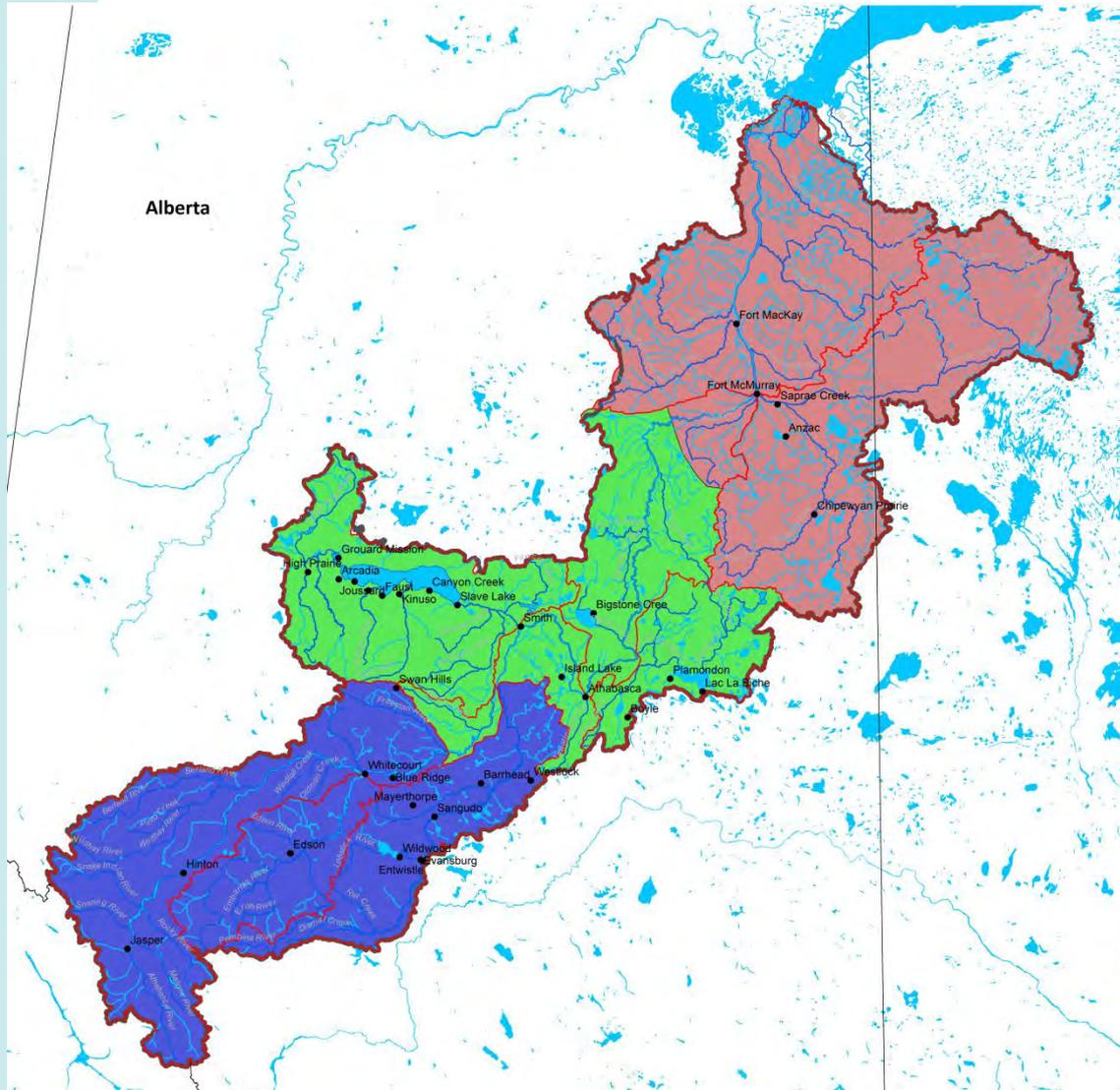
**Table 1: Megan and Danielle
Lower Athabasca**

**Table 2: Denise and Ryan
Central Athabasca**

**Table 3: Claire and Mike
Upper Athabasca**

A volunteer from each table needs to provide a brief readout back to the full group😊. Readout will be visual with help from a modeller

Breakout Groups



**Table 1: Megan and Danielle
Lower Athabasca**

**Table 2: Denise and Ryan
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**Table 3: Claire and Mike
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Readouts

Use the modelling tool to have a group representative show:

- What opportunities were identified
- Where are opportunities located

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By Performance Measure (PM) we mean...

Performance Measure (PM)

- Any visual that shows the status of an interest to a Working Group participant (e.g., fish species, navigation, streamflow)

Issues are reflected in the PMs

- PMs will be used to show the direction and magnitude of change on an issue of interest in response to a simulated change in the system.

Current list of PMs grouped into:

- Water management
- Ecological
- Social

Current Performance Measure (PM) list with descriptions

Naturalized streamflow: streamflow values in the absence of withdrawals from the system. These are calculated as the total of all inflows to the basin.

Simulation time period: The simulation time period refers to the length of time between the start and the end of the simulation. The current simulation time period is from 1990 to 2010 (21 years).

Water Management PMs:

- 1) Seasonal system shortages (dam³)
 - a) This PM shows the basin-wide water shortages by season over the simulation time period.
 - b) There is also a map component to this PM. The map is broken up by sub-basin, where colours indicate the shortage (red is high, green is low, and clear is no shortage). The user can select sub-basins to evaluate the total shortage volume for each season.
- 2) Net water use upstream of Fort McMurray
 - c) This PM shows net water use upstream of Fort McMurray. The black line on the graph refers to the threshold of (60,000 dam³) established by the Surface Water Quantity Management Frameworks for the Lower Athabasca River.
- 3) Annual total system shortages (dam³)
 - a. This PM shows the total annual shortages for all of the demands in the system over the simulation time period.
- 4) Lesser Slave Lake Elevation
 - a. This PM measures the water elevation at Lesser Slave Lake at a daily time step throughout the simulation time period.
- 5) Water Demand and Delivery
 - a. This PM measures the water demand (cms) and the delivery (cms) to that demand at specific nodes on a daily time step throughout the basin over the simulation time period.

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Breakout Groups

What PMs are needed to represent & show movement on the issues & opportunities that have been identified?

Objectives:

- Review and confirm list of issues identified to date
 - Discuss how PMs will show movement on the issues- ***Which PMs 'move the needle' on issues of interest for you?***
 - Refine the working list of PMs to reflect basin issues and opportunities
- Feel free to move between tables
- Scribes will record notes on flip charts

**Table 1: Megan and Danielle
Lower Athabasca**

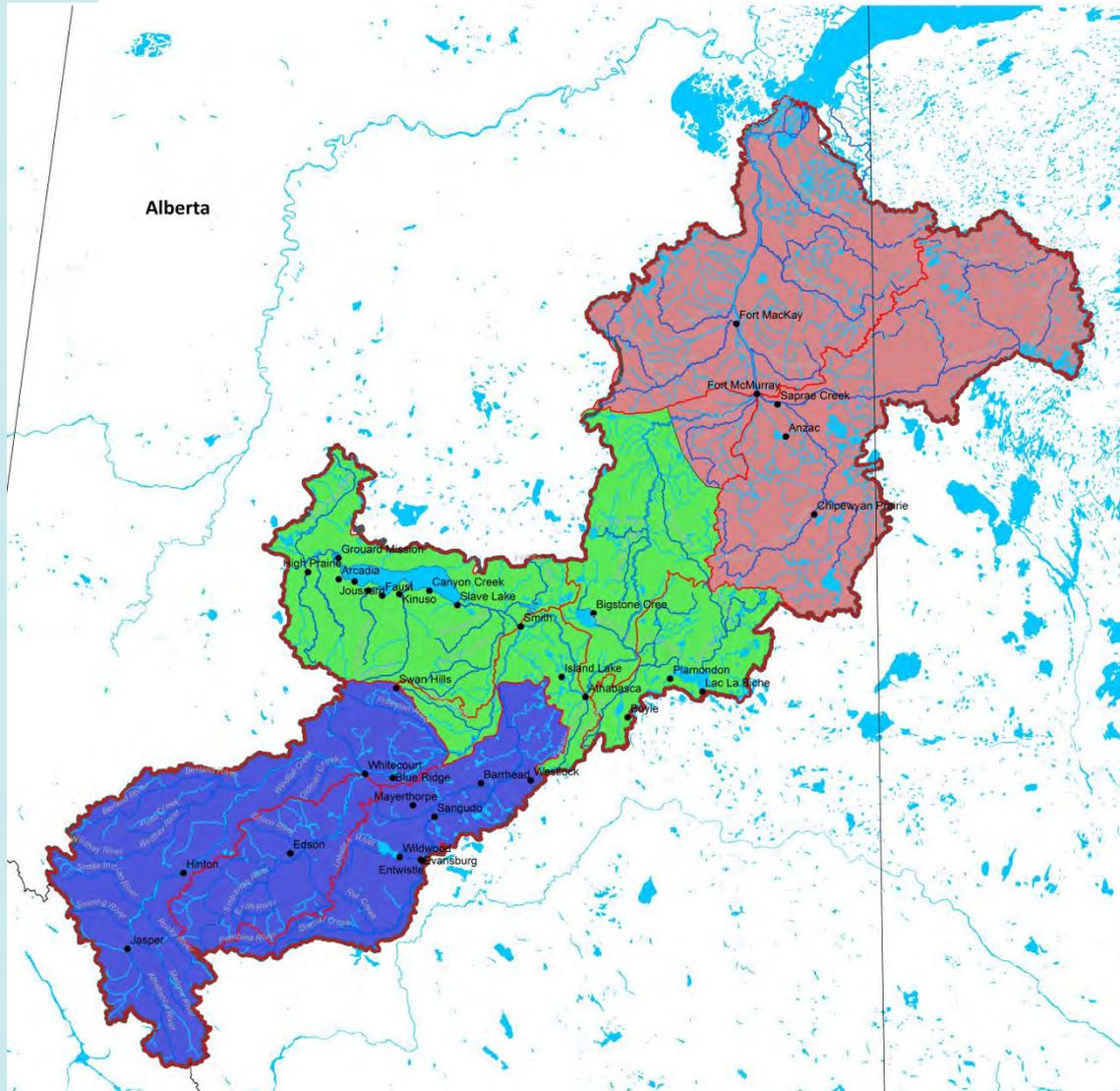
**Table 2: Denise and Ryan
Central Athabasca**

**Table 3: Claire and Mike
Upper Athabasca**

Please refer to working list of issues and the working list of PMs

A volunteer from each table needs to provide a brief readout back to the full group 😊

Breakout Groups



**Table 1: Megan and Danielle
Lower Athabasca**

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Readouts

For each table highlight:

- What changes were suggested to working list of PMs?
- Which new PMs were suggested?
- Any additional issues that were added to the list of issues?

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ARB Initiative Working Group Terms of Reference

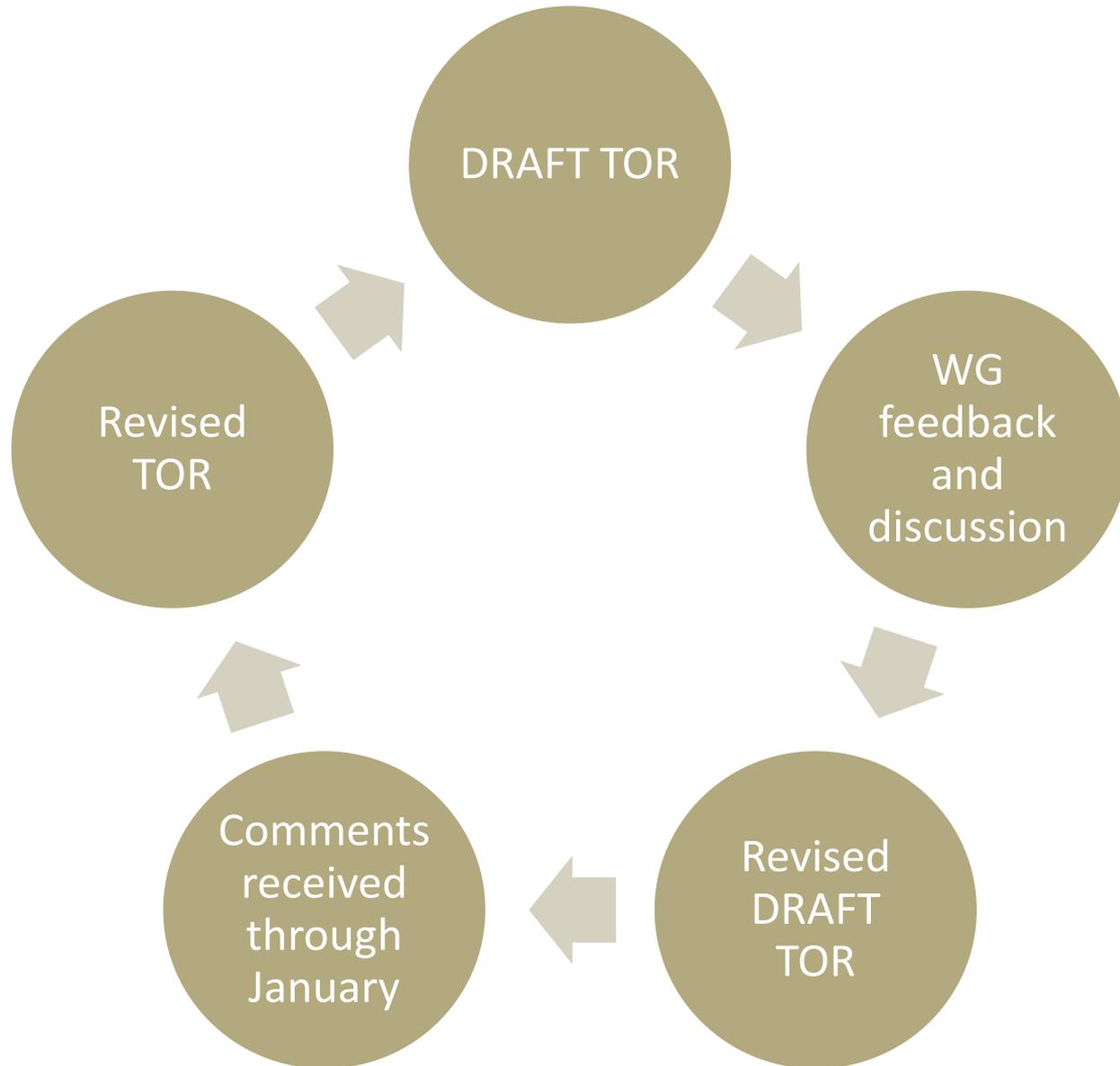
Terms of Reference (TOR)

Terms of reference (TOR) define the *purpose* and *structure* of a project, committee, meeting, negotiation, or any similar collection of people who have agreed to work together to accomplish a shared goal.

Why is the TOR important?

- Beyond the scope, participation may take many forms and your involvement is critical to the outcomes of the ARB Initiative

TOR development process



DRAFT TOR - Page 3

1.0 Background

WaterSMART is committed to improving water management through better technology and practices, for the social, environmental, and economic benefit for all. We do this in part through the development and execution of collaborative, fact-based, basin wide projects that identify and assess water management strategies under current conditions and to meet future needs. The ARB Initiative was first developed by WaterSMART and is being executed by WaterSMART, as an impartial entity, in collaboration with participants representing a broad range of water users.

The ARB Initiative is a **basin wide collaborative effort** to create a common understanding of the issues and opportunities and inform decision making across the Athabasca Basin for proactive water management. Proactive water management means looking at the whole watershed and the current issues, forecast issues and changes, and identifying and discussing mitigation, adaptation, and management options to deal with future changes in flow before they arrive. This Initiative will build on existing data, tools, capacity and knowledge to:

- Provide an integrated modelling tool to inform water and natural resource management plans, approaches, and decision making;
- Provide accessible and transparent information on basin water management;
- Promote a common understanding and trust across the basin;
- Identify strategies for adapting to current and future water challenges; and
- Identify critical gaps in data, science, processes and policy for effective water management.

The ARB Initiative is **NOT**:

- Just Aa modelling project.

The Initiative is a stakeholder engagement project that uses integrated models to engage

DRAFT TOR - Page 4

like to see for water management, adaptation, and mitigation strategies for their watershed. There is no separate and distinct consultation process as this is not consultation. We welcome participation from all [Indigenous First Nations and Métis](#) Communities if they so choose.

2.0 Vision

To have a robust, strategic, proactive approach for water management in the ARB ('ARB Roadmap'), from the headwaters to the confluence with Lake Athabasca, that provides practical and implementable management ~~and adaptation~~ strategies, balances the basin's interests and needs, and provides an improved common understanding of water resource issues and opportunities from a basin perspective.

3.0 Project Principles

- Cause no significant, measurable environmental harm.
- Uphold an open, [inclusive](#), and transparent process [without prejudice](#).
- Include interests and needs, as expressed by participants, from across the basin. [Management strategies in tributary basins outside of Alberta will not be included at this time. It is assumed that the principles of the Mackenzie River Basin Master Agreement will be upheld by Saskatchewan.](#)
- Make data, findings, and materials from the Working Group, including the final report, available and assumed to be considered public domain.
- [Support Use](#) long term population/economic growth [forecasts/plans as established by provincial/municipal government and industry](#).
- Maintain ~~municipal, indigenous~~ [Aboriginal, and environmental](#) minimum flow requirements [throughout the basin](#).
- [Meet Align with](#) Alberta's annual ~~apportionment and~~ bilateral commitments to neighboring provinces and territories.
- Recognize that Alberta's legal water priority system, the Water Act, and all other regulatory frameworks (e.g., LARP, SWQMP) are ~~assumed to remain~~ the guiding legal and regulatory authority.
- [Achieve](#) Alberta's policy goals as laid out in the Water for Life Strategy.
- [Participants have no legal obligation with respect to any outcomes of this work.](#)

- Build trust surrounding multi-stakeholder engagement in the basin, [providing an opportunity](#) for participants ~~not only~~ to be heard, ~~and possibly to~~ [but also to genuinely](#) inform decision-making.
- Ensure traditional knowledge and other ~~input that may be provided~~ [input](#) from ~~Indigenous First Nations and Métis~~ groups ~~is-are~~ integrated into the project.
- Enable and facilitate innovation: the innovation associated with such collaborative processes is often seen when participants, who may initially have had conflicting perspectives, seek and offer solutions to meet the needs of other parties.

5.0 Scope

- The Athabasca River Basin (ARB) will be regarded and simulated as an integrated system, ~~from~~ [inclusive of](#) headwaters and [major](#) tributaries [up](#) to Embarras Airport, [which is a commonly measured point of flow](#) just before Lake Athabasca. Due consideration will be given to growth and change of the water uses along its course, as well as potential future effects of changes in climate, land use, and natural disturbance.
- The current scope of collaborative modelling will focus on surface water river management, basin landscape [changes](#), and climatic change [over time](#), as per ~~Phase 3~~ funding allocations and timelines.
- Flow quantity in the Athabasca River main stem, and the major tributaries (Appendix A) based on budget and data availability.
- Out of Scope:
 - Lake Athabasca;
 - [Explicit modelling of the Peace-Athabasca Delta, however changes in flow from the Athabasca River and any components that can be evaluated with respect to the Delta may be in scope \(e.g. changes in flow and walleye recruitment\);](#)
 - [Engineering F](#) feasibility or environmental assessment of mitigation, adaptation, or management strategies, [however existing feasibility studies will be taken into account where applicable;](#)
 - Water quality modelling; [however, water quality may be addressed as it relates to water quantity;](#)
 - Groundwater modelling;

8.0 Expected Benefits

- Inform and support participant (e.g., GoA, industry, municipalities) policy and planning work. Policies and plans will not be created. The scenarios developed through this project will be valuable to communities and organizations, including GoA, as future developments or changes in the basin are considered and planned. Recipients of this work include all water users and broader water communities in the basin who can use the products (tools and processes) after the work is complete. Discussions are ongoing with AEP and other organizations on housing and maintaining the project tools and data. GoA has not agreed to use the outcomes in a specific planning or policy development process; however, there is never a guarantee with any work that GoA will use the outcomes, but their support indicates they see the value of the ARB initiative, their intent to do so. The GoA supports this project and encourages participation. It is the hope and expectation of all that are involved, including GoA, that outcomes from this work will be used to further the development, and ongoing improvement, of regional plans, sub-regional plans, and environmental management frameworks for the ARB.
- Support decision making for organizations across the basin (e.g., support cumulative effects assessments, basin water management plans, environmental assessments, regional planning, and ongoing state of the watershed reporting).
- Identify, at a screening level, feasible adaptation, mitigation, and management options. Trade-offs of each are identified and understood at a screening level.
- Help to translate science into policy and action.
- Support the political, social, and governance challenges associated with water management decisions.
- Develop broad regional understanding and science based evidence, which may help facilitate informed decision making within government.
Provide An improved common understanding of water resource issues and opportunities from a basin perspective.

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Working Group participant role and responsibilities

- Bring interests/ideas for water management in the basin (e.g., mitigation, adaptation, and management strategies), and their unique perspective on challenges and opportunities, and their expertise.
- Provide quantitative and qualitative data and information if available and can be shared.
- Actively participate in Working Group meetings.
- Assemble data and ensure quality assurance/quality control (QA/QC) of data for accuracy.
- Develop agreement on data in the models, ~~and~~ performance ~~indicators~~ measures, and uncertainty metrics.
- Develop scenarios for model runs (i.e., revise, refine, improve).
- Discuss social/community implications of scenarios (e.g. recreation, assured water supply, etc.).
- Participate in a Technical Team as necessary (e.g., Data and Modelling, Economic and Financial Implications and Estimates, Environmental Impacts, Opportunities, Communications, etc.).
- Support preparation and approval of final report.

Decision-making

- The ARB Initiative is a collaborative, integrative approach to water management to provide a common understanding of water resource issues and opportunities from a basin perspective.
- Rather than from a consensus based decision-making model or process.
- .
- WaterSMART works to ensure all voices at the table heard and diverse perspectives are considered.

Logistics and Administrative Committee (LAC)

The LAC will focus on:

- Resolving issues ~~Issue resolution~~ and associated strategic guidance on:
 - Opportunities that may change scope of original workplan
 - Budget changes from original workplan as needed;

- Reviewing updates to the budget and advisinge on potential changes based onto the direction of the work based on takes from Working Group meetings; and
- Scoping support and funding structure for additional work.

Alberta WaterSMART (WaterSMART)

- WaterSMART is an independent third party that is leading and facilitating the process. WaterSMART is responsible for overall project accountability to the funding agencies, as well as project leadership, coordination/management, banker functions, contract management, and administrative processes.

DRAFT Terms of Reference (TOR)

See document as revised to reflect comments and suggested changes

Any other revisions or comments at this time?

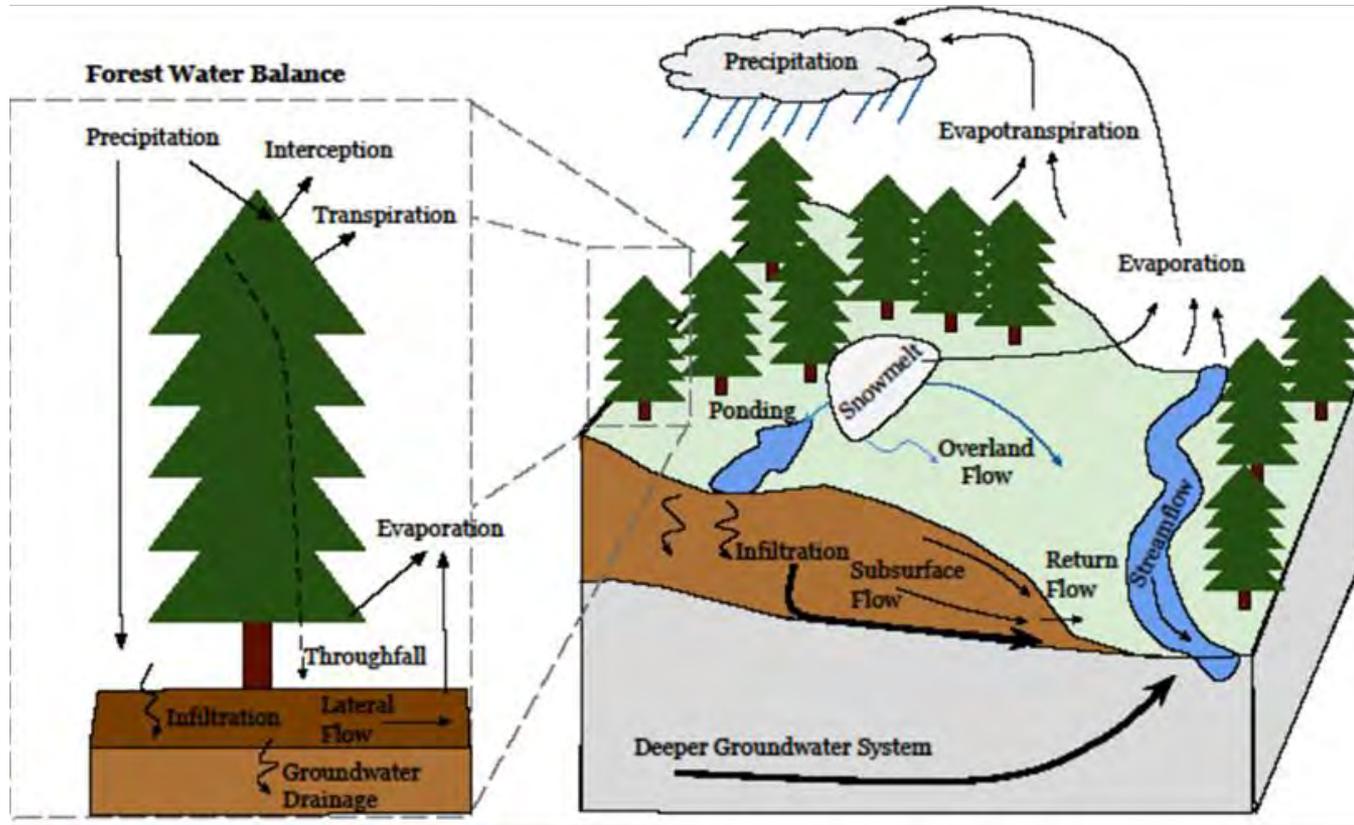
TOR: Next steps...

- Project Team makes revisions based on comments received through January
- Revised TOR document will be distributed to the Working Group (WG)
- TOR will evolve as determined by the WG
- TOR will be redistributed to the WG to reflect ANY and ALL changes

| Today's Agenda | | |
|----------------|--|-------------------|
| 9:00 | Welcome, Introductions, and Opening remarks | Mike |
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Modelling 101

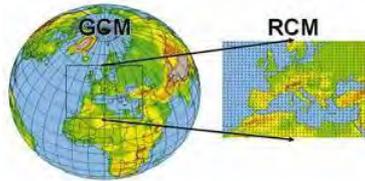
- The integrated model is a representation of a large complex system



- No model is 100% correct – the intent is to have a model that is correct enough to facilitate informed discussions
- The model is a scale appropriate tool for the Working Group to understand the current system and explore how it might change

ARB integrated model

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



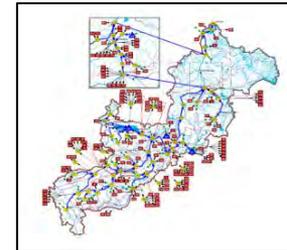
Output: future daily precipitation and air temperature



Outputs: changes in landscape composition from various scenarios



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

What can be looked at in the model...

Operational changes to existing infrastructure



Investment in new water infrastructure

Investment in natural infrastructure



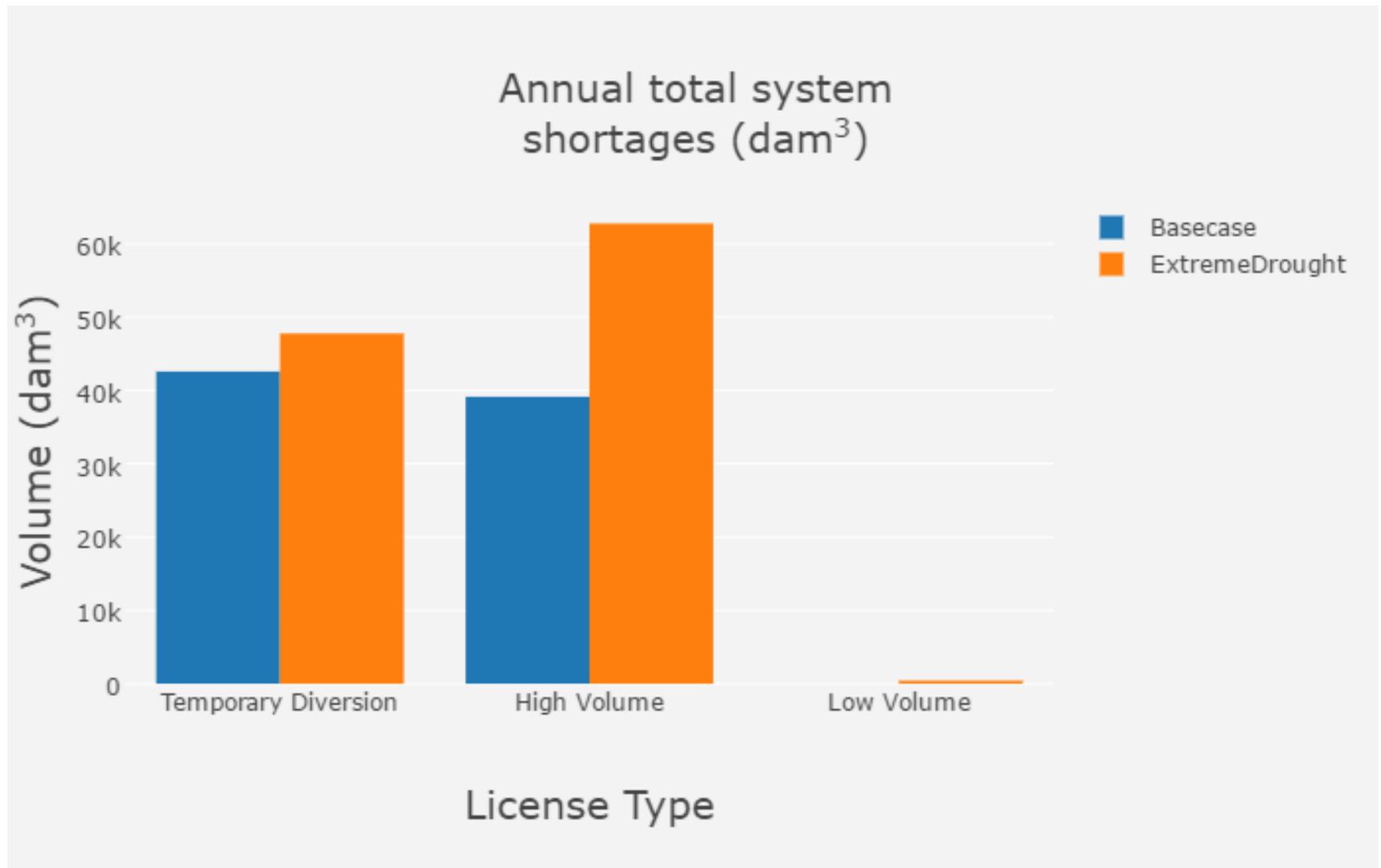
Demand management

Planning and preparedness

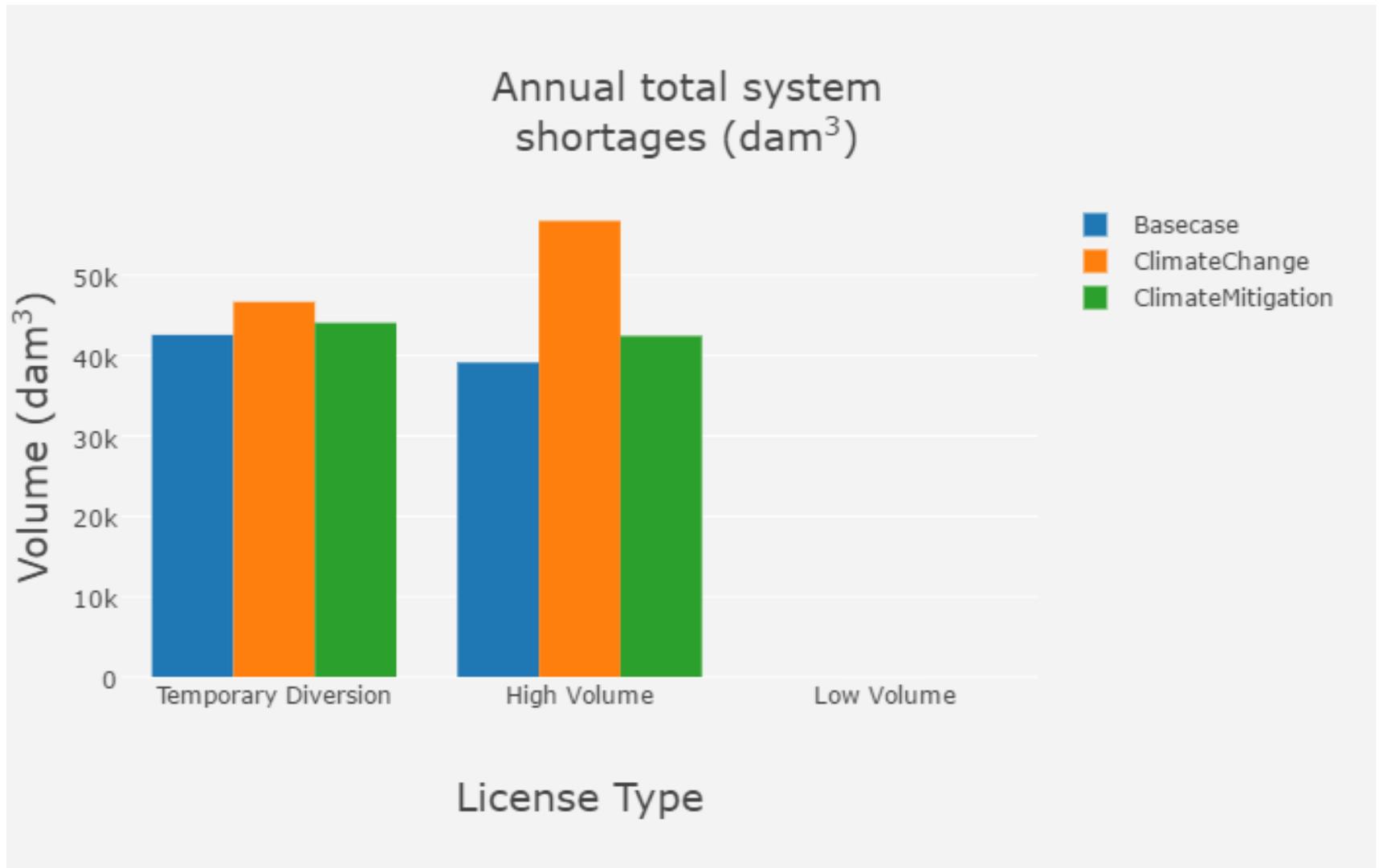


Policy and practices

What can be looked at in the model...



At the next meeting we will be using the model to....



How the model is used.....



Define the Opportunity

Design Performance Measures

Collect Data & Knowledge

Build or Access the Tools

Identify & Select Strategies

Develop the Roadmap

Some of the opportunities for the Roadmap



Reminders: things to remember when we talk about the integrated model

- Three 'components' to the model
 - Mass balance model (simulates water demand and availability)
 - Hydrological model (simulates hydrological processes)
 - Landscape model (simulates changes in landscape)
- Simulates surface water quantity at a daily time step
- The model is driven by operating 'rules' that can be changed
- The mainstem of the Athabasca River is modelled, as are many larger tributaries
- Water quality as it relates to quantity will be simulated (e.g. DO, temperature)
- Changes to surface water quantity due to landscape changes and changes in climate will be modelled
- This is an iterative process!

Based on the feedback we made some model updates

- We've made 10 specific updates to the model based on what we heard at the last working group meeting
 - These updates are shown in the following slides
- Modelling committee?
 - Volunteers?



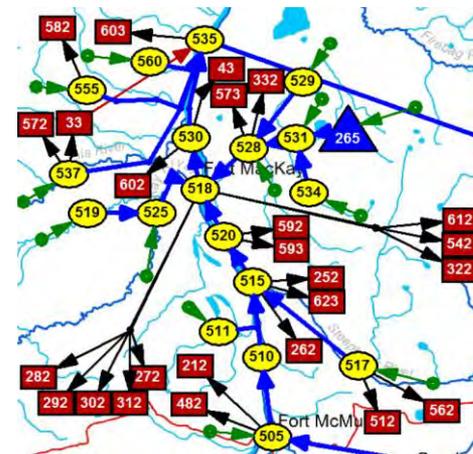
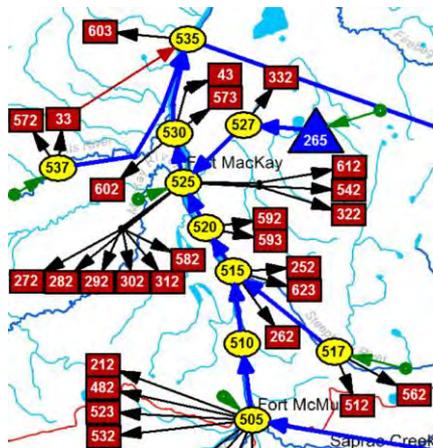
Modelling updates

Working Group feedback:

- New tributaries should be added to align with water quality modelling being conducted by AEP/JOSM

Action completed:

- We have added eleven new tributaries into the model.
 - Unnamed Creek near Fort McKay, Calumet River near Fort Mackay, Tar River near Fort Mackay, Dover River near the Mouth, Jackpine River at the Mouth, Pemmican Creek above Jackpine, North Muskeg River at the Mouth, Wapasu Creek at the Mouth, Poplar Creek near Fort McMurray, Owl River below Piche River, Logan River near The Mouth



Modelling updates

Working Group feedback:

- Check other environmental flows that should be incorporated into the model
- Look at actual vs allocated use for environmental management water licences
- Follow up on a GIS stream order layer to manage TDL shutoffs

Action completed :

- Based on contact with AEP and AER there are no other minimum flows in the upper ARB or elsewhere that should be incorporated into the model
- There is no actual use data for environmental management licences
- Working on acquiring GIS stream order layer with AEP

Modelling updates

Working Group feedback :

- Please verify infrastructure in the system

Action completed :

- We verified and compiled a list of control structures existent in the ARB
- The following control structures were added or confirmed to be in the model
 - South Heart Dam #1 and #2
 - Lesser Slave Lake Regulation
 - Paddle River Dam

Working Group feedback :

- Follow up with licensees; confirm use in model and determine whether it is necessary to ungroup certain demands

Action completed :

- Followed up with participant concerns regarding licence groupings:
 - Followed up with Suncor
 - Followed up with Cardinal River Operations (Teck)
 - Removed a licence they no longer use
 - Added a licence we were missing

Modelling updates

Working Group feedback :

- Look into forecasting future use for industrial licences downstream of Fort McMurray. Compare with current modelled use.

Action completed :

- Compared our current simulations of full allocation and actual usage volumes with projections from the Athabasca River Water Requirements for Oil Sands Mining Operations (Golder, 2009).
- Full allocation in the model (15 cms) align well with projections (14.1 cms) from the Golder report, and actual use volumes from the model (4 cms) are aligned with conservative estimates (11.3 cms) in the Golder report, which scaled up average water use at all mines by adjusting for a 1:100 year drought
- Going forward, future water use will be simulated based on feedback from the Working Group.

Modelling updates

Working Group feedback :

- Confirm whether or not registration volumes are within margin of error of model

Action completed :

- We have calculated the volume of registrations as a percent of total water demand in the system, per sub basin
- Some sub basins showed significant registration volumes (15-20%)
- We therefore added the registrations into the model by sub basin

| Sub basin Name | Registrations as a % of total allocations (by volume) |
|----------------------------|--|
| Central Athabasca -- Lower | 0.3 |
| Central Athabasca -- Upper | 16.8 |
| Clearwater | 0.2 |
| La Biche | 7.1 |
| Lesser Slave | 0.5 |
| McLeod | 2.0 |
| Pembina (Alta.) | 18.2 |
| Upper Athabasca | 0.2 |

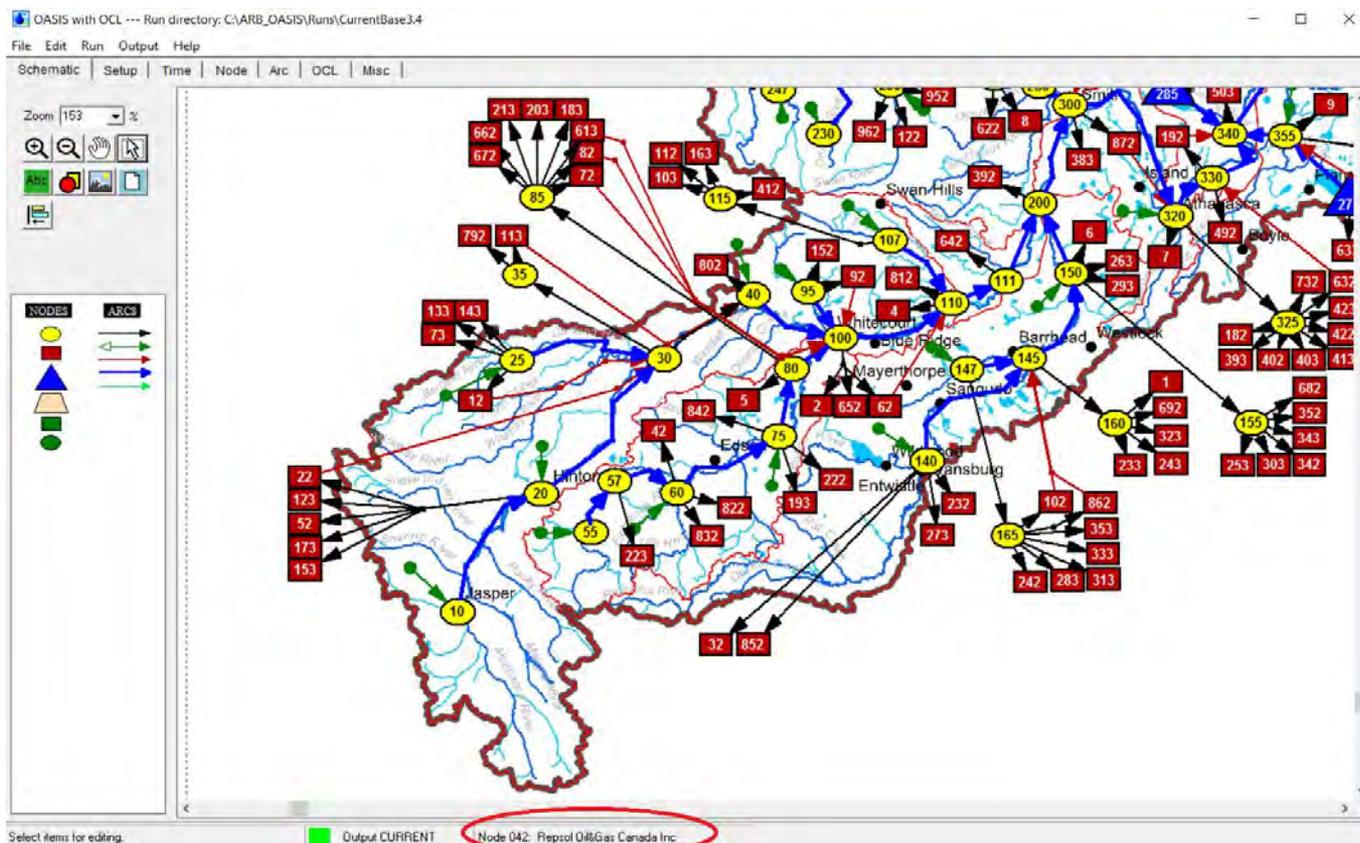
Modelling updates

Working Group feedback :

- Should label nodes in the schematic for ease of identification

Action completed :

- We have added labels (e.g., licensees) to nodes in the model



Modelling updates

| Mid Winter (January 1 to April 15) Weeks 1-15 | |
|--|--|
| Weekly Flow Triggers (m ³ /s) | Cumulative Water Withdrawal Limits |
| more than 270 m ³ /s | 16 m ³ /s |
| 150 to 270 m ³ /s | 6% of Weekly Flow |
| 91.6 to 150 m ³ /s | 9 m ³ /s |
| 87 to 91.6 m ³ /s | Weekly Flow minus 82.6 m ³ /s |
| less than 87 m ³ /s | 4.4 m ³ /s |

| Early Spring (April 16 to May 6) Weeks 16-18 | |
|---|--|
| Weekly Flow Triggers (m ³ /s) | Cumulative Water Withdrawal Limits |
| more than 98.6 m ³ /s | 16 m ³ /s |
| 87 to 98.6 m ³ /s | Weekly Flow minus 82.6 m ³ /s |
| less than 87 m ³ /s | 4.4 m ³ /s |

| Late Spring (May 7 to June 10) Weeks 19-23 | |
|---|--|
| Weekly Flow Triggers (m ³ /s) | Cumulative Water Withdrawal Limits |
| more than 102.6 m ³ /s | 20 m ³ /s |
| 87 to 102.6 m ³ /s | Weekly Flow minus 82.6 m ³ /s |
| less than 87 m ³ /s | 4.4 m ³ /s |

| Summer/Fall (June 11 to October 28) Weeks 24-43 | |
|--|--|
| Weekly Flow Triggers (m ³ /s) | Cumulative Water Withdrawal Limits |
| more than 111.6 m ³ /s | 29 m ³ /s* |
| 87 to 111.6 m ³ /s | Weekly Flow minus 82.6 m ³ /s |
| less than 87 m ³ /s | 4.4 m ³ /s |

| Early Winter (October 29 to December 31) Weeks 44-52 | |
|---|--|
| Weekly Flow Triggers (m ³ /s) | Cumulative Water Withdrawal Limits |
| more than 200 m ³ /s | 16 m ³ /s |
| 150 to 200 m ³ /s | 8% of Weekly Flow |
| 94.6 to 150 m ³ /s | 12 m ³ /s |
| 87 to 94.6 m ³ /s | Weekly Flow minus 82.6 m ³ /s |
| less than 87 m ³ /s | 4.4 m ³ /s |

* Cumulatively, licensed pumping capacity for mineable oil sands projects may eventually exceed this limit. Water sharing agreements will identify how water management decisions will help ensure maintenance of the limit.

Note: Table 4 has been reformatted from the version presented in *Cumulative Environmental Management Association 2010*, and incorporates the transition

.com

- Incorporated weekly flow triggers and cumulative water withdrawal limits below Fort McMurray:
- As per the surface water quantity management framework under LARP
 - Downstream withdrawal encompasses all demands below Fort McMurray

Modelling updates

Incorporated water quantity objectives from the Muskeg River Interim Management Framework for Water Quantity and Quality:

- When weekly flows are in “green” ($\geq Q80$ of naturalized), only 15% of the instantaneous flow is available for consumptive use
- When weekly flows are in “yellow” ($\geq Q95$ and $< Q80$), only 5 % of the instantaneous flow is available for consumptive use
- When weekly flows are in “red” ($< Q95$), no water is made available for consumptive use

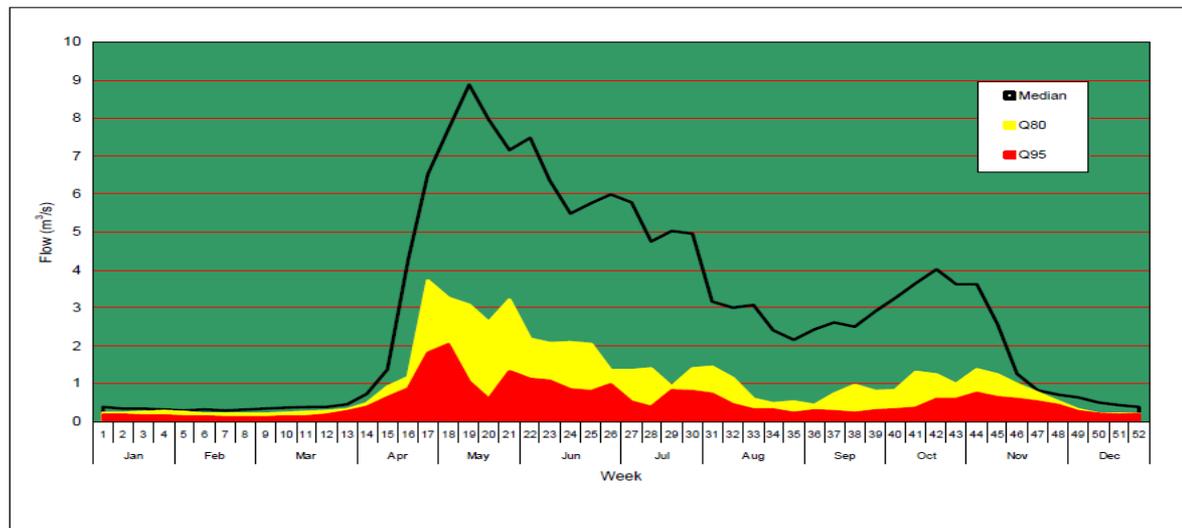


Figure 5.1 Natural Flows and Environmental Management Conditions of the Muskeg River

Alberta Environment. 2008. Management Guidance for Aquatic Components of the Muskeg River Watershed: Muskeg River Interim Management Framework for Water Quantity and Quality. ISBN: 978-0-7785-7630-3

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Upcoming meetings

Next meeting: January 26th- Edmonton

- Explore effects from climate change and variability scenarios on water in the ARB
- Examine how effects from changes in climate impact issues and opportunities discussed in meeting #2
- Explore and discuss opportunities to address or adapt to changes in climate for a Roadmap for Sustainable Water Management in the ARB

Any thoughts or comments on the plan for the January 26th meeting?

Supplementary Working Group meeting: January 17th – Fort McMurray

- Day-long meeting with participants in the Fort McMurray area to discuss the ARB Initiative and run a supplementary Working Group meeting.
- Meeting is in addition to today's Working Group meeting
- Everyone was also welcome to attend, although the agenda will be much the same.
- It is our hope that this dialogue will help inform primarily Indigenous communities decision on if and how they would like to participate in the ARB Initiative going forward.

Upcoming meetings

March Working Group meeting: Any weeks to avoid in March?

- Explore effects from landscape change on issues and opportunities in a Roadmap for Sustainable Water Management in the ARB
- In Edmonton, week of 13th or 20th?

| MARCH 2017 | | | | | | |
|-------------------|--------|---------|-----------|----------|--------|----------|
| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
| | | | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

Download Free Printable March 2017 Calendar from www.24calendars.com

Final Reminders

This work is focused on identifying practical options for adapting to change throughout the ARB

- WaterSMART to draft meeting summary and distribute to Working Group members for review
- Call with the Data and Modelling Committee to:
 - Follow up on key datasets required to refine the PM and modelling tool
 - Vet modelling and PM refinements between now and the next meeting
- Next meeting January 26th, and anyone is welcome at the January 17th meeting (similar to today's agenda) in Fort McMurray.
- Please contact us if you have any thoughts, questions, comments!

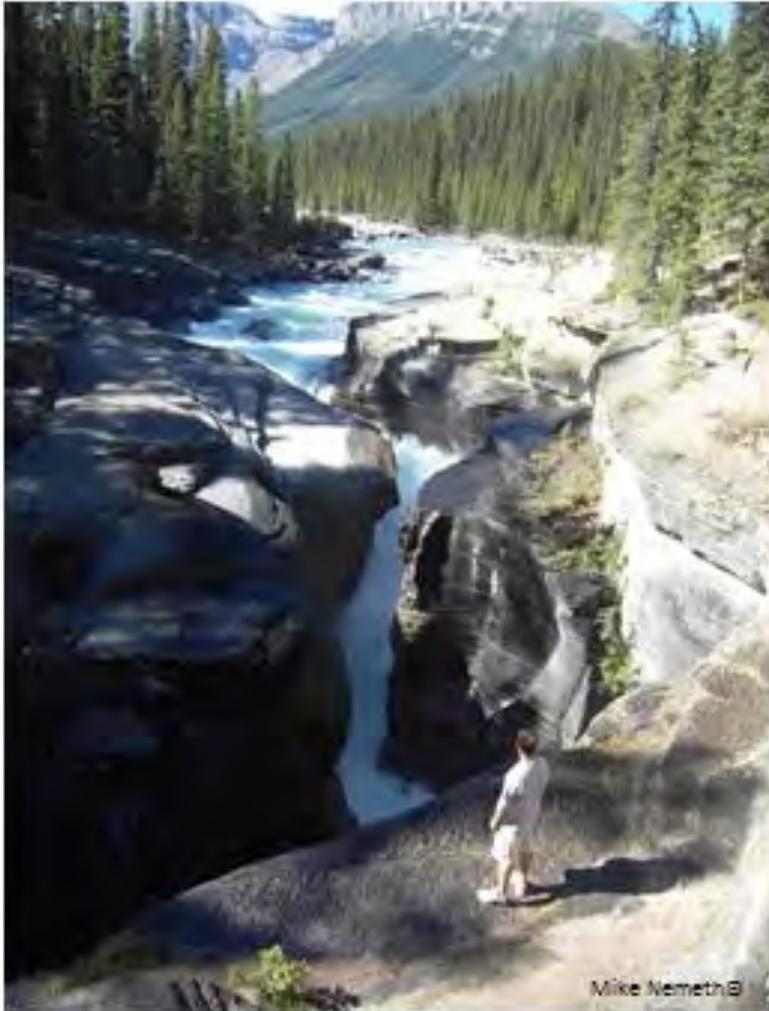
Thank you for all your support and participation!

Thank you



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