ECACEP Scenario – Big Green

### Planning Factor: Water Quality and Quantity

<table>
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<tr>
<th>Force/Driver</th>
<th>Scenario Assumptions (developed by workshop participants)</th>
<th>Forces/drivers /outcomes from Consolidated Report that could support this scenario (developed by workshop participants)</th>
<th>Supportive Information from Topic and Focus papers</th>
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</table>
| **Climate change** | • Increased weather variability  
• Shifting weather patterns create uncertain supplies of water and more rain/drought cycles  
• Drier climate and atmospheric air  
• Decreased availability of drinking water, ground water and soil quality  
• Dryer wetlands, well water and recharge areas  
• Amount of arable land decreases (loss of farmland)  
• Wildlife declines  
• Communications/education helps people adjust to climate change/drought conditions | • A warming world  
• By 2050 Calgary, Edmonton, Grande Prairie and Fort McMurray are projected to experience degree-day totals similar to Lethbridge and Medicine Hat today  
• Longer growing season/shorter milder winters  
• Reduced snow accumulation – declines in annual streamflow- shift in streamflow to earlier in the year = lower summer water supplies  
• Drier soils – decrease in subsurface recharge leading to decline in the water table  
• Increased soil erosion leading to increase in stream sediment and nutrient load (increased eutrophication and pathogen loading in local water bodies and streams during summer  
• Increased frequency of extreme weather events  
• Could have enhanced productivity of forests, crops and grasslands – where there is adequate moisture  
• Summertime drying – greater water loss by evaporation and plan transpiration | |
| **Wetlands** | • Recognition of contribution of wetlands to water quality and quantity  
• People begin to value and protect wetlands  
• Wetlands are restored throughout the watersheds in Alberta  
• Improved agricultural practices lead to improvement of ecosystem and conservation of water supply | • 71% of wetlands in the Prairie Region have been lost (2003)  
• Drainage has been encouraged through policies and incentives  
• Conflict is common between communal and individual rights to resources  
• Crown owns the water in a wetland, but the surrounding land, bed and shores of non-natural or non-permanent wetlands can be privately owned  
• Wetlands help recharge underground aquifers that store 97% of the world’s unfrozen freshwater (groundwater recharge occurs where there are ponds - and mostly occurs in spring and early summer – before evaporation intercepts seepage outflow from ponds.  
• Benefits include increase soil moisture for crop production and increased deep aquifer recharge for well water maintenance  
• Wetlands store as much as 40% of global terrestrial carbon (carbon sinks)  
• Plants and soils in wetlands purify water, removing nitrogen and phosphorous, and in some cases toxic chemicals  
• Freshwater wetlands hold more than 40% of the world’s species and 12% of all animal species  
• Recreational activities associated with wetlands (and which generate income locally) are boating, hunting, bird watching, art and literature | |
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<tr>
<th>Ecological Goods &amp; Services (EG&amp;S)</th>
<th>Water supply</th>
<th>Water use</th>
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</table>
| • EG&S are recognized and assigned an economic value  
  • A whole suite of EG&S are identified to support ecological values  
  • Retention of native vegetation (as a social value) is being compensated (EG&S)  
  • EG&S becomes an economic value and quality of life value – not just an environmental one | • Water shortages and droughts  
  • Water conservation attitude is developed and becomes a priority  
  • Improved agricultural practices lead to improved ecosystems and conservation of water supplies  
  • Increased demand from agriculture, rural populations and local industry  
  • Shortages impact types of farming, size of community  
  • Inter-basin transfers may be considered, but surplus elsewhere is not available  
  • We determine in-stream Flow Needs (IFN) first – as the basis to sustain a healthy aquatic ecosystem and healthy river – before water allocations are made  
  • Groundwater supply is protected  
  • Well water supply is safe and ensured | • Demand requires water to be piped into homes  
  • Well-water supply is safeguarded  
  • Pumped water is used to water livestock so they do not contaminate the source  
  • Better management techniques and equipment lower demand and increase quality  
  • True cost of water usage is paid for by the- | • Study area lies mostly in the Battle River Basin (BRB)  
  • Primary surface water source  
  • Water is derived entirely from local surface run-off (rain and snow melt) and ground water flows. River flows dependent on precipitation, resulting in tremendous variability in annual flows  
  • Total current average surface water us is about 19% of average natural flow  
  • North Saskatchewan River Basin (NSRB) is also important (especially around Tofield)  
  • Trends in the NSRB:  
    • Increase in water use in the NSRB is the result of petroleum sector (bitumen upgraders and coal gasification plants  
    • Annual groundwater use is expected to increase around 13%  
  • Groundwater- used mostly for agriculture (stockwatering). 12 municipalities in the area rely on groundwater for their municipal water supply | • Battle river uses:  
  • ATCO (cooling thermal electric power facility) is biggest user – but 98% is returned to river after use  
  • Agriculture (irrigation, feedlots, stockwater) second largest user  
  • Wildlife conservation – uses about 30%  
  • By 2030 water use for agriculture is projected to increase by 18%, in part due to expanding livestock operation  
  • Carrying capacity of pastureland could decrease with increased water restraints  
  • Water licenses: Upper basin uses 70-79% of its allocated water; middle basin use 60-76% of its allocation through water licenses

### Ecological Goods & Services (EG&S)

- Natural capital yields EG&S, which is almost always overlooked in calculating Canada’s assets.
- Value of wetlands to Canadians is estimated at $20 billion
- Forests provide air quality, carbon storage and sequestration, soil formation, water treatment, biological control, stormwater control, recreation, culture, raw materials and genetic resources
- Grasslands and rangeland provide water regulation, erosion control, soil formation, waste treatment, pollination, carbon storage and sequestration, biological control and food production
- Wetlands provide water supply and treatment, disturbance regulation, food production, recreation, culture, habitat and refuge
- Lakes, Rivers and riparian areas provide water supply and treatment, food production and recreation
- Croplands provide food production, habitat/refuge, scenic (over 80% of the region)
- Undeveloped lands provide scenic, carbon sequestration and storage, tourism

### Water supply

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### Water use

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<th>Category</th>
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| **Consumer**      | • Wastewater is better managed and treated  
• Water recycling is encouraged and adopted  
• Location of underground water dictates where populations can live |
| **Trends: Battle River** | • Key sectors driving future use: population growth (especially in upper basin); expansion of livestock populations; industrial growth; oilfield injection  
• Increased groundwater uses: stockwatering; industrial; recreation |
| **Water Quality** | • Better management techniques and equipment lowers demand for water and increases quality  
• Pollution clean-up industry is developed |
| **Trends: Battle River** | • Surface water is generally poor. Battle River frequently has high concentrations of fecal bacteria and numerous pesticides and personal care products have been detected.  
• Poor water quality is a result of low flows (increased contact time with surrounding soils) and point (industrial and municipal) and non-point (primarily agriculture) discharge into the Battle River.  
• As a result of high nutrient concentrations, frequent excessive growth of algae and aquatic plants occurs in most bodies of water in the project area.  
• Water quality in the lakes sampled is generally poor with high nutrient concentrations. |
| **Water Management** | • Environment technology – movement towards renewable change  
• Water conflicts arise as water allocations are fully utilized  
• Water shortages impact sizes of communities and types of farming and industry  
• Water management becomes an important governance issue  
• Policies are developed to support water recycling  
• Assurance role of government is strengthened |
| **Reclamation** | • Reclamation/restoration of surface water supply is improved and becomes a priority  
• Policy moves beyond reclamation to restoration  
• Pace of reclamation increases |
| **Reclamation** | • Major factor is still to achieve agricultural supportive lands, however wetlands are now being taken into account.  
• Current policy is of 3:1 compensation ratio for wetlands. Aim is to quickly re-establish riparian corridors (wetland areas)  
• Balanced approach to reclamation now in use – intent is to provide more than one ag land use (e.g. rotational ag production and cattle pasturing) using progressive reclamation approach (forage/hay crop first to build up nitrogen and reduce compaction, then cereal crops.  
• Plus the creation of wetlands, e.g. lakes for wildlife, fisheries, recreation, etc. and forested land |