

Monitoring and Evaluation Working Group Final Report

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1.0 Defining the Role of Monitoring, Evaluation and Reporting within Alberta's Land-Use Framework

Alberta's Land-Use Framework (LUF) is to articulate a vision that will guide the process of making land-use decisions across the province and specify the outcomes that this process should achieve. The Monitoring and Evaluation Group is one of four working groups contributing to the overall LUF and is tasked with developing a monitoring framework for three main outcomes:

1. Well-Planned Places to Live, Work, and Play (Social outcome)
2. Sustainable Prosperity Supported by our Land and Natural Resources (Economic outcome)
3. Healthy Environment and Ecosystems (Environmental outcome)

It should be noted that there was a minority opinion that culture should be one of the four pillars which is sustained under the planning, management, monitoring and assessment components of the Land-Use Framework and that the reader consider culture wherever social, economic, and environmental outcomes or values appear in this report.

While these three outcomes are the result of previous consultations with Albertans, they can also be aligned with the Capital Model proposed by the National Round Table on the Environment and the Economy which at least partly addresses the above minority view. The implications of this alignment are discussed in Section 2. For these three outcomes, the Monitoring and Evaluation Group was asked to address three overarching questions:

- What should we measure?
- How should we measure it?
- How should the measured results be used in a continuous improvement process?

In order to address these questions, it is necessary first to clarify the purpose of monitoring, evaluation, and reporting within the Land-Use Framework. Given that the three broad outcomes above are what the Land-Use Framework should enable us to achieve, then the way in

which we achieve these outcomes is by implementing different plans and policies. As an analogy, when setting out on a sail-boat we plot a course (i.e. implement a policy) that we think will get us to our desired destination (i.e. set of desired outcomes). However, the only way we can know whether we are going to arrive at our desired destination is by monitoring and evaluating where we are on the map and the direction in which we are heading. Similarly, in the context of the Land-Use Framework the role of monitoring, evaluation, and reporting is to tell us where we are in relation to our desired outcomes, whether we are moving closer or farther away from these outcomes, and thus whether we need to change policies so that we do not “crash into the rocks.” Such policy changes can be necessitated because a given policy does not live up to its expectations, external factors that we cannot control necessitate changes (e.g., changes in world commodity prices, global climate change), or there are underlying changes in what outcomes Albertans desire. Just as we would not attempt a long voyage without navigation equipment to tell us where we are and where we are heading relative to our desired destination, similarly no jurisdiction should institute policies to achieve long-term outcomes without some way of measuring the success of these policies in actually achieving the desired outcomes. No one expects to arrive at their desired destination by randomly steering a sail-boat while blindfolded. Therefore, we cannot expect to achieve the three broad outcomes of the Land-Use Framework without ongoing monitoring information to guide day-to-day decision making.

Given the important role that monitoring, evaluation, and reporting has within any viable land-use decision making framework, the ME Group felt it was imperative to describe the design criteria used to develop its proposed monitoring framework. These criteria are the broad principles that the Group felt the monitoring, evaluation, and reporting framework must satisfy to be effective within the context of the Land-Use Framework.

- **Comprehensive** – Ensuring the comprehensiveness of what is monitored and evaluated requires ensuring that all the important dimensions or attributes that define the three social, economic, and ecological outcomes are covered by the monitoring program. While the Group is cognizant of First Nation and Metis issues within the context of the

Land-Use Framework, and while the Group attempted to ensure that what it proposed to monitor encompassed the rights and interests of Aboriginal Peoples, the Group acknowledges that it cannot determine or verify this except through meaningful dialogue and consultation with the Aboriginal Peoples of Alberta.

- **Guide Decision Making** - Given the way in which monitoring, evaluation, and reporting is conceived to fit within the overall Land-Use Framework, the Group felt it was imperative that the monitoring framework be able to guide two distinct aspects of decision making. First, the programs must be able to report on landscape condition across a range of spatial and temporal scales and capture the positive and negative changes that occur over time in different regions as a result of past decisions. Second, it must be possible to feed the results of ongoing monitoring and evaluation into planning and decision support tools capable of evaluating the potential impacts of alternative policies before they are implemented.
- **Understandable** - The results from ongoing monitoring and evaluation must be reported in a way that is understandable by the people of Alberta, industry, and the Government of Alberta.
- **Forward Looking** – If monitoring, evaluation, and reporting are to be done over the long term, then the framework and its indicators must be relevant both today and into the future.
- **Adaptive** – Research focused on improving the effectiveness of monitoring procedures for social, economic, and environmental issues must be ongoing to address new issues that will arise over time. While monitoring and evaluation must have a degree of permanence to enable comparisons over time and across space, it also must adapt to new knowledge and new issues.

While the Group faced a number of challenges in developing the monitoring, evaluation, and reporting framework, the primary challenge was defining and then staying focused on what this Group was to accomplish relative to the other four groups. While the Group initially started by listing indicators it felt were relevant to each of the social, ecological, and economic outcomes, its final product is not this list of indicators but the more general attributes that define each of the

three broad outcomes. One of the reasons this Group focused its efforts on defining attributes is that it lacked the time and resources to develop actual effective monitoring programs that would identify and validate the indicators proposed. While suggestions of possible indicators are included in this report, they are included primarily to clarify the meaning of the attributes identified.

The Monitoring and Evaluation Group used the Outcome-Oriented Indicator Framework (see the reference Olsson 2006 for more information on this particular framework) to structure the monitoring, framework proposed. This framework structures monitoring, evaluation, and reporting around the outcomes that one is trying to achieve, the attributes that define each outcome, the condition indicators that capture the state of the underlying systems and define each attribute, and the influencer indicators that affect or bring about changes in the state of the condition indicators. This framework is described below in greater detail while Figure 1 illustrates its inherent hierarchical structure.

For this Group, the outcomes are the three broad environmental, economic, and social values. Condition indicators measure the state of the attributes associated with the social, economic, or environmental systems. Influencer indicators, because they measure what is impacting the condition indicators, provide useful information to guide management actions or policy decisions. For example, some of the attributes that

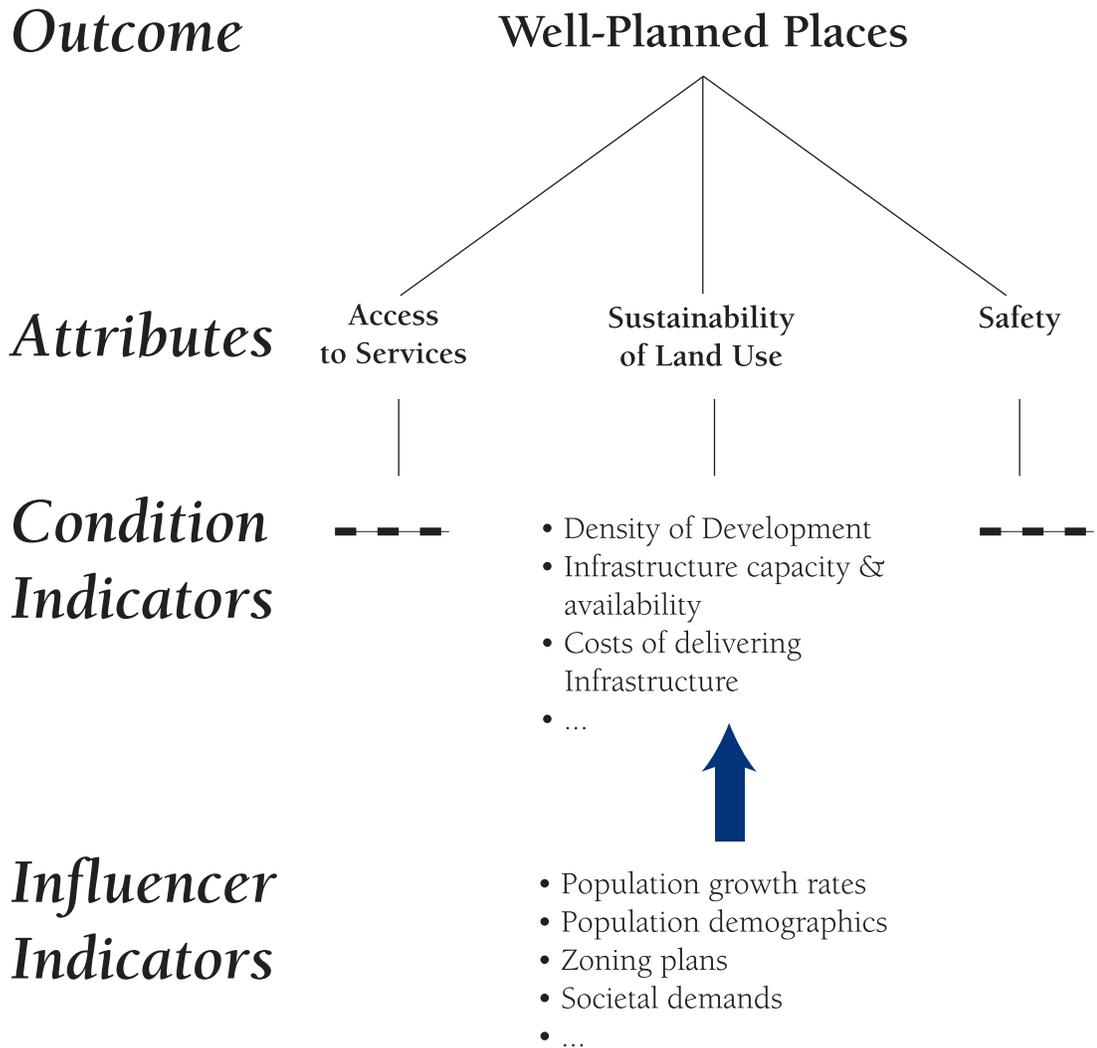


Figure 1

define the overall outcome of “Well Planned Places to Live, Work, and Play” include Access to Services, Sustainability of Land Use, Safety, and Diversity of Communities and Lifestyles. Some specific condition indicators for the attribute Efficiency of Land Use include: density of commercial development, density of housing, and infrastructure capacity and availability. Some of the influencer indicators that could affect these condition indicators include: population growth rates, population demographics, zoning plans, and societal demands.

In the context of the Land-Use Framework and the design criteria listed above, some of the Outcome-Oriented Indicator Framework’s strengths include:

- Relatively simple and easy to understand by public, decision makers, and others.

- Produces information centred on the objectives of interest to those making decisions.
- It is clear what is required to achieve a particular outcome.
- Lays out the indicators in terms of testable hypotheses, thereby structuring the questions to be asked during evaluation.
- Can be adapted to various spatial and temporal scales.
- Selection of indicators is relatively flexible.

However, the Outcome-Oriented Indicator Framework also has some weaknesses which the strategies proposed in Section 4 overcome:

- Can easily lead to very long lists of indicators, given that the framework aims at completeness without clear guiding principles of essential and universal properties of what's being monitored.
- May create subjectivity and a lack of transparency in how indicators are selected.

Having described the framework used by this Group to structure the overall monitoring program, we now turn to describing the concept of targets or thresholds and how they facilitate evaluation and reporting. A threshold is a technically or socially-based standard that identifies the points at which an indicator changes to an acceptable or unacceptable condition. A target is goal statement about a desired endpoint to be achieved over a given time period. Thresholds are a lot like speed limits in that there is no single right answer or way to set a speed limit, every speed limit represents a trade-off, and speed limits are set differently in different areas. The Group envisioned that at least two threshold values

would be set – similar to stop lights. When the value of the indicator is in the red region, it means that corrective actions need to be taken. The yellow region indicates that caution is required and that corrective actions may need to be taken if conditions do not improve. In the green area, the value is deemed acceptable and no corrective action needs to be taken. For example, Figure 2 illustrates how such information might be reported. The boundaries between the green-yellow and yellow-red zones are determined by the thresholds set. In this example, the indicator transitions from the red zone in Year 1 to the green zone in Year 4, indicating that the performance target (set back in Year 1) of transitioning the indicator into the green area by Year 5 has been achieved.

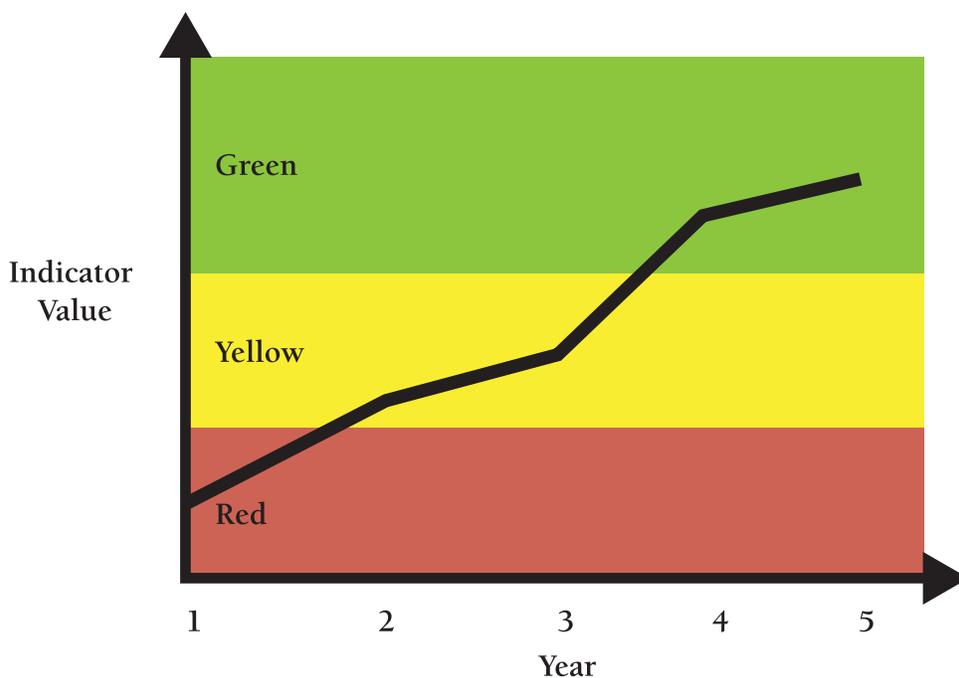


Figure 2

Thresholds provide a baseline against which performance can be measured. Evaluation is the process of comparing the level of each indicator to these thresholds, while reporting is the process of communicating performance levels across spatial (local, regional, provincial) and temporal scales to the general public and decision makers in a manner that they can

understand. This implies rolling-up the performance measures for individual indicators into meaningful indices that measure performance for each attribute and outcome. Without such information roll-up, decision makers and the general public will drown in a sea of seemingly useless information.

1.1 Facilitating Continuous Improvement

While the questions of what to measure and how to measure it will be addressed in subsequent sections of this report, the above description of the monitoring and evaluation framework provides the necessary background to describe how such a system could contribute to the process of continual improvement. This is summarized in Figure 3 on the right. Once the key attributes defining each outcome have been identified, condition indicators are chosen that will enable measurement of the state of each attribute. Influencer indicators are also selected to enable understanding of what things are altering the overall state of the condition indicators. Monitoring is then conducted and

performance evaluated relative to the thresholds set for the indicators. After rolling up all of this information into meaningful and understandable indices, policy decisions and management actions can then be informed by this information. Continuous improvement in the outcomes is achieved by modifying decisions and policies in response to the levels of performance observed and measuring the changes in the performance outcomes that result from such modifications.

In addition to guiding policy adaptation, the framework is flexible enough to enable changes in the targets or thresholds set as a result of changing societal values or as our knowledge and understanding increases. Given that information is rolled up into indices that quantify performance for each attribute, particular indicators defining each attribute may be dropped (for example because they prove to be ineffective) and alternative

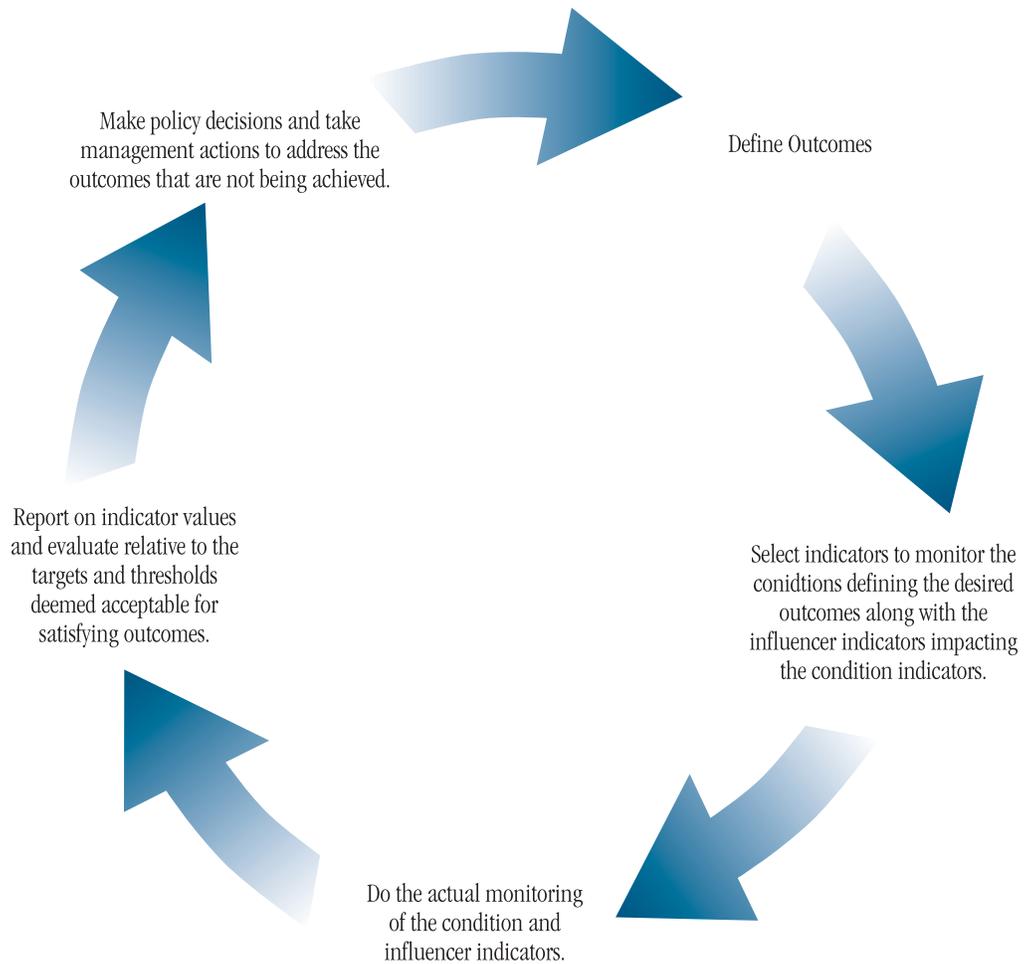


Figure 3

indicators substituted without disrupting the entire monitoring, evaluation, and reporting system. This is important because the use of such frameworks to manage natural resources and the land base is still in its infancy and ongoing research will be needed to evaluate the performance of this monitoring, evaluation, and reporting framework.

While the framework cannot guarantee that we will always make the right decisions -- no framework can do that -- ongoing monitoring, evaluation, and reporting will enable us to determine the impacts of our decisions and whether we need to make changes. In this way, the framework is able to deliver on the goal of sustainability by enabling us to adapt our decisions so that current and future generations achieve the ecological, social, and economic outcomes desired.

The next section of this report describes how the proposed monitoring framework links to the full-cost accounting model proposed by the National Round Table on the Environment and Economy. Section 3 presents the monitoring, evaluation, and reporting framework arrived at by the Group while Section 4 gives the Group's high-level strategy for actually implementing this monitoring, evaluation, and reporting framework.

2.0 Linking Monitoring to Full-Cost Decision Making

Given that one of the objectives of the Land-Use Framework is to facilitate the integration of environmental, social, and economic considerations in decision processes, the Group felt strongly that any monitoring framework developed for Alberta should contribute to the aim of full-cost accounting. This section highlights how the three primary outcomes of this group are consistent with the Capital Model proposed by the National Round Table on the Environment and the Economy (see NRTEE 2003 in the references). see Figure 4.

The Capital Model takes a broad view of capital – defining it from both economic and non-economic perspectives. **Produced Capital** is defined as the goods that provide benefits to their owners by enabling them to produce other goods and services including things such as equipment, buildings, machinery, etc. **Natural Capital** is defined as the “costed” and “uncosted” environmental stocks and systems that provide us with the natural materials and services we depend upon for our survival and also to sustain our economic activity. **Human Capital** includes the “knowledge, skills, competencies, and other attributes embodied in individuals that facilitate the creation of personal, social and economic well-being,” and encompass factors associated with a healthy, well-educated population (Organization for Economic Co-operation and Development, OECD 2001 in references). **Social Capital** includes the “relationships, networks, and norms that facilitate collective action including both formal and informal institutional arrangements” such as social-cohesion (OECD

2001). Of the four types of Capital, Social Capital is by far the least understood.

The three major outcomes of the Land-Use Framework have been harmonized with this Capital Model as follows:

- Social and Human Capital = Well-Planned Places to Live, Work, and Play
- Produced Capital = Sustainable Prosperity Supported by our Land and Natural Resources
- Natural Capital = Healthy Environment and Ecosystems

While the Group could have used these four Capitals as the primary outcomes for the monitoring framework, it was decided to stay with the three outcomes listed in the Group's terms of reference. Some might say that Social Capital and its inclusion under the “Well-planned places to live, work and play” falls outside of the scope of the Land-Use Framework. However, the general feeling of the Group was that Social Capital was too important to exclude from this monitoring framework,

Capital Model

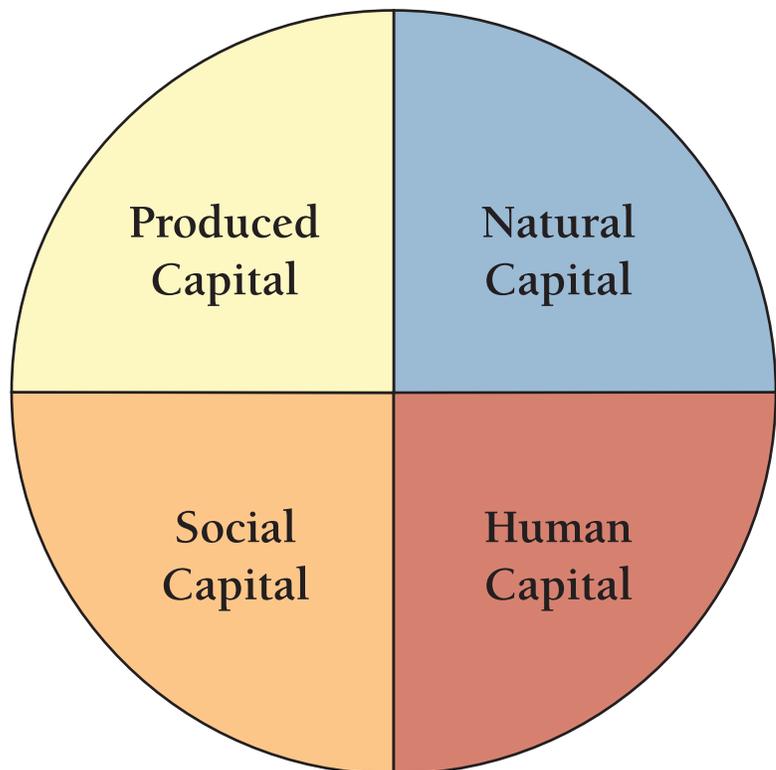


Figure 4 - Capital Model

given that First Nations view Social Capital as linked directly to the land and, given the Group's desire to be comprehensive in what is monitored.

While each of the three broad outcomes in the Land-Use Framework contains explicit or implicit references to sustainability, the Capital Model distinguishes between what needs to be measured to support decision making and the full-cost accounting method used to make such decisions. Such a separation is essential for developing effective monitoring, evaluation, and reporting programs as it separates the information needed to support decision making from the decision processes that are designed to achieve sustainability. Thus, the role of this Group is to ensure that the appropriate information is monitored and reported, while the role of the Planning and Decision-Making Group is to determine the process by which such information will be balanced in decision making. This is one area where integration between the Groups must be more clearly established.

3.0 Monitoring, Evaluation, & Reporting Framework

The intent of this section is to provide the broad outline of the monitoring framework the Group developed. It needs to be stressed that while we think we have identified a fairly complete set of attributes for defining each outcome, we may have missed components that are relevant within the context of the Land-Use Framework. The indicators listed under each attribute are included primarily to clarify what the Group means by the attribute label. The Group is not suggesting that these indicators are necessarily the best ones to use in an actual monitoring program. Such decisions need to be addressed in future work (see Strategy 2). However, the Group felt strongly that the overall intent of this monitoring, evaluation, and reporting framework described in the previous sections should be maintained.

One weakness in the framework presented is that the Group did not spend a lot of time identifying and grouping the influencer indicators into "influencer attributes." Instead, we simply list potential influencers for each outcome at the end of each sub-section. Future work (see Strategy 2) also needs to address this short-coming.

3.1 Outcome: Well-Planned Places to Live, Work, and Play (Social Values)

One of the changes made by the Group was to add the word "work" to this outcome so that it covered where we lived, recreate, and work. This outcome was interpreted as largely equivalent to "quality of life." This is defined by five major attributes: Safety, Access to Services, Diversity of Community and Lifestyles, Sustainability of Land Use, and Social Capital. Human Capital is subsumed under the attribute Diversity of Community and Lifestyles.

Attribute: Safety

Possible Condition Indicators: crime rate (reported and perceived), traffic incidents (e.g., number, severity peak/non-peak), emergency service response times, workplace incidents, etc.

Attribute: Access to Services

Possible Condition Indicators: emergency health care availability, health care generally (proximity, wait times, delivery options, user and provider costs, capacity to meet demand), education, recreation (e.g., area per capita), social services, business services, cultural and heritage services, etc.

Attribute: Diversity of Community and Lifestyles (Human Capital)

Possible Condition Indicators: Cost of living, housing options/distribution, diversity of employment options/distribution, recreational options/distribution, population (size, age, gender, cultural diversity, ethnicity), personal income index, educational attainment (formal, informal), size and diversity of skills in labor force, employment/unemployment rates, income distribution, debt rates.

Attribute: Sustainability of Land Use

Possible Condition Indicators: Density, effectiveness, and efficiency of commercial, industrial, and institutional development. Density of housing, infrastructure capacity and availability, wastewater management (septic fields, sewage disposal, etc), electricity supply/demand, water supply capacity, costs of delivering infrastructure, changes in existing land uses (e.g., conversion of agricultural lands), succession planning, security of food supply.

Attribute: Social Capital

Possible Condition Indicators: Democratic participation (voting rates, rates of membership in social organizations), substance abuse rates, rates of volunteerism, divorce/marriage/common law rates, suicide rates, family structure (# kids, # parents, household size), cultural/heritage options and distribution as it relates to land use, community stability.

Potential Influencer Indicators

Zoning and density of development, loss of educational opportunities (formal & informal), immigration/emigration, changes in population demographics, societal demands or values, cost of living.

3.2 Outcome: Sustainable Prosperity supported by our Land and Natural Resources (Economic Values)

The Group interpreted the intent of this outcome as measuring the economic value of goods or services derived directly from the land. This represents a subset of the overall economic production of the province, since the economic contribution of “high-tech” industries (e.g., software, biotech) that have minimal land or natural resource requirements will not be captured. While diversifying the industrial base of the economy to such “high-tech” fields is a laudable goal and performance in achieving this goal needs to be monitored, it was decided that such monitoring was outside the Group’s terms of reference. Thus, the attributes listed below only capture the economic contribution of highly “land-based” industries.

Attribute: Quantities of Natural Resource Production

Possible Condition Indicators: quantities of hydrocarbon extracted, crops produced, livestock produced, volume of timber harvested, tonnes of ore extracted, mega-watts of electricity generated, etc.

Attribute: Economic Value of Natural Resource Production

Possible Condition Indicators: economic value of each of the natural resources produced (timber, hydrocarbon, crops, etc.), economic value on a per-unit basis, economic value on a per-unit of land disturbed.

Attribute: Economic Value of Intact Landscapes

Possible Condition Indicators: economic value derived from activities on intact landscapes such as trapping, outfitters, hunting, fishing, ecotourism, and recreation.

Potential Influencer Indicators

Availability of resources (e.g., labor, materials, natural resources such as water, financial capital), production costs (labor, equipment, materials, infrastructure, royalties, technology, energy), tax structure, land-use zoning, market accessibility.

3.3 Outcome: Healthy Environment and Ecosystems (Environmental Values)

Alberta currently lacks an integrated approach for monitoring the environmental health and status of ecosystem goods and services. The intent of the monitoring proposed in this sub-section is to fill this gap. This requires the systematic and coordinated monitoring of land, air, water, and biodiversity in addition to the cumulative disturbance of human activity on the land.

Attribute: Water Quality and Quantity

Possible Quality Condition Indicators: Total dissolved solids, heavy metal concentrations, pesticide concentrations, concentration of organic contaminants. Refer to Alberta Water Council or other similar bodies.

Possible Quantity Condition Indicators: In-stream flow, surface water levels, groundwater use/recharge, seasonal variability. Refer to Alberta Water Council or other similar bodies.

Attribute: Air Quality

Possible Condition Indicators: Levels of hydrogen sulfide, mercury, particulate levels, nitrous oxide, etc. Refer to Clean Air Strategy.

Attribute: Soil Quality

Possible Condition Indicators: Erosion, compaction, salinity, carbon balance, capability for current and future land uses, contamination, amount of different soil types and potential for use, soil diseases (anthrax, club root), etc.

Attribute: Biodiversity

Possible Indicators: amount and quality of habitats for native species, population viability and abundances for

native species, ability of land to meet traditional use needs of Aboriginal Peoples. Where possible, refer to existing monitoring programs including the Alberta Biodiversity Monitoring Institute, Species at Risk, Foothills Model Forest, Water For Life, and provincial wildlife surveys.

Potential Influencers

Farming practices, water management practices, rates of pesticide use, rates of fertilizer use, land conversion, grazing practices, forestry practices, oil and gas industry practices, linear disturbance, cumulative amount of surface disturbance/habitat loss, recreational use intensity, other activities and movements that occur as part of economic and social activities, land-use zoning.

Linking Monitoring to Decision Making

Having presented what the Group felt needs to be monitored, it needs to be emphasized that while monitoring, evaluation, and reporting are intended to support decision making, monitoring programs by themselves do not create the decision-making processes or systems that balance desired social, economic, and ecological outcomes. The Group's expectation, however, is that such decision processes and decision support systems will be developed. While such strategies are outside this Group's scope, they need to be included as strategies in the final Land-Use Framework report.

4.0 Strategy for Implementing the Monitoring, Evaluation & Reporting Framework

To provide a strategy for implementing this monitoring, evaluation, and reporting framework it is necessary to first identify what outcome this strategy is to deliver. The primary outcome desired is operational monitoring, evaluating, and reporting programs for the attributes identified above. The strategy proposed contains four parts:

- Integrate the work of the four Land-Use Framework Working Groups
- Adapt existing or create new monitoring programs
- Establish the governance structure for these programs

- Determine how all of this monitoring information can be communicated to the public and governments.

A minority opinion that was offered stated that within the Land-Use Framework, Western Scientific Knowledge and Traditional Ecological Knowledge should be consistently integrated within its planning, managing, monitoring and assessment components.

Strategy 1: Integrate the work of the four LUF Working Groups into a viable Land-Use Framework

To date, each of the four Land-Use Framework Working Groups has been working in isolation with little discussion across groups. As a result, simply aggregating the four reports into a single document will not result in an integrated Land-Use Framework. Achieving a workable Land-Use Framework requires that the four groups work out any inconsistencies in how the entire Land-Use Framework will function after they see what each Group has done. One way this could be accomplished is for select members from each of the four Working Groups to meet and to work out the inconsistencies in the overall emerging framework and to identify gaps. These members would then present the emerging, integrated framework to their respective Working Groups. This process would need to be iterated until a final, consistent framework emerged.

This strategy needs to be accomplished in the next month.

Strategy 2: Convene separate groups of knowledgeable and experienced experts to design, test, and implement monitoring programs for the attributes identified

The outcomes of the LUF encompass a broad spectrum of economic, environmental and social issues. For some of the attributes, such as those related to economics, monitoring already occurs. To gather data for other attributes, however, new programs will have to be established. For each identified attribute and the supporting indicators, a monitoring program must be developed and implemented. This is a complex and

difficult task. Thus, for each attribute, a group of individuals who are both knowledgeable and extremely experienced with respect to the subject areas covered by the attribute needs to be convened to take on this work. At a high level, the following things need to be achieved by such groups:

- Scope out what steps are required to achieve effective monitoring, evaluation, and reporting programs for the particular attribute the group is focusing on and what the costs of program development will be.
- Determine what indicators should be monitored for both condition and influencer indicators. What are the costs of collecting different indicators? How could such collection be accomplished? How often? What will the overall cost of running the program be? Additionally, the group needs to anticipate externalities to Alberta's monitoring requirements, for example the emerging federal bio-security monitoring requirements that will need to be satisfied to engage in international livestock trade.
- Define the level of monitoring accuracy the program should achieve, and why. For example, increasing levels of monitoring may be necessitated if an indicator moves from yellow and then to red, while less monitoring is required when the indicator values are in the green area. Such details about how the monitoring program would change based on performance need to be specified.
- Where appropriate, determine whether existing monitoring programs within Alberta or other jurisdictions (e.g., federal government) could be adapted or used to report on the given attributes. In order to make use of such programs, however, it is necessary to first construct a more detailed Inventory of existing monitoring programs than is given in the Section 7 Appendix. Having such an Inventory is essential to understanding how current monitoring could fit into the holistic monitoring and evaluation framework proposed by this Group. As the government is currently conducting an inventory of all its different regulatory and policy requirements, the monitoring requirements (implicit or explicit) in these different regulations and policies should also be identified and linked into this Inventory of monitoring programs. In this way, a

complete picture of what is being measured and what needs to be measured (based on existing regulatory requirements and as an outcome of the LUF) can be obtained. This Inventory needs to address the following questions:

- what is currently being monitored and why
- who is doing the monitoring
- the level of detail and accuracy required of the program given the particular regulations or policies it is supporting
- the demonstrated level of detail and accuracy the program is able to provide
- how the results are evaluated and reported
- where the results are used in the decision making or regulatory process
- the cost of the program
- whether the program is accountable, as judged by the measurements it makes, the metrics it uses, and the transparency of its reporting
- Describe how the proposed monitoring program needs to be tested to ensure its effectiveness.
- Determine how the monitoring information obtained from the suite of indicators will be rolled-up into aggregate indices, determining how positive and negative changes in the underlying indicators will affect the overall behavior of the index.
- Determine the reporting requirements. This should include identifying the audience and format of the reporting as well as the spatial (geographic) and temporal scales.

The Group did not feel that any of the three outcomes should be given priority over the other in terms of monitoring program development but instead noted that different attributes in this monitoring framework would require far greater investment than others. For example, provincial systems for monitoring of land, air and water are far less developed than monitoring for economic attributes. The Group felt that greater resources needed to be devoted to attributes where monitoring is the weakest.

The Group felt that this entire strategy needs to be completed within the next two years, while the Inventory of existing monitoring programs needs to be completed in the next year.

Strategy 3: Establish a governance structure for the monitoring, evaluation, and reporting programs

Governance relates to the question of how monitoring, evaluation, and reporting is to be accomplished and covers a range of issues including: determining responsibilities for gathering information, setting thresholds and required performance standards, evaluating performance, reporting on performance, and funding. The main conclusion reached by this Group is that because monitoring, evaluation, and reporting are to support decision making at the municipal, regional and provincial levels the provincial government must ultimately be responsible for the development and governance of the monitoring, evaluation, and reporting programs. This statement does not mean that the regions and industry do not have vital roles to play in the creation and running of such programs, but instead is intended to convey that when disagreements and disputes arise about what and how to monitor, it is the province that must resolve such issues. There are a number of reasons why the provincial government (as opposed to municipalities or regions) must take the lead role.

- It is the provincial government (and not regions or municipalities) that has ultimate authority over Alberta's natural resources. With this authority come certain responsibilities for monitoring and evaluation that cannot be delegated.
- Attempting to shift responsibility for monitoring, evaluation, and reporting to the regions makes it more difficult to access all of the monitoring information and leads to a lack of consistency in what is measured and reported. For example, different stakeholder groups and industry currently do a large amount of monitoring, but it is a difficult and laborious task to access and aggregate this data for analysis purposes. Regional responsibility for monitoring and evaluation, coupled with a lack of standardization, would greatly increase the costs to

industry (e.g., air and water samples from different regions could require different analyses to satisfy specific regional monitoring requirements). A lack of data accessibility and standardization would also greatly complicate provincial-level decision making. For example, if each region in the South Saskatchewan River basin measured and reported stream flow differently, how would it be possible to determine which regions need to cut-back on water usage in order to maintain flow in the South Saskatchewan River? Because the province is responsible for ensuring that river flows satisfy inter-provincial flow requirements, the only way to answer this question would be to standardize the regional monitoring programs – thereby arriving at a unified provincial system. In summary, just as we would not accept measuring the rate of inflation differently in Calgary versus Edmonton, similarly we should not accept a regionalization in the meanings of the attributes put forward by this Group. Acknowledging differences in the importance of outcomes to be achieved in different regions does not imply that we should measure and report on such outcomes differently across the province.

- The province must be responsible for ensuring that the thresholds set in different regions will not inhibit other regions from achieving their targets and for ensuring that provincial level objectives are met. For example, suppose a particular endangered species' habitat spans multiple regions. Because the province is responsible for the recovery of this species the province must ensure that, across the regions, thresholds are set in a manner that is consistent with the provincial objective. This does not mean that every region must have the same recovery standards, only that across the province the necessary trade-offs have been made to ensure the provincial goals for the species are met. Another example could be the transport of air pollutants from one region leading to air-quality problems in another region. Because the province is responsible for dealing with the health impacts of air-pollution, it must maintain the authority to resolve such cross-regional problems by maintaining the right to enforce performance standards.

Given the important role that such monitoring information is intended to play in future decision-making processes at various government levels, the governance and funding structure for the monitoring programs must:

- enable ongoing monitoring over the long term
- be adaptive to emerging needs and increases in understanding
- be transparent so the trust of all stakeholders is maintained even as they are impacted by the evaluation results.

The challenge is finding the appropriate model to deliver on these three criteria. The Group recommends that the provincial government needs to take the lead role in developing and funding the required monitoring programs. The relationship of the programs to the government would likely be structured similarly to that of the Bank of Canada relative to the federal government – while still part of the federal government the bank is in some sense at “arms-length” from the federal government. Another example might be that of the Auditor General who audits federal government operations and provides Parliament with independent information on the government’s stewardship of public funds. Again, while part of the government, the role is at “arms-length” from it.

The Group thus recommends that another group of individuals who are both knowledgeable and extremely experienced with such issues be formed to address the critical issue of how monitoring and reporting programs should be governed. This group needs to define how these programs can be “arms-length” from government so that under different decision scenarios impacting stakeholders, the monitoring, evaluation, and reporting systems will persist over the long term. In essence, how should the governance structure be created so that if our monitoring system tells us we are “heading for the rocks” we can resist the inevitable political pressures to throw our navigation system (i.e. monitoring programs) overboard?

The group felt that this strategy should be completed in the next two years.

Strategy 4: Determine how information from the separate monitoring programs will be aggregated and reported to inform decision processes

The monitoring, evaluation, and reporting framework presented in this report is designed to support the process of decision making. Thus, because we envision separate monitoring programs for the attributes listed, it is critical that separate program information be aggregated to enable decision making. The model we propose is that of separate programs each maintaining their own databases. However, to make it easy for the end-users to satisfy their informational needs, these separate databases should be accessible through a single portal. Thus, to obtain data on diverse attributes covered by separate monitoring programs, a user would issue the requests using the central portal and the central portal would then seamlessly query the separate databases for each program and deliver this information to the user. In this way, all the monitoring information can be accessed easily by the users (public, government, municipalities) and the data can be stored and managed in a distributed fashion by the separate programs.

Achieving such seamless delivery among separate monitoring programs requires that programs standardize the way in which their database can be queried and the way in which information from such queries is delivered to the central portal. Given that we are intending this monitoring, evaluation and reporting system for the long term, such seamless integration needs to be “built in” as these monitoring programs are constructed. Because the provincial government has full responsibility for monitoring, evaluation, and reporting, it also has full responsibility for housing this information. This will require further significant investment in integrated information systems.

A group with expertise in the field of such distributed data delivery needs to be formed to scope-out how such a system would function and what interoperability standards need to be created. In addition, this group also needs to address how the wealth of monitoring and evaluation information data can be presented effectively to diverse audiences to facilitate full-cost accounting in the decision making process. Prototypes of such a system need to be created and tested under different decision contexts to ensure that the way information is

presented to the end-users minimizes the chances for misinterpretation.

The Group felt that this strategy should be completed within the next three years.

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5.0 Glossary of Terms Used

Attributes — Components or aspects that together define the broad outcomes. Each attribute is quantified using a number of different condition indicators, the values of which are combined into a performance index for the attribute.

Evaluation — Evaluation involves comparing the indicators to the specified thresholds and reporting on overall performance with respect these thresholds.

Human Capital — Defined by the Organization for Economic Co-operation and Development (OECD 2001 in references) to include the “knowledge, skills,

competencies, and other attributes embodied in individuals that facilitate the creation of personal, social and economic well-being,” and encompass factors associated with a healthy, well-educated population.

Index — Indices are computed from the values of indicators to measure performance on more abstract entities such as attributes or overall outcomes.

Indicators — Measurable or quantifiable features of the attributes that are used to report on the status of the attributes. Indicators can be of two types. Condition indicators measure the specific state of the social, economic, or environmental system (e.g., physical or chemical) and quantify the state or condition of the particular part of the system. Influencer indicators measure things that bring about a change in the state of the condition indicators. For example, in an environmental context these could be industrial development intensity that impacts water quality (a condition indicator). Influencer indicators help to guide management actions or policy decisions.

Monitoring & Evaluation — If we adopt policies and make decisions to achieve particular outcomes, then the only way we can determine whether we are achieving those outcomes is through a monitoring and evaluation process. Monitoring by itself simply reports on the status or condition of different indicators, while the evaluation process compares these to the specified targets or thresholds.

Natural Capital — The “costed” and “uncosted” environmental stocks and systems that provide us with the natural materials and services we depend upon for our survival and that sustain our economic activity.

Outcomes — Broad, general aspects of the environment, economy, or social values that are important to Albertans.

Produced Capital — Material goods that provide benefits to their owners by enabling them to produce other goods and services including things such as equipment, buildings, machinery, etc.

Social Capital — Includes the “relationships, networks, and norms that facilitate collective action including both formal and informal institutional arrangements” such as social-cohesion (OECD 2001).

Targets — Levels of indicators that we strive to achieve in the future, possibly so that we will eventually achieve a given threshold. For example, a target may be a 20% improvement in an indicator over the next five years thus enabling the indicator to transition out of the red-zone and into the green zone by the end of this time period.

Thresholds — Technically or socially based standards identifying the points at which acceptable or unacceptable conditions occur.

6.0 Appendix: Summary Answers to Three Questions in Terms of Reference

The Monitoring and Evaluation Group was tasked with answering three specific questions:

1. What should be measured?
2. How should it be measured?
3. How should the measured results be used in a continuous improvement process?

While these questions are answered implicitly in the body of the report, the aim of this Appendix is to provide explicit, short answers to these questions.

6.1 What should be measured?

While the direction given to this Group was to identify the “key land use, natural resource and other indicators that should be used to measure progress toward achieving the proposed vision and outcomes of the Land-Use Framework,” the conclusion of this Group was that we could best address the intent of this question by specifying the attributes which defined the three outcomes of i) well- planned places to live, work, and play, ii) sustainable prosperity supported by our land and natural resources, and iii) healthy environment and ecosystems. This the Group did, and our results are presented in Sections 3.1 to 3.3. The primary reasons for focusing our work and report at the level of attributes was:

- To ensure that broad aspects of each major outcome are actually covered by the monitoring, reporting, and evaluation framework. Ensuring this framework is comprehensive and balanced requires thinking at a level between individual indicators and the three broad outcomes. Thus, the Group felt that it could best answer this question by attempting to group the indicators it came up with into broad attribute categories and by ensuring that these attributes covered the important dimensions of the three major outcomes.
- There was not sufficient time available to the Group to design comprehensive, balanced monitoring programs. While it is easy to design ineffective monitoring and evaluation programs, designing effective, comprehensive programs requires research programs that carefully define what indicators to measure for each attribute, how the indicators are to be measured, and testing the proposed methods before implementing the program.

6.2 How should it be measured?

The question of how the information should be measured spans a number of other questions asked in the Group’s terms of reference.

What existing information and monitoring systems are working well? What is not working well and what are the gaps?

The government was able to furnish this Group with a partial list of existing monitoring programs and this is included in the Section 7 Appendix. However, the information within this synthesis was not sufficient for the Group to address whether existing monitoring programs are working well or where gaps exist. While the Group did not feel it could answer these two questions, it is worth noting that other recent reports have highlighted grave deficiencies in the government’s current monitoring and evaluation systems (e.g., “Investing in our Future – Responding to the Rapid Growth of Oil Sands Development” <http://www.gov.ab.ca/home/395.cfm>; “Report of the Rosenberg International Forum on Water Policy to the Ministry of Environment, Province of Alberta” http://www.waterforlife.gov.ab.ca/docs/Rosenberg_Report

.pdf). The Group suggest that an Inventory of existing monitoring programs be conducted, as outlined in Strategy 2.

What improvements are required to existing land information, monitoring and evaluation systems and processes?

Even though the Group could not address the strengths and weaknesses of existing monitoring programs, a number of suggestions can be made:

- Monitoring programs need to use standardized data collection processes and standardized metrics so that the same program can be applied across jurisdictions. Currently, it seems that this is not being achieved across different regions, ministries and departments. Further, monitoring needs to be more integrated. For example, stream water quality stations need to be integrated with stream water quantity stations in order to adequately interpret water quality data.
- The Monitoring and Evaluation framework needs to be embedded within a legal framework that ensures accountability and sufficient resources to conduct effective monitoring, evaluation, and reporting.
- Current monitoring programs are not doing a good job of reporting or synthesizing the information across spatial scales and across indicators. Reporting and integration between monitoring programs needs to be improved.

What new systems and processes are needed?

Ultimately, this Group wants to see a monitoring, evaluation, and reporting framework that is capable of supporting full-cost accounting – meaning that economic, ecological, and social values are considered in decision making. Such a monitoring system currently does not exist and needs to be created. As discussed in Section 0, such a system would take the information produced by monitoring programs for each attribute and roll-up such information in ways that would support decision-making at regional and provincial scales. The process by which such information would be used in decision-making also needs to be developed.

In terms of the actual monitoring and evaluation systems needed to support such a system, it seems likely for many of the attributes (e.g., Quantities of Natural Resource Production, Economic Value of Natural Resource Production, Maintenance of Biodiversity) the required indicators are likely already being measured, and thus the programs for such attributes would simply have to ensure that the information is reported in a manner that facilitates full-cost accounting. For other attributes (e.g., Disturbance, Water Quality and Quantity of Groundwater) entire new monitoring programs must be created. This point will become clear once existing monitoring programs are inventoried.

6.3 How should the measured results be used in a continuous improvement process?

This question is addressed in Section 1.1 of this report.

7.0 GOA Draft Overview of Current Monitoring Programs

Environmental Monitoring - Title	Responsibility and Participants	Purpose	Indicators	Comments
Environmental Effects Monitoring	Federal	Science-based tool used to detect and measure changes in aquatic ecosystems. Detected adverse changes can lead to changes in effluent release standards.	<ul style="list-style-type: none"> Fish health (contaminant levels) fish habitat condition use of fisheries resources by humans 	EEM is a federal requirement for regulated pulp mills and mines under the Regulations Amending the Pulp and Paper Effluent Regulations and the Metal Mining Effluent Regulations both under authority <i>Fisheries Act</i> . Companies regulated under the Act and regulations are required to design the monitoring program, carry out monitoring and report on monitoring results in accordance with EEM standards.
Ecological Monitoring and Assessment Network (EMAN)	Multi-stakeholder	<ul style="list-style-type: none"> national perspective on how Canadian ecosystems are being affected scientific rationale for pollution control and resource management policies evaluate and report on the effectiveness of resource management policies identify new environmental issues 	<ul style="list-style-type: none"> Range of biotic and abiotic indicators 	Six EMAN sites in Alberta. Coordination support provided by Environment Canada.
State of the Environment	Provincial	Broad long-term monitoring and reporting on status of the environment	Currently, the State of Environment reports includes 45 indicators organized within six major themes – air (12), water (17), land (8), biodiversity (3), waste (3) and climate	The Government of Alberta (GOA) has a responsibility under the <i>Alberta Environmental Protection and Enhancement Act</i> legislation to conduct “State of the Environment” (SOE) reporting. While the mandate to report resides within Alberta Environment (AENV), it is clear that the environment, and responsibility for its management and determination of desired outcomes, rests across multiple ministries within the GOA, all levels of

(2). Indicators within each theme are categorized according to whether they are reporting on a

- “condition” (reporting an ambient state),
- “pressure” (induced or human-caused effects on environmental conditions), or
- “stewardship” (assessing our management regime or business performance).

government, and indeed with parties external to government. SOE reporting by necessity must take a collaborative approach that recognizes and maximizes the particular responsibilities, data and expertise of all contributing organizations and stakeholders.

Indicators are targeted for updates every 1-2 years, or as new data and information become available. New indicators are developed as policies, trends, or environmental issues emerge.

Historically public SOE reporting was conducted in cycles, with a 5-year time frame for major updates and with an annual report focus on a particular theme. Evolving with growth in information systems such as the Internet and public expectations for more relevant and timely access to information, Alberta Environment launched an online SOE website (www3.gov.ab.ca/env/soe/index.html) in 2005. The SOE website was developed in partnership and consultation with other departments within the GOA.

The SOE reporting model is moving from a “basic” level of reporting (“what is going on”) to a model where indicators are more directly linked to specific policy targets and benchmarks in order that progress either toward or away from shared outcomes can be measured (“how are we doing”). This represents the assurance function within the systems management approach – ensuring that credible information is available in order to support management decisions. Policies and management objectives can be assessed for their level of success and subsequently modified if they are not achieving the desired outcome.

Alberta Natural Heritage Information Centre	Provincial/federal	Data repository for natural heritage information; provides accurate and accessible biodiversity information for making informed resource management decisions	Species data (selected taxa including geographic range, sub-national status and autecology)	Provincial-federal partnership
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Land and Land-use Monitoring - Title	Responsibility and Participants	Purpose	Indicators	Comments
Loss of farmland	Federal	Monitor loss of agricultural land	<ul style="list-style-type: none"> • “dependable” (CLI class 1-3) agricultural land 	Statistics Canada also does national level monitoring of the loss of “dependable” (CLI class 1-3) agricultural land – reports released in 2001 and 2005.
Soils monitoring	Provincial	Soil productivity and farm production	field management crop yields changes in soil properties	<p>Agriculture and Food had initiated a comprehensive soil and water monitoring program in 1995-9.</p> <p>Annual sampling was carried out by landscape positions on 45 farm fields across Alberta to monitor field management, crop yields and changes in soil properties (since 1997). The time series data has been analyzed in cooperation with the Alberta Research Council using multivariate techniques in order to ascertain the effects of field management upon soil properties (report in prep.). Various reports have been prepared on specific parameters such as soil organic matter trends, micronutrient and trace element analysis (of soil as well as grain). Extension material on soil quality have been produced over the years with tools for farmers such as the Soil Quality Health Card. Extension, monitoring and science development reports are available on line at the soil quality webpage: www.agric.gov.ab.ca/soil_quality</p>
Loss and fragmentation of farmland	Provincial	Monitor loss and fragmentation of agricultural land	Changes in agricultural land-use to other land uses	<p>Agriculture and Food (Policy Secretariat) has been monitoring either the conversion of agricultural land or the fragmentation of that land since 1976 (the emphasis/purpose has changed over time in response to changes in land-use pressures and to farming practices). Its scope pertains to agricultural lands across the province and any changes in land use - from agriculture to other land uses. The most recent (2002) report available at: www1.agric.gov.ab.ca/\$department/deptdocs.nsf/all/psc4786. This information is based on development applications and approvals collected from rural municipalities.</p>

Protected areas network monitoring	Provincial	Maintain information on province's landscape classification system. Progress on achieving province's representation targets	<ul style="list-style-type: none"> • Natural regions • Natural history themes (Levels 1, 2, & 3) • Preservation targets 	<p>Preservation Targets: There are preservation targets for each of the 174 level 1 natural history themes across the 21 sub-regions. These targets meet only the preservation requirements of the parks and protected areas network. As we consider additional uses for outdoor recreation, tourism and other economic activities, the targets are adjusted upward.</p> <p>Together these targets indicate the total area required to adequately preserve most of Alberta's biodiversity. Targets are based on literature reviews and on the combined expertise of the province's scientists and naturalists. Level 1 targets reflect the importance of the various themes to natural diversity within each sub-region. While the targets reflect the aerial extent of the themes within each sub-region, they are not based on exact proportions. For example, springs in the Dry Mixed Grass Sub-region are far more diverse and biologically important than areas of ground moraine in this sub-region. Although the level 1 target for springs is only 2.5 square kilometres, it accounts for a greater proportion of the total area of springs as compared to the target of 200 square kilometres for ground moraine.</p>
Grassland Vegetation Inventory	Provincial	Inventory of the extent and composition of existing native grasslands	<ul style="list-style-type: none"> • Soil classification • Vegetation classification 	Not a systematic monitoring program, but an inventory of existing grasslands.
Rangeland Reference areas program	Provincial	Rangeland condition monitoring	<ul style="list-style-type: none"> • Vegetation species composition in presence and absence of grazing (every 3 yrs.) • forage production (annual) 	Rangeland reference sites (over 180) include forested rangeland, harvested sites, grasslands, and riparian areas.
Range and Riparian Health	Provincial	Determine range and riparian health	<ul style="list-style-type: none"> • Vegetation composition and condition 	Information recorded as part of the grazing lease renewal process.

Monitoring of industrial development and reclamation of public land	Provincial/industry	Determine level of compliance with conditions placed on allocation and disposition approvals	<ul style="list-style-type: none"> Allocation and disposition conditions (e.g., setbacks, buffers, timing restrictions, soil disturbance, erosion control, re-vegetation) 	Ongoing compliance and audit inspections by provincial land managers. Industry monitoring to ensure environmental compliance and adherence to approval conditions.
SRD land allocation reporting	Provincial	Track number of disposition approvals	<ul style="list-style-type: none"> #s of dispositions 	
Land Monitoring - Long term soil acidification monitoring	Multi-stakeholder	Measure soil chemistry affected by acid deposition at 8 sites across the province.	<ul style="list-style-type: none"> soil chemistry and acidity 	Land use & industrial soil monitoring according to conditions land-use approvals. Carried out through partnerships with ARC, UofA, Cows & Fish, ACA, GOA ministries.
Land Monitoring - Riparian health assessment (southern Alberta)	Multi-stakeholder	Pilot project to assess the health of riparian areas in selected watersheds in south and central Alberta	Stream bank stability % vegetation cover composition and condition of stream bank/riparian vegetation	Data from riparian health assessment compiled into reports for use by watershed stewardship groups and land managers.
Land Monitoring - Reclaimed soil quality benchmark sites (under development)	Multi-stakeholder	Monitor recovery of soil and landscape quality to its original or background condition following industrial disturbance	soil composition nutrient and contaminant levels	In addition to the above monitoring, industrial soil quality monitoring, including remediation activities, is reported to AENV annually, as part of approval requirements. Reports are compiled for decision makers to use for the environmental management of land.
Alberta Vegetation Inventory	Industry	Broad scale monitoring of provincial forest cover	<ul style="list-style-type: none"> forest cover forest types 	Conducted by forest companies according to GOA standards. Completed through air photo interpretation and ground truthing.
Growth and Yield monitoring (forests)	Provincial/Industry /federal	Monitoring of forest growth to support sustainable forest management	<ul style="list-style-type: none"> forest growth and yield 	Approximately 1000 sample sites located throughout the forested area of the province are monitored by the GOA. Over 6000 sample sites are monitored by forest companies. A small number of sample sites are also monitored by the federal government (Canadian Forest Service) to model forest growth and monitor pine effects

Forest Operations Monitoring Program	Provincial/industry	Verification of forest industry compliance with timber harvesting and reforestation regulations and operating ground rules	Two types of monitoring criteria: <ul style="list-style-type: none"> • forest operations (e.g., watercourse crossings, roads, soils structure retention) • silviculture (e.g., site preparation, seeding, planting, tending) 	Reforestation success is monitored by forest companies and data is provided to GOA where it is housed in the Alberta Reforestation Information System (ARIS)
FMA Detailed Forest Management Plans	Industry	Establish a future forest condition and a spatially planned harvest sequence. Predict forest growth and determine actual stand level performance	Indicators and targets established by the Canadian Council of Forest Ministers include: <ul style="list-style-type: none"> • Biological diversity • Ecosystem productivity • Soil and water • Global ecological cycles • Multiple benefits to society • Accepting society's responsibility for sustainable development 	As part of the FMA, companies are required to measure effects of forest activities on forest land base and forest values/objectives. Forest management planning is required to follow a CSA approved process that assesses plan objectives through the use of measurable indicators and targets from which companies monitor and adjust.
Historical resources assessments	Provincial	Determine the effect of develop activities on historical resources	<ul style="list-style-type: none"> • paleontology, archeological prehistoric, historic, natural, scientific or aesthetic sites or objects 	Historical resource assessments are not done as part of a systematic monitoring program but must be completed by development proponents prior to their activity. The province has a number of database to house the data obtained through assessments – Archeological Land-Use Database, Archeological Sites Inventory Database, Traditional Land-Use Database, Paleontology Sites Records.

Biodiversity, Fish and Wildlife Monitoring - Title	Responsibility and Participants	Purpose	Indicators	Comments
Alberta Biodiversity Monitoring Institute (ABMI)	Multi-stakeholder	Broad-scale (provincial), long-term monitoring program	<ul style="list-style-type: none"> • ~ 25 terrestrial and aquatic metrics ranging from fungi and lichens to diversity of habitat types 	Currently transitioning from prototype Proof-of-concept Phase to implementation
General Status of Wildlife reporting	Provincial, ACA	Determine status of Alberta's wild species	<p>Wide range of taxa including:</p> <ul style="list-style-type: none"> • Birds • Mammals • Amphibians • Reptiles • Fish • Butterflies • Orchids • ferns 	<p>Every five years, the Fish and Wildlife Division of Alberta Sustainable Resource Development reviews the status of Alberta's wild species. These reviews, which were previously conducted in 1991 and 1996 (Status of Alberta Wildlife), rank species into categories reflecting the perceived level of risk to their populations in Alberta. In 2001, the most recent version of this review process was completed (The General Status of Alberta Wild Species), which includes rankings for a wide range of taxa (birds, mammals, amphibians, reptiles, fish, butterflies, orchids, and ferns). The Alberta Wildlife Status Report Series is an extension of this review process.</p>
				<p>Species ranked "At Risk" (formerly "Red List") or "May Be At Risk" (formerly "Blue List"), that are of uncertain status (ranked "Undetermined"), or are considered to be "At Risk" at the national level because of listing by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered or Threatened receive priority in this process. Links to the detailed status reports for such species are found on this page. These reports have been published and distributed jointly by the Alberta Conservation Association and Alberta Sustainable Resource Development, and are intended to provide up-to-date information that may be used towards the sound management of populations of species and their habitats in the province.</p>

Species monitoring	Provincial, NGOs, Industry	Determine population size and distribution, and trends in high profile species.	<ul style="list-style-type: none"> Grizzly bear caribou
Aerial Ungulate surveys	Provincial and NGOs	Determine ungulate species population distribution, size and trends.	<ul style="list-style-type: none"> Big game ungulate species (e.g., moose, w-t deer, mule deer, antelope, elk, bighorn sheep) habitat conditions
Spring waterfowl pair survey	Provincial, federal, U.S., and DU	Monitor habitat condition and waterfowl numbers	<ul style="list-style-type: none"> Pond conditions # & species of waterfowl
Upland Bird Surveys	Provincial and NGOs	Determine upland bird species population distribution, size and trends.	<ul style="list-style-type: none"> count of number of breeding birds and/or leks habitat conditions & disturbance
Annual hunter surveys (hunter success)	NGOs	Determine level of hunter success	<ul style="list-style-type: none"> species harvested location harvested success rate
Recreation angler survey	Federal/provincial	Monitor recreational fishing activities and expenditures	<ul style="list-style-type: none"> fishing effort numbers of fish and species angled fishing related expenditures additional provincial angling information (e.g., where fish are caught)

Water Monitoring - Title	Responsibility and Participants	Purpose	Indicators	Comments
Surface Water Quality Monitoring	Provincial (AENV) and multi stakeholder	Monitoring of the amounts and types of physical, chemical and biological components in water (lakes, rivers) and in aquatic ecosystems.	<p>Common monitoring parameters include:</p> <ul style="list-style-type: none"> • in-organics (nutrients, ions) • metals • organics • bacteria • chlorophyll • turbidity • pH • temperature • dissolved oxygen. 	<p>AENV's program includes a level of ongoing long-term provincial monitoring, in addition to regional/site specific project-based monitoring that varies from year to year. Monitoring of inter-provincial agreements is also done to ensure water quality standards are met at the borders of neighbouring jurisdictions. A significant portion of data is collected by in house field staff and stored in AENV databases.</p> <p>The following types of monitoring projects will assess trends in water quality:</p> <ul style="list-style-type: none"> • Reporting on performance measures (i.e. Alberta Water Quality Index) through the long-term river network. • Data for lake and watershed management in support of Watershed Planning and Advisory Councils (WPACs) and Watershed Stewardship Groups (WSGs) • Assessment of aquatic ecosystem health (Water for Life) • Evaluation of human health risks, such as from bacteria, viruses and pesticides • Evaluation of 'emerging' contaminants and issues (e.g. pharmaceuticals) <p>Reports are compiled for decision makers to use for the environmental management of water. In addition to the above ambient program, the water quality of municipal and industrial effluent is reported to AENV monthly, as part of approval requirements.</p> <p>Financial and in-kind support is also provided to partners in monitoring, such as Alberta Lake Management Society (ALMS), Alberta Agriculture, Regional Aquatic Monitoring Program (RAM), Alberta Parks, WPACs (e.g. Bow River Basin Council, Milk River WPAC, etc.), cities.</p>

Watershed water monitoring program	Provincial (Agriculture and Food)	Watershed-based water quality assessment to determine effects of different levels of agricultural intensity	Standard water quality parameters including nutrient loading parameters	Weekly water sampling (flow biased) has been carried out by Agriculture and Food on 23 watersheds across Alberta. Watersheds have been selected to represent different levels of agricultural intensity. Annual report cards have been produced that summarize measured water quality parameters. Agriculture and Food now currently focusing its water monitoring resources on two small watersheds containing intensive livestock operations with the purpose measuring the effects of changed livestock management practices on water quality over the longer-term.
Groundwater Monitoring - • Groundwater Observation Well Network • Industry groundwater monitoring of levels and quality • Issue driven monitoring programs (e.g., Coal bed methane, Industrial Heartland, Wood Buffalo region)	Provincial and industry	Groundwater quantity and quality	<ul style="list-style-type: none"> • Well water production • Standard water quality parameters • Presence of methane gas in coal bed methane production areas 	<p>The Groundwater Observation Well Network has approximately 186 active (currently monitored) wells across Alberta that are measured for groundwater quantity (water levels). Furthermore, within a network of 337 wells, approximately 30 wells are sampled annually for a variety of groundwater quality parameters. Data is collected by and housed within AENV.</p> <p>Reports are compiled for decision makers to use for the environmental management of water. There is a considerable amount of industry monitoring of groundwater levels and quality, which is reported to AENV annually as part of approval requirements.</p> <p>The groundwater monitoring program also conducts well maintenance and the ‘closing off’ of abandoned wells to prevent groundwater contamination. Alberta Environment groundwater monitoring program supports a variety of partnerships in Alberta, including data sharing agreements and regional programs.</p>

<p>Hydrometric Monitoring – Surface Water Quantity and Meteorological (Climate)</p>	<p>Federal/Provincial Agreement (Water Quantity) and Provincial (Meteorological)</p>	<p>Basic hydrometric monitoring to support water use and allocation decision-making, environmental reporting and trend assessment. Monitoring of inter-provincial agreements is also done to ensure enough water is received from and also delivered to neighbouring jurisdictions.</p>	<ul style="list-style-type: none"> • long-term weather metrics - precipitation (rainfall, snowfall), snow pack, temperature, wind (speed & direction), relative humidity and solar radiation data. • River, creek and canal flows, lake/reservoir levels, real time networks (362 sites) • water management (water licensing and use), • water supply 	<p>Hydrometric monitoring also supports real-time operational decision-making for AENV Water Management Operations (e.g., operation of dams, reservoirs).</p> <p>Surface Water Quantity monitoring deals with the amount of water in the environment, whether it is a water level for a lake or the amount of water flowing in a river or stream. Water Survey of Canada (WSC) operates 398 hydrometric sites in the province under the Cost Share Agreement. Historical data sets of varying record length exist at more than 1,200 sites and are available online from WSC. Data is also gathered by AENV at some sites.</p> <p>Meteorological (Climate) monitoring provides baseline data for current conditions, reporting, weather forecasting, flow forecasting, water supply, forestry (forest fire monitoring and logistics), agriculture (drought monitoring). Data is gathered through partnerships with Alberta Agriculture, Alberta Sustainable Resource Development, and Meteorological Service of Canada (Environment Canada).</p> <p>Reports are compiled for decision makers to use for the environmental management of water. Monitoring information is also used to issue monthly water supply outlook reports to the public, as well as advisories or warnings during periods of high flow or flood.</p>
<p>WBEA Monitoring Programs</p> <p>Passive Ambient Air Monitoring</p> <ul style="list-style-type: none"> • Jack Pine Acid Deposition • Monitoring Network • Nitrogen Deposition Effects in Bogs • Lichen Monitoring Pilot Project 	<p>Wood Buffalo Environmental Association (multi-stakeholder)</p>	<p>Monitoring of air shed, air quality, land effects and human exposure</p>	<ul style="list-style-type: none"> • O₂, NO, NO₂, NO_x, SO₂, H₂S, TRS, THC PM 2.5, CO Wind Speed and Direction, Exterior Temperature • Jack pine growth • Bog moss growth and bog water chemistry • Lichen condition 	<p>WBEA is a multi-stakeholder organization that monitors the air quality in the Municipality of Wood Buffalo. This is done through a variety of air, land and human monitoring programs.</p> <p>The Terrestrial Environmental Effects Monitoring (TEEM) committee of WBEA identified the need for a centralized database to store all previous and current TEEM Program datasets. As a result, TEEM contracted a consultant to develop a regional database designed to store TEEM data as well as other relevant datasets that might be utilized for future TEEM</p>

<ul style="list-style-type: none"> • False Colour Infrared (FCIR) Vegetation Stress Survey 	<ul style="list-style-type: none"> • Vegetation stress captured through false-colour infra-red film 	<p>Programs. The TEEM database will include both primary (e.g., field and laboratory) and secondary (e.g., data analysis) data. In addition, the TEEM database includes files that describe the data in terms of data collectors, date of collection, as well as other descriptive information.</p>
<p>Air Monitoring</p>	<p>Multi stakeholder (including provincial, industry, federal, other)</p>	<p>Air pollution surveillance conducted through approximately 140 continuous stations (8 GOA stations, 42 air shed stations, 88 industry stations) across Alberta that record air quality data 24 hours a day, 7 days a week. Air monitoring data is stored and can be viewed online through the CASA data warehouse. (www.casadata.org)</p> <p>Most air monitoring across the province is conducted by industry and/or air sheds. An air shed is a multi-stakeholder management group that addresses air quality concerns at a regional level. A mobile air monitoring lab travels to locations across Alberta to conduct monitoring studies in response to local concerns, in areas where no station exists, or in emergency response situations. AENV provides operating grants to the air sheds in support of station operation. AENV also conducts audits of industry and air shed station operations to help ensure data quality.</p> <p>AENV also partners with Environment Canada as part of the national air pollution surveillance, an assessment of ambient air quality in Canadian urban centres. The data from these stations is compared against national air quality objectives, and reported on annually.</p> <p>The Air Quality Index is a GOA performance measure and uses data from approximately 15 stations is used to calculate the provincial air quality index, to report current or daily air quality to Albertans.</p> <p>Air quality reports are compiled for decision makers to use for the environmental management of air. In addition to the above monitoring, industrial air emissions are reported to AENV monthly, as part of approval requirements.</p>
<p>Air pollution surveillance (data stored in one hour average time blocks) - pollutants monitored include:</p> <ul style="list-style-type: none"> • sulfur dioxide, hydrogen sulfide • carbon monoxide • nitrogen oxides • ozone • particulate matter • methane • volatile organic compounds <p>Air Quality Index – daily index of air quality</p> <p>Wet acid deposition – acid levels in precipitation from 9 sites across the province</p>	<p>Broad-scale (provincial, air shed and regional), long-term air quality and pollution surveillance</p>	<p>Most air monitoring across the province is conducted by industry and/or air sheds. An air shed is a multi-stakeholder management group that addresses air quality concerns at a regional level. A mobile air monitoring lab travels to locations across Alberta to conduct monitoring studies in response to local concerns, in areas where no station exists, or in emergency response situations. AENV provides operating grants to the air sheds in support of station operation. AENV also conducts audits of industry and air shed station operations to help ensure data quality.</p> <p>AENV also partners with Environment Canada as part of the national air pollution surveillance, an assessment of ambient air quality in Canadian urban centres. The data from these stations is compared against national air quality objectives, and reported on annually.</p> <p>The Air Quality Index is a GOA performance measure and uses data from approximately 15 stations is used to calculate the provincial air quality index, to report current or daily air quality to Albertans.</p> <p>Air quality reports are compiled for decision makers to use for the environmental management of air. In addition to the above monitoring, industrial air emissions are reported to AENV monthly, as part of approval requirements.</p>

8.0 ME Working Group Feedback to Final Report

Legend: Working Group Member and Reviewer Stakeholder Sector Designations

Sector	Abbreviation
Aboriginal	ABO
Academic, Consultant, Professional	ACP
Agriculture	AGR
Conservation	CON
Energy, Industry, Development	EID
Environment	ENV
Forestry	FOR
Government of Alberta	GOA
Municipal – Rural	MUN-R
Municipal – Urban	MUN-U
Recreation	REC
Water	WAT

ACP

I was originally not going send comment on this report but on second reading I am a little concerned on how we stated the inclusion of culture as a minority opinion on pages 3 and 13. It reads to me like it was put in at the last minute, which it was. And as a result reads very clumsy. If it could be more subtly stated, it would not look like it was a last minute inclusion. Otherwise, I believe we can be proud of the work that was done and how it is being presented.

Jill did a great job in doing the power point presentation.

ENV

I'm really impressed with the final report- great job everyone. While I haven't been able to attend all meetings, I appreciated the opportunity for input in Aug.

ACP

1. Very well done.
2. As part of implementation strategy may want to suggest a pilot project to develop the overall system, perhaps in the Edmonton region, or oil sands region, then go provincial.
3. As part of economics measurements we may want to consider "value added" processing not just value of raw materials. This could be an influencer.

MUN-R

Here are my general comments...

- Sometimes in the paper we refer to outcome three (Healthy environment and ecosystem) as environmental and other times we refer to it as an ecological outcome. Should we use one or the other for consistency? I don't see these terms as being synonymous.

- Title and number all diagrams (this is more of a formatting issue)
- Facilitating continuous improvement diagram – I think the titles for each step should be shorter so it is easier to read. The detail can be covered in the text explanation. As well, I think evaluating and reporting should be separated into 2 steps. When we talk about it monitoring, evaluation, reporting I think of it as 3 steps. I recommend the following titles:
 - Define Outcomes
 - Select Indicators
 - Monitor Indicators
 - Evaluate Indicators
 - Report Performance
 - Inform Decision Making Processes
- For each of the strategies I recommend dates be assigned. If we say 2 years from now what does that mean? From when we submit the report or when the Minister completes his report? Dates make it much firmer.
- With respect to the Indicators – is Lana going to review them to determine if they are condition versus influencers?

9.0 Reviewer Feedback to Final Report

ACP

Overall, I support the conclusions of the ME Report, particularly with regard to the need for a strong governance system if the goals and objectives are to be met. Clearly, it does need to be a provincial level system if the local conflicts are to be effectively monitored. A key issue will be whether or not the monitoring and evaluation entity should be arms' length or a function of a governmental agency.

Another issue I noticed is the coyness of not mentioning carbon emissions under air quality except perhaps as part of 'etc'. In the current climate, it needs to be a clearly acknowledged indicator.

From an urban perspective, sprawl needs to be addressed, and transportation systems are an important issue affecting land use but not treated independently here. There is a mention of 'density' but no indication whether higher density is a good thing or not.

I recognize that some of these issues will be addressed by the other groups.

EID

Please accept the following comments on the ME Final Document for Review of the Monitor ring and Evaluation Working Group (MEWG) from EnCana:

It is obvious that a great deal of effort went into creating this challenging document. It is a good reflection of the previous meeting notes.

Section 3.1

The intrinsic value of an Intact Landscape as per 3.2.3 is very difficult to quantify, balance and compare to the economic value of Natural Resource Production as in 3.2.1. All of the values are important however many of them are confounding and balanced management and decision making will be a great challenge.

Section 4.3

This program must not be 'at arms length' from the government. The government is the stewards of the province and as such should be responsible for the decision making. However, this is not discounting the existing protocols for all government agencies (and industry) being subject to 3rd party procedural audits.

Section 4.4

An integrated information system would be of great value to the entire Province. However, there are several existing initiatives that should be built upon and modified to contribute to an interagency system. The development of a brand new system is discouraged we must look to the terrific exhibiting resources (see Appendix 7 for examples).

10.0 Treaty 8 First Nations Recommendations Relevant to Alberta's Land Use Framework – Monitoring & Evaluation

Introduction

This document highlights recommendations provided by Karen Geertsema, representing Treaty 8 First Nations, in the capacity of sitting on two of Alberta's Land Use Framework (LUF) working groups (Growth and Resource Management Group and the Monitoring and Evaluation Group). Specifically, this document serves as a formal written request, on behalf of Treaty 8 First Nations to include the recommendations outlined in this document below as amendments to the September 25, 2007 Monitoring and Evaluation Summary Report.

In light of the nature of these working groups where there is a diversity of interests vying for accommodation of sector specific interests, and where procedural barriers have largely subverted articulation of recommendations put forward by Treaty 8 First Nations, I have acquiesced on a number of recommendations put forward by the group, rather than agreeing to group "consensus". Appropriately, I have consistently attempted to put forward a few critical but clear and seemingly easily accommodated concepts, as minimal recommendations to the Ministers for the LUF framework. My intent has been to: 1) Provide an avenue where Treaty 8 First Nation's rights and interests have an auspicious opportunity to be addressed through the LUF framework as it evolves; and 2) Provide a few critical but clear and easily accommodated recommendations to be incorporated into the Working Group recommendations document to the Ministers. On these two premises I believe an opportunity may present itself for a fair LUF to be forged, and that on-going consultation and participation of Treaty 8 First Nations will continue given the LUF should be a living document subject to adaptive management.

Accordingly, I provide the following final recommendations for the September 25, 2007 Monitoring and Evaluation Summary Report for input into the Monitoring and Evaluation final recommendations' submission to the Ministers. First though, I would like to acknowledge that the

Monitoring and Evaluation Working Group (M & E) has to this point (September 25, 2007), made few attempts to incorporate the two key critical recommendations that I have attempted to put forward for FN rights and interests. Those two key critical recommendations being: 1) The integration of Science and TEK to inform land and resource decision makers; and 2) The inclusion of Culture as the fourth pillar to manage for sustainability.

Nonetheless, the M & E working group has included statements in their September 25, 2007 report which makes mention of key critical recommendations put forward by Treaty 8.

1) The recommendation that culture should be one of the pillars to be managed sustainably was mentioned as follows:

"It should be noted that there was a minority opinion that culture should be one of the four pillars which is sustained under the planning, management, monitoring and assessment components of the Land Use Framework and that the reader consider culture wherever social, economic, and environmental outcomes or values appear in this report"; and,

2) The recommendation that Western Scientific Knowledge (WSK) should not be the only system of knowledge used to inform decision makers, and that TEK and other systems of knowledge should be integrated with WSK in the decision making process to inform decision makers was mentioned within the September 25, 2007 document as follows:

"A minority opinion that was offered stated that within the Land Use Framework, Western Scientific Knowledge and Traditional Ecological Knowledge should be consistently integrated within its planning, managing, monitoring and assessment components".

I now provide the following final recommendations as amendments to the September 25, 2007 Monitoring and Evaluation Summary Report for input into the Monitoring and Evaluation final recommendations' submission to the Ministers.

Recommendations

Page & Paragraph or Section	Current Proposal	Treaty 8 Recommendation
9; 3.1.3	“educational attainment (formal, informal)”	“educational attainment (formal, informal and TEK)”
9; 3.1.4	“security of food supply”	“security of food supply and First Nation subsistence food”
9 & 10; 3.1.5	Add: First Nation Subsistence Economy Value”	
10; 3.2.2	Add: “First Nation Subsistence Economy Value”	
10; 3.2.3	Add: “First Nation Subsistence Economy”	
11; 3.3.4	“ability of land to meet Traditional Use needs of Aboriginal Peoples”	“ensure the integrity and health of ecological systems to sustain Traditional Use rights and interests”
12; 4: Bullet 4	“Determine how all of this monitoring information can be communicated to the public and governments.”	“ensure the integrity and health of ecological systems to sustain Traditional Use rights and interests”

11.0 ME Working Group Members & Meeting Venues/Dates

Facilitator

Ken Shipley

Summarizer

Lynne Rach

Members

Bill desBarres

Bill Gillespie

Kathy Sloan

Calvin Rakach

Leonard Leskiw

David Pryce

Terry Kosinski

Jill Pelton

Joe Obad

Karen Geertsema

Brian Hills

Lana Robinson

Daryl Procinsky

Peggy Holroyd

Jennifer Rowell

TJ Schwanky

Vonn Bricker

Brad Batten

Kenton Ziegler

Craig Aumann

Mark Fawcett

Jeffrey Dawson

Tim McCready

ME Meeting Venues and Dates

Location

Sherwood Park

Red Deer

Red Deer

Red Deer

Date(s)

June 19-20, 2007

July 10-11, 2007

August 22, 2007

September 11, 2007

