

**Exploring the use of Adaptive Management in an Environmental
Protection Program to Improve Mitigation Performance during
Manitoba Hydro Transmission Projects**

by

Kristopher R. Watts

A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfillment of the requirements of

the degree of

MASTER OF ENVIRONMENT

Department of Environment and Geography

University of Manitoba

Winnipeg

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Abstract

Adaptive management (AM) is a systematic process that regards management and policy decisions as experiments or treatments. This iterative process is relatively simple and intuitive, leading to widespread uptake and application of these principles. Popularity of AM results in the process being routinely inserted into strategies or plans without full recognition of the commitment and paradigm shift in management that it represents. This case study involved evaluation of Manitoba Hydro's Environmental Protection Program during construction of the Bipole III transmission line and its use of AM. Researching the program's functionality spanned three construction seasons using document review, employee interviews and site visits. The program was evaluated according to what current literature identifies as elements of successful AM. Monitoring and Innovative activities provided strong examples of AM principles while other areas such as communication face challenges. The recommendations pursue a more active approach to AM and continual improvement of environmental protection performance.

Acknowledgments

I would like to thank my advisor, Dr. Rick Baydack, for your ongoing encouragement and coaching throughout this process, as well as allowing me the latitude to take this topic on in the first place. To my committee members: Dr. Alan Diduck, thank you for the contribution of your time, expertise and advice. Dr Brian Kotak, I appreciate your counsel, guidance and mindful edits. To James Matthewson an individual who has always been an example of work ethic, integrity and “stick-to-itiveness”. Thank you again for the time spent reviewing this material and for providing the recommendations that went along with it.

Thank you to Manitoba Hydro for funding the field work portion of this project, I appreciate the opportunity to see many different areas of Manitoba and the firsthand experiences that it provided.

I would like to thank all of the Manitoba Hydro employees who took the time to participate and opened up to share your experiences and insight with me. Without your cooperation and contributions none of this would have been possible.

I would like to thank my friends and family for their love, support and understanding.

Of course to my beautiful wife:

Karly,

Having gone through this experience, I now know how important it is to thank your spouse.

Thank you so much for your sacrifice and patience while we made this happen, you and the boys can have me back now!

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Abbreviation List

AM- Adaptive management (AM) is a systematic process that regards management and policy decisions as experiments or treatments.

Environmental Management System- An EMS is a set of tools and processes a company uses to realize its environmental goals. (Adapted from https://www.hydro.mb.ca/environment/env_management/)

CEnvPP- Construction Environmental Protection Plans will provide information and guidance to contractors and field personnel during construction of the project from beginning to end.

EPIMS- Environmental Information Management System: A single interface to store all environmental documentation. It is utilized by project staff to submit permits, inspection reports, plans, logs, checklists, etc. Used for the management of all environmental protection implementation, regulatory compliance and incident reporting. (Adapted from Bipole III Transmission Project Construction Environmental Protection Plan)

EnvPP- Project level Environmental Protection Plan- contains general environmental protection information applicable to all project components, provides a foundation for developing component-specific CEnvPPs, and is intended for project managers and regulators. (adapted from the BPIII Transmission Project Environmental Protection Plan)

EPP- Environmental Protection Program

ESS- Environmentally Sensitive Site, a specific site that have been deemed to be ecologically, socially, economically or culturally important or sensitive which require a level of protection during construction activities. (Adapted from Bipole III Transmission Project Construction Environmental Protection Plan)

LEA- The Licensing & Environmental Assessment Department (LEA) manages the site selection, public engagement and environmental assessment programs for planned transmission line, gas and station projects in order to secure required provincial and federal environmental licenses and approvals in a timely manner. (sourced from internal departmental sharepoint site)

TLCC- Transmission Line & Civil Construction responsible for construction of civil works related to Manitoba Hydro transmission and distribution facilities as well as construction of high voltage and EHV transmission lines (adapted from internal departmental sharepoint site)

Chapter 1 INTRODUCTION

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1.1 INTRODUCTION

The objective of this master's thesis is to evaluate the use of Adaptive Management during the implementation of an Environmental Protection Program (EPP) used by Manitoba Hydro during the construction of a major transmission line. The EPP utilized by the Transmission Business Unit at Manitoba hydro is comprised of several major components interacting with one another which include:

- Environmental Protection Plan (EnvPP) documents
- Construction Environmental Protection Plans (CEnvPP),
- Management Plans and Frameworks and Environmental Standards
- Program updating and review
- Implementation of environmental mitigation
- Environmental Protection Information Management System (EPIMS)
- Communication between internal and external project participants
- Environmental monitoring and compliance monitoring

In 2014 Manitoba Hydro began construction of the Bipole III (BP III) 500kV transmission line, the largest power line construction project in the company's history. At completion, the line will stretch from northern Manitoba to the agricultural belt in the south. The line will traverse eight ecological regions for a total of 1,384km. This presents a formidable challenge for the company's EPP due to a multitude of diverse ecological concerns as well as the needs of different stakeholders, Indigenous communities and the public.

While not exclusively, the focus of the evaluation will be of the EPP and its function during the construction of Manitoba Hydro's Bipole III Transmission Project. This case study evaluates the implementation of Manitoba Hydro's EPP against what current literature identifies as elements of successful Adaptive Management. The company's new electronic Environmental Protection Information Management System (EPIMS) promotes these elements which include fostering knowledge acquisition, creating effective information flow and establishing a platform for creating shared understandings. This thesis project will also involve identifying the use of Adaptive Management between the major components within the EPP, when those inputs directly contribute to the goal of environmental impact mitigation. Manitoba Hydro works to continually improve the EPP used by the Transmission Business Unit. This is to help ensure that environmental protection measures are in place prior to the construction of transmission projects such as the BPIII Transmission Project. The EPP fulfills a very important function, described succinctly in the following statement:

"The Program provides a framework for the delivery, management and monitoring of environmental protection measures that satisfy corporate policies and commitments, regulatory requirements, environmental protection guidelines and best practices, and the input from stakeholders, Aboriginal communities and members of the public."

(BPIII Transmission Project Environmental Protection Plan)

For the program to work effectively many different departments and groups must feed into it. Feedback from the implementation of plans, processes and mitigation is crucial to refining and improving the program's function. Adaptive Management is an iterative process in which information gleaned from monitoring the implementation of management activities, the results of which are fed back into the decision making process to help improve the overall process and

facilitate learning. While Adaptive Management has the potential to manage and improve the EPP, the context of this application warrants further evaluation.

1.2 PROBLEM STATEMENT

The term Adaptive Management is used in environmental protection documents throughout the Bipole III Transmission Project Environmental Protection Program and it is stated to be used as a means to evaluate mitigation measures and processes in an effort to continually improve environmental protection. Its use is also directed by a licence condition of the Bipole III transmission project, a project which is currently under construction. Environment Act Licence condition #57 stipulates that the Annual Biophysical Monitoring Program contains “a description of the Adaptive Management measures undertaken to address issues, and recommendations for improvements of mitigation in future projects”. Manitoba Hydro’s Environmental Management Policy stresses continual improvement of environmental performance. This case study aims to evaluate the implementation of the Adaptive Management process as a means to increase the effectiveness of Manitoba Hydro’s EPP.

1.3 PURPOSE AND OBJECTIVES

The purpose of this study is to research the Adaptive Management approach and develop an understanding of the required steps and processes for successful implementation. With that information in mind I will look for evidence of those activities and their prevalence in the EPP. If Adaptive Management currently exists in the program, suggestions will be made for opportunities to improve its use. However if Adaptive Management is absent from the program, steps to implement Adaptive Management will be identified.

A series of research questions have been developed to guide the research and identify objectives which are outlined below:

Research question one (RQ1)- What is required to adopt an Adaptive Management approach?

Objective- Through a literature review, a full understanding and description of Adaptive Management will help to appreciate and describe what is required of a corporation or agency when claiming to be practicing Adaptive Management

Research question two (RQ2)- Within the Transmission Environmental Protection Program (EPP) what are the applications of Adaptive Management principles used towards the management goal of environmental protection?

Objective- Informed by the literature review, an analysis of gathered information and interviews will reveal to what extent the EPP exhibits Adaptive Management principles and any areas that may be lacking.

Research question three (RQ3)- Would an increased investment in an Adaptive Management approach increase the efficacy of the EPP with respect to Manitoba Hydro's mandate of environmental protection?

Objective- Is to assess current EPP activities through EPP document review and interviews with Manitoba Hydro employees working in the program. A comparison will be done to determine what changes would be necessary to fully implement an Adaptive Management process given insight found in the literature review. Recommendations will be made as a result of this assessment.

1.4 STUDY SIGNIFICANCE

Manitoba Hydro can benefit from the evaluation of the EPP by identifying areas that are in need of improvement as well as identifying where Adaptive Management can help. Addressing these susceptible areas will enable Manitoba Hydro to “continually improve its Environmental Management System” as directed by its Environmental Management Policy. Through support of this thesis, Manitoba Hydro’s Licensing and Environmental Assessment Department (LEA) shows an interest in self reflection and continual improvement of its EPP. The evaluation process of this thesis has the potential to increase defensibility of the EPP as a robust and effective way to help mitigate the impact of transmission line construction. As a product of this thesis, recommendations will be made to help develop documentation or tools to aid in the use of effective Adaptive Management which will in turn help improve the EPP.

This research will benefit the public as the EPP and construction activities on the BPIII project will be reviewed and documented in a concise comprehensible way. This study will be publicly accessible which increases Manitoba Hydro’s transparency with regard to environmental protection and transmission line construction. Potentially other utilities can learn from the EPP processes, what has worked, what needs improvement and what has been gained from the evaluation of the program. Sharing this information will contribute to the continual development of industry best practices in environmental protection and Adaptive Management.

1.5 ENVIRONMENTAL PROTECTION PROGRAM OVERVIEW

1.5.1 Environmental Protection Program Components

The Environmental Protection Program (EPP) has been structured to serve Manitoba Hydro's commitment to regulatory requirements, industry best practice guidance, corporate policies and commitments as well as the results of stakeholder inputs. The EPP outlines the processes in place for implementation of environmental protection measures as well as compliance and effects monitoring. The program also describes how information is managed. There is a vast amount of information collected from several sources during pre-construction, construction and post construction. Information collected during these periods is reviewed on an annual basis and compared to predicted environmental effects of the project. Inspection monitoring programs are in place during construction to actively assess construction activities to assure compliance with license conditions, Acts and regulations and community commitments. There are several components to the program which are in place towards these objectives, documenting the information that is feeding the EPP. Serving as a central depository for communication and documentation for major transmission projects, including BPIII, is the Environmental Information Management System (EPIMS). The several components that contribute and constitute the EPP can be planned, communicated, created, served and stored using EPIMS. Shown in Figure 1 on the next page are the components of the EPP as it is applied to the Manitoba-Minnesota Transmission Project.

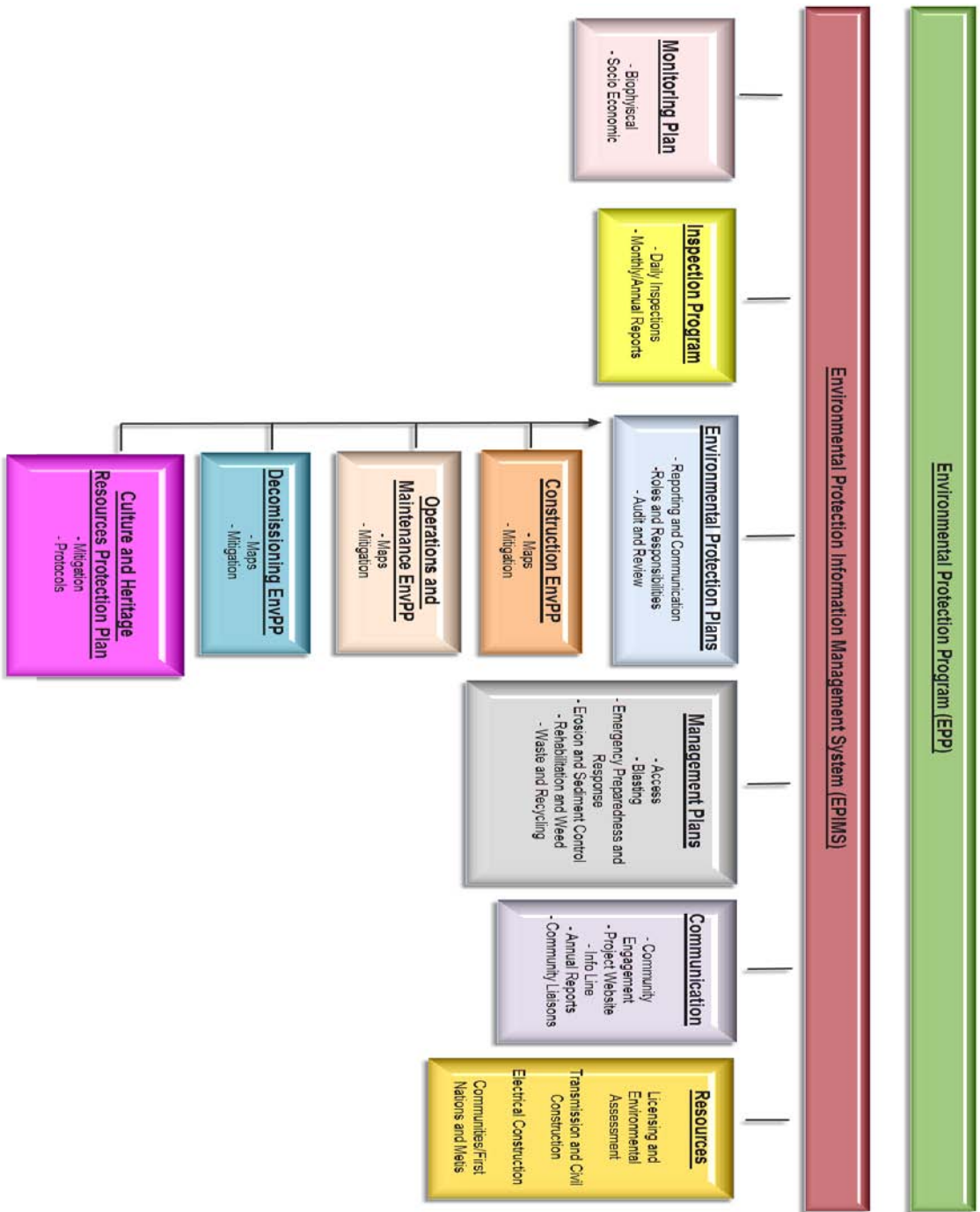


Figure 1 Environmental Protection Program Components

(Source: Manitoba-Minnesota Transmission Project Environmental Impact Statement, Figure 22-1 Sept 2015 pg 22-5)

The major components of the EPP are the monitoring program and plans, Inspection Program (compliance), EPP documents, several Management Plans, internal and external communication documentation, and resources internal or external to Manitoba Hydro. All are contained and maintain within EPIMS.

Monitoring Plans- Helicopter and fieldwork requests and bookings take place through EPIMS. Field reports, annual monitoring reports and data are communicated and filed through EPIMS. Contract consultants are also able to access pertinent project information for their work.

Inspection Program- Daily compliance monitoring and field reporting created by Manitoba Hydro's Environmental Inspectors is created and/or filed through EPIMS. Stop work orders, compliance documents created for contractors as well as weekly progress reports created for Manitoba Sustainable Development (i.e. the government regulator) are all be stored in EPIMS.

Environmental Protection Plans- Project level Environmental Protection Plan- contains general environmental protection information applicable to all project components, provides a foundation for developing component-specific CEnvPPs, and is intended for project managers and regulators. (Adapted from the BPIII Transmission Project Environmental Protection Plan)

Project Environmental Protection Plan provides an overall description of the Environmental Protection Program, its components and how it is designed to address "...effective implementation of mitigation measures and follow-up actions as well as regulatory requirements, environmental guidelines and best practices identified in the Bipole III" (BPIII Transmission Project Environmental Protection Plan, pg 8).

Construction Environmental Protection Plans- (CEnvPP) will provide information and guidance to contractors and field personnel during construction of the project from beginning to end. These documents are designed to be user-friendly and provide information on: regulatory requirements, license terms and conditions, general and site specific mitigation measures. Each CEnvPP provides detailed site specific mapping of environmentally sensitive sites (ESS) and their recommended mitigation. These documents were prepared with the intent that they would be “living” documents to be changed and updated as new information or ESS are discovered during construction.

Operational and Maintenance Plans- (OEnvPPs) are very similar in most respects to the CEnvPPs but focus on the effects on the completed transmission line during post-construction activities. Mitigation measures are selected and tailored to minimize impact during vegetation maintenance and infrastructure maintenance or emergency activities.

Decommissioning Plans- (DEnvPPs) provide ESS information and mitigation measures that are implemented during the decommissioning of a transmission line. These would address potential impacts of the removal and disposal of retired infrastructure and the movements of necessary equipment.

Culture and Heritage Resources Protection Plan- (CHRPP) - This plan is used throughout any activities that all major projects that the Transmission Business Unit undertakes. This plan aids project personnel in the identification of potential artifacts and the significance of those findings during any project activity. The document also provides information on the processes in place and the mitigation measures to enact should a find or suspected find take place.

Each First Nation of Metis community is asked to fill out a notification protocol to provide Manitoba Hydro personnel with guidance or notification information should a find be made.

Management Plans- are provided by Manitoba Hydro such as: The Access Management Plan, The Rehabilitation and Invasive Species Management Plan for example. Others management plans are provided by the contractor and approved by Manitoba Hydro such as: emergency response plan, erosion and sediment control measures, and waste and recycling procedures.

Communication- that is facilitated by or stored in EPIMS would consist of: Community Engagement meetings minutes, Community Environmental Monitors and Liaison Reports, weekly progress meeting minutes, Manitoba Hydro EI daily reports, annual reports and specialist monitoring reports.

Resources- contact information and other documentation can be found here for First Nations and Metis communities. Interdepartmental access within Manitoba Hydro allows different departmental working groups on the project to access and share information.

1.5.2 Organizational Structure

Within the scope of this study is the relationship between the Environmental Protection Management Team and the Environmental Protection Implementation Team and the various Manitoba Hydro department and external regulatory and community inputs (Figure 2) shown below. The figure depicts the organizational structure of the EPP and the various groups that interact to ensure that environmental protection measures and mitigations are implemented as committed to in the project Environmental Impact Statement (EIS) and found in license conditions.

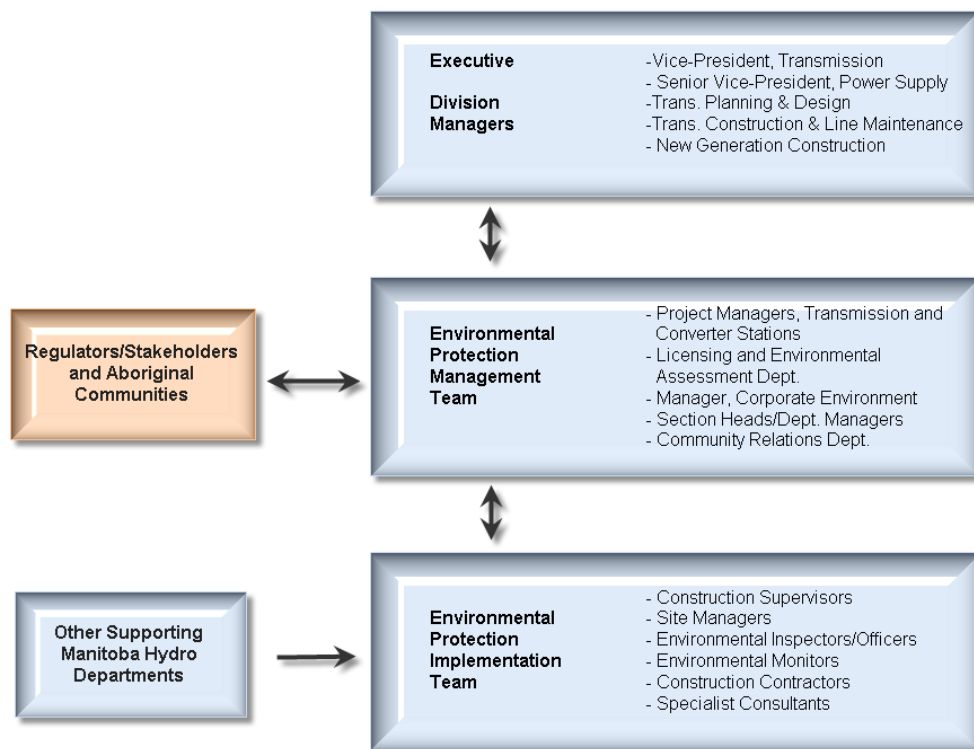


Figure 2 Environmental Protection Program Organizational Structure

(Source: BPIII Transmission Project Environmental Protection Plan, (Figure 2-1 pg 11))

1.5.3 Communication Reporting Structure

To provide further context some of the relationships discussed in this study, the following Figure 3 is taken from the Bipole III Transmission Project Construction Environmental Protection Plan. This figure depicts an overview of the common reporting relationships interacting during active construction. Information shared through these relationships by reporting, communication, follow up and shared understanding is a focus of this study. Interviews took place with Senior Environmental Assessment Officers, members of Licensing and Environmental Assessment department (LEA) and Environmental Inspectors to gain a better understanding of the dynamics of these relationships.

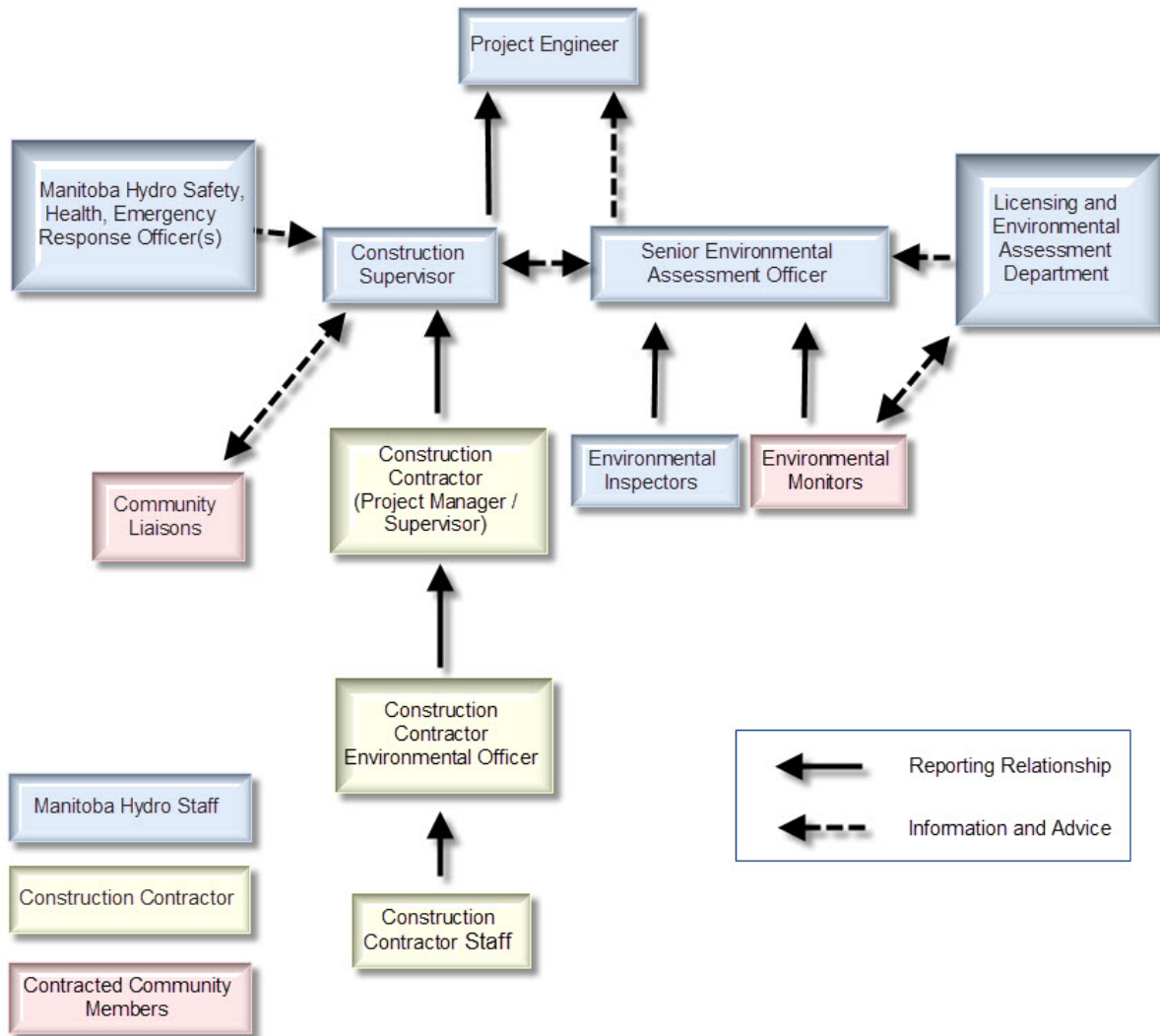


Figure 3 Environmental Communication Reporting Structure

(Bipole III Transmission Project Construction Environmental Protection Plan Figure 1-3 pg 1-9)

1.6 ASSUMPTIONS, SCOPE AND LIMITATIONS OF THE STUDY

This study is a case study of the Bipole III Transmission Project and how the Environmental Protection Program has developed to serve the project needs. However when discussing larger trends and initiatives such as the evolution of the Community Monitor/Liaison positions, changes and experiences from other projects such as the Lake Winnipeg East System Improvement Transmission Project (LWESI) and the Manitoba-Minnesota Transmission Project (MMTP) were considered within the scope of study.

One limitation of this study was not interviewing more of the numerous employees that are involved and necessary to accomplish the construction of a transmission line. The potential value in interviewing other positions was proportionately low when considering the additional time that would be required for additional data transcription and coding. The people who received participation requests were selected based on their positions, which are roles directly related to environmental protection. These positions have the most influence and interaction with the environmental protection program and thus best suited to inform this study.

I am working on the assumption that the information gained through the interview process is accurate and representative of the situations they experienced. There was no independent verification by cross referencing descriptions of events or circumstances; to do so to corroborate that information would be prohibitively time consuming. Each participant was given a copy of the final findings chapter to read through and confirm accurate representation of what was said.

This provided interviewees the opportunity to refine or clarify their comments. In reviewing their own material participants would be able to read the full findings section in draft format. Doing so allowed them to refute each other's claims or substantiate them, and instances of both did occur in the process.

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2.1 INTRODUCTION

The origin of Adaptive Management (AM) has been traced back to ideas of scientific management in the early 1900s (Boreman *et al* 2007). The introduction of AM into the realm of resource management began in the 1970s and many authors accredit this to the work of Holling (1978). Walters (1986) and Lee (1993) build on his ideas, further refining the concept, expanding on the eco-technological beginnings by giving more weight and consideration to related social and civic issues (Allen, 2007). These early works have had numerous citations and are considered by many authors to be seminal works on the topic (Allen 2007, Boreman *et al* 2007, Diduck *et al* 2012). The application of AM in natural resource management was in response to the need for managers to make complicated decisions that have an impact on large, complex and dynamic ecosystems. These ecosystems are not completely understood and may be at risk due to the increasing demand that has been placed on them through human influence. Management challenges are complex and compounded by an attempt to satisfy the interests of several different stakeholders. There is an added pressure on managers by the expectation that they will accomplish these goals in more effective ways and obtain better results.

AM is an iterative approach that has a focus on learning from the implementation of management prescriptions, while evaluating the product of those decisions with the intent to inform and improve future or present management prescriptions.

Williams-B (2011) states the benefit of this approach; *“Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process.”* (pg. 1347)

2.2 ADAPTIVE MANAGEMENT DEFINED

AM is considered by William-B (2011) to be a “resource conservation framework that promotes learning-based decision making” (pg. 1371). Incorporating learning as an objective of AM sets it apart from other management methods, as the learning component is influential and to a certain extent can guide how decisions are made. AM considers management policies as experimental treatments and re-integrates monitoring activities back into management activities (Wilhere 2002). Schreiber *et al* (2004) defined the learning distinction of AM as “...purposefully designing management in such a way that the success can be evaluated, preferably by comparing several strategies at the same time.”(pg. 179)

AM has been described in a number of different ways with variations and disagreement as to its definition (Rist *et al* 2013). However, to describe the concept plainly Allan (2007) states: “AM is learning from doing;...” (pg. 1); or Williams (2011) “...learning through management...” (pg. 1371); While Kwasniak (2010) suggests to “...treat decisions made in relation to proposed projects as experimental hypothesis” (pg. 340). A succinct definition of the general idea or principle for this review comes from Canadian Environmental Assessment Agency- Operational Policy Statement- (in the context of federal EA).

“In general, AM is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes. AM provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project” (CEAA 2009, pg. 1).

Recognizing the large variations found within definitions, Diduck *et al* (2012) see more value in identifying key characteristics which they consider being fundamental and universal to the concept of AM. The key characteristics of AM that they have identified are as follows:

- Is iterative, meaning decisions are reviewed and assessed on a regular basis;
- Includes ongoing experimentation, which involves treating human interventions in natural systems as “experimental probes”;
- Focuses on system monitoring, involving observing and evaluating changes in the environment caused by the ongoing experimentation; and
- Emphasizes feedback and learning as a way to minimize “known unknowns” and “unknown unknowns” (Diduck *et al* 2012 pg. 4).

2.3 THE UTILITY OF ADAPTIVE MANAGEMENT

2.3.1 Reduce uncertainty through learning

Adaptive Management (AM) helps to reduce the uncertainty that is inevitably faced by all managers through its focus on learning. The goal is to reduce knowledge gaps rather than attempting to solve uncertainty outright. As Bown *et al* (2013) state, “The only rational course is to accept uncertainty as a permanent condition rather than see it as an obstacle to be overcome...” (pg. 129). AM establishes a plan, a mode of action for ecosystem management that involves what Allan and Stankey (2009) call a “sea of uncertainty (e.g. social, institutional, regulatory, economic, ecological, and biophysical)” (pg. 24). When proceeding under an AM framework, with a purposeful attempt to gain knowledge and enhance learning, AM can enable management to work with uncertainty where it exists, and work towards reducing that uncertainty (Allen and Gunderson 2011). AM is often a recommended approach to environmental management when uncertainty becomes a road block, not allowing planning to proceed (Kato and Ahern 2008).

The majority of the papers that used AM in the natural environment or where it is cited as AEM (adaptive ecosystem management) were applying the concept to natural resources management (Gregory *et al* 2006); often where complex natural resource management challenges exist (Allen and Gunderson 2011); or in instances of resource conservation (Williams-B 2011).

AM is often regarded as the solution for complex systems with high uncertainty. Uncertainty can have many sources. Diduck *et al* (2012) identify uncertainty in resource management as stemming from:

- Variability in the natural environment;
- Human impacts on the environment;
- Lack of knowledge about most aspects of the ecosystems being managed;
- Multiple social and political goals which impact resource management at any given time;
- Imperfect sampling and modeling techniques. (pg. 3)

AM uses uncertainty as a learning opportunity and encourages managers to embrace and incorporate uncertainty instead of avoiding it (Allan and Stankey 2009). Under incredible pressure and responsibility, managers and organizations can behave in a way that is risk-averse (Stankey *et al* 2003, Stankey *et al* 2005, Doremus 2010, Westgate *et al* 2013). For this reason AM is a departure from a conventional way of thinking. Johnson (1999) sees the need for managers to change their philosophies around uncertainty. As Stankey *et al* (2003) point out, instead of treating uncertainty as a call for caution, AM uses it as an opportunity to introduce new policies and actions that might ultimately bring about understanding and reduce said uncertainty. This paradigm shift would be difficult for most professionals as they might consider admitting uncertainty as a threat to credibility. Schreiber *et al* (2004) cites Marcott (1998) and mentions the implications and the weight that the word “uncertainty” may have. For example, “The understanding of uncertainty and its consequences differ greatly amongst individuals, even at the level of managers and scientists and, most certainly, the public who may well (mistakenly) see an admission of uncertainty as incompetence” (Marcott 1998 cited by Schreiber *et al* 2004, pg. 178).

Allan and Stankey (2009) stress the tenet of AM that we do not have the ability to act with full understanding of our impacts and that our knowledge of appropriate interventions is limited.

Through the AM process participants elevate monitoring activities to a new level of importance and as such they can be mechanisms for significant change. Through careful outcome evaluation participants can increase their understanding of complex processes without actions hinging on and being bogged down by extensive and expensive traditional scientific methods. (Allan and Stankey 2009). Emerging from the desire to meet environmental challenges and undertake effective resources management both the theory and the practice of AM has expanded (Gregory *et al* 2006). It has been seen as a promising approach when faced with uncertainty and large complex systems (McLain and Lee 1996). The concept of AM according to Allen (2007) "...has been embraced by natural resource managers worldwide..." (pg1).

2.3.2 Fostering corporate learning and knowledge retention

One common challenge faced by corporations or organizations is the retention of knowledge and the lessons learned through its history of management activities. Loss of this knowledge can occur through employee attrition or poorly documented decision and follow-up analysis. As projects or management plans are implemented, unexpected setbacks may occur or unforeseen responses to management actions can disprove initial predictions. The benefits of these revelations may or may not be incorporated into a preventative strategy and those lessons learned can be lost, where through the AM process these experiences are documented and can be passed along or referenced later. This record keeping and reflection is a particular strength of AM. With documented, routine evaluations AM can help improve and retain corporate knowledge (Allan and Stankey 2009). When corporate knowledge is lost or is difficult to access, new projects may suffer with management at risk of repeating past mistakes. Novelist George Santayana very aptly states, "Those who cannot remember the past are condemned to repeat it". As AM is designed to test and evaluate policy implementation or management decisions, it is an excellent way to document these results whether positive or negative. Allan and (Stankey 2009) contend that AM provides process and structure for improving and retaining corporate knowledge as "...even the most abysmal AM failure provides knowledge that can be accessed in the future." (pg. 25).

2.3.3 Adaptive Management - Current use and popularity

There is an appealing aspect to AM because the basic concept is easily explained and is intuitive to most people. Failing *et al* (2004 pg 7) mention that stakeholders easily comprehend a simplified concept of AM described as: “We don’t know, we don’t want to guess, let’s try it and then (we think) we’ll know for sure.” AM also appeals to scientists “because it will increase their knowledge about the system” (Failing *et al* 2004 pg 15). The appeal AM holds for resource managers can be “...because they will feel more comfortable making recommendations about the resources for which they are responsible” (Failing *et al* 2004 pg 15).

Since its introduction in the 1970s, AM has been widely adopted for use in resource management, conservation ecology and environmental decision making. Rist *et al* 2012 noted that AM is widely cited in literature as the aspirational method for resource management. Attesting to this is McFadden *et al* 2011 who have evidence that the amount of literature on the topic has increased. By many it is “...considered to be a best practice for minimizing the environmental and social risks of development” (Diduck *et al* 2012 pg i). Rist *et al* 2012 pg 1 cite (Karkkainen 2003) in saying that it has become “something of a mantra among conservation ecologists and natural resource managers”.

Characterized as the ideal method, AM has been applied to many management plans with suggestions for broader application within resource management and in some cases where it has been legally mandated as an appropriate approach (Johnson 1999(B)). There are concerns that AM has been adopted by managers too quickly without recognizing the commitment and paradigm shift in management that it represents. Allen and Stankey (2009) pg 5 recognize this as an issue where “...the requirement to use “AM” is routinely inserted into strategies and plans

with little appreciation of what might be needed to fulfill this requirement, and/or little will to provide it”.

Under the Canadian Environmental Assessment Act (CEAA) there is recognition of the value of AM as well as the need to provide direction for its application. A Canadian Environmental Assessment Agency (2009) guidance document contains an operational policy statement that provides best practice guidance under the Act. As stated in the policy, “Development of this document arose from a need to strengthen understanding and application of AM in the federal environmental assessment (EA) process” (CEAA 2009 pg 1). Sub-section 38(5) of the Act authorizes government to use the results of project follow-up in this context to improve the quality of federal environmental assessments. The document provides guidance to proponents during project scoping through a framework for evaluating when AM is an appropriate approach and when it is not. This is a critical evaluation process that some authors believe is missing and results in poorly implemented or failed attempts at AM.

Unfortunately there are no similar provincial guidelines available to guide the implementation of AM. There is mention of the practice in a Manitoba Conservation Forest Practices Guidebook- “Forest Management Guidelines for Riparian Management Areas” published January 2008 and valid until January 2016. On page 2 the document mentions that management activities will be guided by several principles one of which is “to facilitate the implementation of AM strategies and effectiveness monitoring for Riparian Areas (RAs) and Riparian Management Areas (RMAs)”. On page 3 the document mentions the only description of AM, which is “Once objectives are determined, guidelines can be evaluated as part of an AM loop that includes research and monitoring to determine whether objectives have been met.” (FMG 2008 pg 3).

Again on page 37 the description reads as “In most cases, land use activities are making progress towards implementing new knowledge gained through research and monitoring initiatives, and developing best management practices (BMP)s to ensure environmental effects are minimized – this process has been termed *Adaptive Management*.” With a guidance document suggesting the use of AM it would be useful to a proponent for the province to also provide guidance as to how to properly employ it but as of the date of this review none could be found.

2.4 THE ADAPTIVE MANAGEMENT CYCLE

In the literature, a number of descriptions of the AM cycle process can be found. As Allen and Stankey (2009) pg 15 note, these descriptions can range from the simple two steps (learning and doing) up to seven or eight steps with “varying levels of detail and with different granularity of the components”. Often figures are used as an effective way to conceptualize the cyclical process of AM (Schreiber *et al* 2004, pg 179; C.R. Allen *et al* 2011 pg 1340). To help frame this review of AM, a figure was chosen showing the general stages in the process (see Figure 4, sourced from Jones 2009). This particular model was chosen from a multitude of others as it captured the major defining steps of AM that are commonly described throughout the literature. This model most accurately portrays the stages and steps that are most beneficial to the application of AM to a transmission powerline construction Environmental Protection Plan (EPP). In addition to the descriptions by Jones (2009), contributions from other authors were incorporated to provide further detail and elaborate on the steps taken in each stage of the model in the following section (Stages of the Cycle).

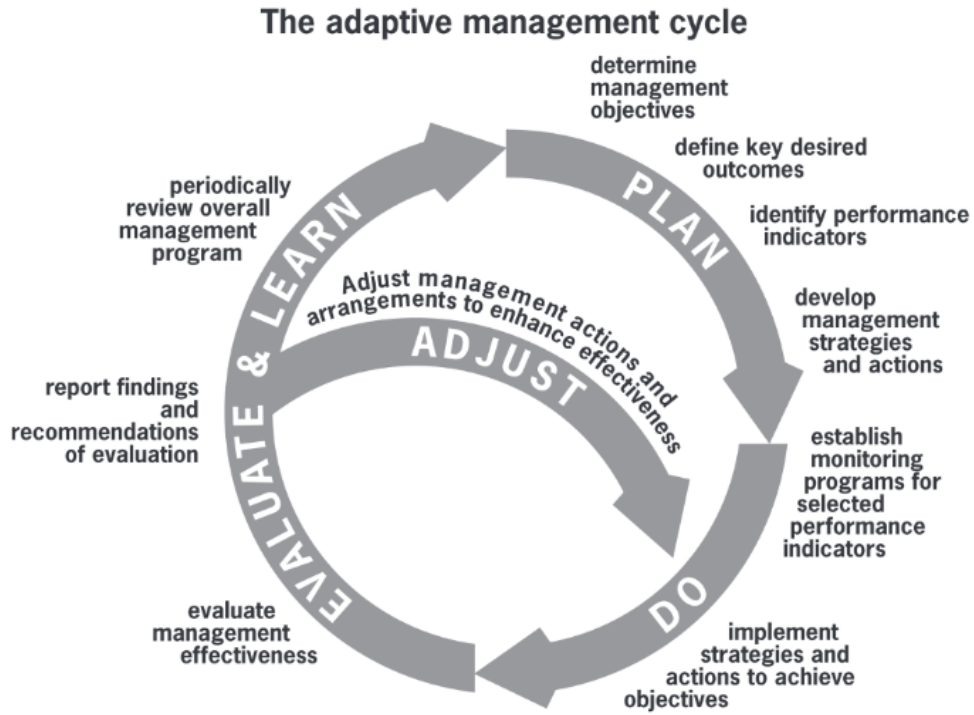


Figure 4: The Adaptive Management cycle

Source: The Adaptive Management cycle for the Tasmanian Wilderness World Heritage Area

(Jones, 2009, P.237)

2.5 STAGES OF THE CYCLE

Expanding on each of the stages shown in figure 4, information has been compiled from a number of authors and what steps they consider to be crucial parts of each stage.

2.5.1 The Planning Stage

2.5.1.1 Stakeholder Participation

Several authors and practitioners recognize that stakeholder participation and involvement is crucial to successful implementation of AM (Stringer *et al* 2006, Schreiber *et al* 2004, McFadden 2011 and Williams 2011 (B)). Stakeholders in this context could be the public, landowners, Indigenous communities, Government departments; or anyone else who might be affected by decisions made or has a position of influence over the decisions that are made. Schreiber *et al* (2004) pg 178 state “Collaboration is also essential to ensure realistic bounding of management problems, constraints on possible actions, and identification of realistic outcomes.” Stakeholder involvement early on in the process is crucial at the planning stages as incorporating different opinions and perspectives is necessary for properly identifying the potential pitfalls of decisions. Williams 2011(B) indicates the value of having the aid of stakeholders in the assessment of a resource problem, contributing to identification of scope and objectives.

2.5.1.2 Determine management objectives and define key desired outcomes

Early in the process it is important to establish funding support, and seek cooperation from management and decision makers for the use of an AM approach (Allen and Curtis 2003).

Decision makers will approach stakeholders who are interested in participation and explain the principles of AM and how they will be involved in the development process (Allen and Curtis

2003). It is healthy for the process to involve a variety of people collaborating from different perspectives or who are impacted by management actions (Schreiber 2004). Doing so increases the number of possible management solutions that are brought forward (Rist *et al* 2012).

It is important to establish and agree upon objectives or goals for an AM undertaking and these can be defined and later evaluated to measure success (Williams 2011 (B)). Examples of objectives are the “identification of issues and unknowns, identification of impacts, communication, information synthesis, research planning, policy analysis, and project management” (Allan and Stankey 2009 pg 19). As Allen and Stankey (2009) identify, it is crucial to have a shared understanding among stakeholders and those involved in the process as to what objectives are being pursued and why. The goals of management actions are then set and the outcomes or results of implementation are assessed and evaluated in relation to identified objectives (Schreiber *et al* 2004). Once issues are identified and an agreement or compromise is reached during a scoping exercise, short and long term objectives are developed (Allen and Curtis 2003). Conceptual or technical models can be developed to demonstrate the issues and how they relate to the system under study or management.

2.5.1.3 Modeling

Some applications of AM will include a modeling component that involves taking known variables and making predictions about the outcomes of different management treatments. In some applications computer modeling is used. In others they are diagrammatical which help to visualize how components of a plan relate to one another conceptually. Mclain and Lee (1996) found that a modeling exercise helped users to explore the different options and envision

possible scenarios in all three case studies examined. Allen and Stankey (2009) discuss the importance of modeling at all stages of AM as a mode used to describe the system under study and the uncertainty of particular interest. They also see it as having a place of importance for debate and discussion, fostering neutrality amongst stakeholders where their interests are represented. Schreiber *et al* (2004) pg 178 identified the importance of modeling and its use "...to explicitly describe components of management and their relationships, to articulate assumptions and, most importantly, to incorporate specifically the levels and types of uncertainty in prior knowledge and data collection."

2.5.1.4 Identification of performance indicators

Once predictions are made there is a need to identify what indicators would signify positive performance of policy or management decisions. An example by Kato and Ashern (2008) utilized three indicator indices to measure biotic (aquatic life), abiotic (chemical properties of water) and cultural (values and attitudes toward a water source) variables for water resource planning. Other examples of management performance indicators are ecological conditions such as plant diversity and structure (Walters 1997). Indicators are chosen depending on the project and what assumptions or predictions have been made. There may be a need to assess a particular component, such as at risk members of plant and animal communities, to assess the health of a particular community (CEAA 2009).

2.5.1.5 Develop management strategies and action

At this stage management objectives have been identified and with the aid of a modeled system a range of scenarios have been developed (Schreiber 2004). From these scenarios, several possible management strategies and/or policies that are expected to result in outcomes to help to meet management objectives are identified (Allen and Curtis 2003). Responsibility for choosing the appropriate actions and management strategies rests with managers and stakeholders who then develop a plan (Williams 2011(B)).

2.5.1.6 Establish monitoring programs for selected performance indicators

Monitoring techniques are planned ahead of time with consideration given to the objectives of a study. This will help to answer particular questions about predictions that are made or to evaluate the effectiveness of mitigation measures or new processes. As Williams 2011(B) pg 1349 describes “Monitoring plans by tracking useful measures of system response, well-designed monitoring programs facilitate evaluation and learning, monitoring provides data for four purposes: 1) to evaluate progress toward achieving objectives 2) resource status 3) understand dynamics vs. predictions 4) refine models.” An important step at this stage is to reach an agreement on how results will be evaluated or what would be considered indicators of good performance.

2.5.2 The Doing Stage

2.5.2.1 Implement strategies and actions to achieve objectives

This stage involves enacting the system, processes and mitigations that were decided upon in the planning stage. The chosen implementation is a strategy designed to achieve identified objectives. Depending on the experimental design of the AM taking place as Allen and Curtis (2003) mention, one or more strategies would be chosen at a time to evaluate.

2.5.3 Evaluation and Learning Stage

2.5.3.1 Evaluate management effectiveness

At this point monitoring activities have been carried out and have gathered information on the response to management interventions or design (the plan). The monitoring period has either been part of an ongoing activity, or over a defined period of time (this cycle would depend on the application). Results are evaluated and, if applicable, are compared across multiple management treatments or options. Rist et al 2012 pg 2 summarizes this well with this description: "Reflection on, and learning from, monitoring results, comparison with original expectation in order to revise models and/or management actions based on what has been learned."

2.5.3.2 Report findings and recommendations of evaluation

With the results of monitoring activities documented, the effects of implementation are evaluated and the outcomes of the management plan or process are assessed against the initial goal of the plan (Schreiber 2004). This is to inform and guide further decisions or review of the original management plan, but could also mean a change in focus or priorities for management (Jones 2009).

2.5.3.3 Periodically review overall management program

A Periodic review based on monitoring results will help inform management on the efficacy of a program, “Monitoring programs that detect hypothesized changes in management outcomes can provide important feedback about whether management strategies or programs are working as intended.” (Jones 2009 pg 240) Rist *et al* 2012 pg 3 identifies the value that cyclical nature of AM has “Iterative repetition of this cycle so that management reduces uncertainties and leads to improved management outcomes over time.”

2.5.4 Adjusting Stage

2.5.4.1 Adjust management actions and arrangements to enhance effectiveness

Adjustments in management practices may be made in light of monitoring results “The findings and recommendations of the evaluation are used to guide adjustments in management actions and arrangements to better achieve objectives.” (Jones 2009, pg 238). As Williams 2011(B)pg 1350 indicates “Feedback at any given time understanding gained from monitoring

and assessment can be used to inform the selection of management actions using this knowledge for future decision making, periodic adjustments based on what has been learned.”

2.6 EXPERIMENTAL APPROACH- TRIAL AND ERROR, PASSIVE AND ACTIVE

Just as there is dispute over the validity of the different approaches of AM, there is also disagreement or inconsistencies in their definitions and interpretations (Rist *et al* 2012). For those who identify different forms or methods of AM, “passive” and “active” AM are regarded as two separate acceptable methods (Gregory *et al* 2006; Williams 2011A). A third method, “trial and error” is recognized by some as a rudimentary attempt at AM and is often described negatively in contrast to passive and active characteristics. Passive and active AM approaches are often described by their differences but differ mainly by their type or level of experimentation (Diduck *et al* 2012). While there are a variety of interpretations, for clarity Walter and Holling (1990 pg 2060) cite the seminal work by Walters 1986:

“There are three ways to structure management as an adaptive process (Walters 1986): 1) evolutionary or “trial and error”, in which early choices are essentially haphazard, while later choices are made from a subset that gives better results; 2) Passive adaptive, where historical data available at each time are used to construct a single best estimate or model for response, and the decision choice is based on assuming this model is correct; or 3) active adaptive, where data available at each time are used to structure a range of alternative response models, and a policy choice is made that reflects some computed balance between expected short term performance and long term value of knowing which alternative model (if any) is correct” Walter and Holling (1990 pg 2060).

2.6.1 Trial and error

Trial and error is mentioned in the literature as a very basic method of management, which is at best, described as (evolutionary) a rudimentary form of AM. Allen (2007) quotes Walters and Holling (1990) - "Evolutionary AM is undirected learning from random experience or trial and error learning". Williams (2011, pg 1347) describes the trial and error approach as an ad hoc strategy, where you "try something, and if it doesn't work try something else". Mclean and Lee (1996 pg 438) cite Chandler (1990) indicating how dated the approach is in the statement "Ethnographic evidence indicates that humans have long used ad-hoc hypothesis testing as a means to take advantage of surprise and increase knowledge acquisition rates". Wilhere (2002 pg 22) considers what is currently in common use today in resource management is the trial and error approach; in which "Under trial and error, managers typically implement a single policy and assume it is satisfactory until proven otherwise." This trial and error approach has also been described as "reactive management" by Sutherland (2006 pg 603). Wilhere (2002 pg 22) mentions (Hilborn 1992) who calls it "reactive learning" or (Halbert 1993) "crisis management". Trial and error isn't regarded as the preferred method, and since the introduction of AM it has been hailed by some as "...a solution to endless trial and error approaches to complex natural resource management challenges." (Allen and Gunderson 2011 pg 1379).

2.6.2 Passive Adaptive Management characteristics

Parma *et al* (1998) as cited in Allen (2007) suggest that passive AM is considered to be the same as the current approach to managing natural resources. Rist *et al* (2012) propose that passive AM is just a new label for conventional ways of managing and AM is a proposed change to this. Rist *et al* (2012) pg 9 supports this interpretation by stating that "...all management adjusts in response to learning..." and this is considered to be good practice but that does not make it AM. Parma *et al* (1998) pg 20 define the approach as instances of when "policies are adapted in response to new information, but learning is not incorporated as a management goal, management is called *passively adaptive*."

Allen (2007) describes passive AM as a form of AM that implements what has evolved through history and is known as the best practice or policy. Learning takes place when results of that implementation are evaluated for effectiveness. The example Allen (2007) used was the implementation of a planting program with the goal of optimum biodiversity in a riparian area. A planting design of 20 meters spacing is known as a current best practice, which would be used and only be revised if an evaluation deemed it to be insufficient.

Wilhere (2002) pg 22 expresses the opinion shared by other authors that, "The evolution of the AM concept has been away from passive approaches and toward active approaches" (Forest Ecosystem Management Assessment Team 1993; Irwin and Wigley 1993; Lee 1993). Due to the focus on experimentation, active AM is often accompanied by a higher cost, often longer timelines and increased complexity of implementation. Passive AM remains an attractive option as it can provide useful information, is a simpler form to implement (Westgate *et al* 2013) and

typically can be performed at a lower cost than the active form (Wilhere 2002). Gregory *et al* (2006) contend that both passive AM and active AM have value and the appropriateness of their application depends rather on the circumstances managers are faced with.

2.6.3 Active Adaptive Management characteristics

Allen (2007) contrasts the passive approach (using best practice standard of plant spacing) with active experimentation, which employs a number of different treatments or trials simultaneously to seek out the most effective practice. For an active AM example, Allen (2007) identifies a range of distances to test the understood best practice, which in this case is a spacing of 20 meters between plantings. With the aim of finding the optimum spacing, plants are strategically spaced at different distances within a predetermined range rather than just the established 20 meter spacing. Through experimenting with simultaneous treatments, an accurate “best practice” can be identified by gathering more information in a shorter time period.

Rist *et al* (2012) sees the contrast between passive AM and active AM in that passive AM undergoes a formalized learning process, which helps improve management decisions but does not perform explicit experiments to assist the process. They suggest that active AM was a term created to focus attention back onto experimentation, which would have been a main element of what the seminal works by Carl Walters and C.S. Holling emphasized. Rist *et al* (2012) pg 9 cite Walters and Holling (1990) in which a distinction was emphasized: “Their article suggested that most management is characterized by passive adaptation to change and they proposed AM as an alternative to this; rather than specifically presenting passive and active as two alternatives of AM.” Active approaches require more effort during the planning of experimental design as well as more resources due to the complexities in implementation and the monitoring work that follows (Gregory *et al* 2006). The benefit of this approach is that it can gather more scientifically viable information in less time it would take for the passive approach to arrive at the same conclusion (Gregory *et al* 2006). As Wilhere (2002) explains, the added complexity and cost associated with

evaluating a range of treatments in the active approach can help to identify a superior strategy or policy.

An additional contrast between passive and active approaches comes from Williams (2011) who makes the distinction that passive AM is intended to focus on generating a resource response rather than a learning response that is found in active AM. This fits well with Rist *et al* (2012) who discuss the differences between passive and active approaches in terms of passive AM being suited to short term management objectives with active AM having objectives for longer term benefits of learning.

2.7 WHERE HAS ADAPTIVE MANAGEMENT BEEN USED AND HAS IT STRAYED?

There are a number of papers that have identified an overuse of the term “Adaptive Management” and where it is misrepresented (Rist *et al* 2012, Wilhere 2002, Westgate *et al* 2013). As Gregory *et al* (2006) pg 3 describes it, “Few concepts in environmental management are both as widely promoted and as widely misunderstood as AM.” Kwasniak (2010) comments on the increased uptake of AM since it was added to the *Environment Act* (Canada) and that it is now featured in CEAA reviews and court decisions. Her concern is that the term was not used consistently and was not reflective of AM in its classic acceptable form. There appears to be a number of reasons for the confusion around AM.

One reason for the confusion around AM is the diversity of applications. Westgate *et al* (2013) feel that published authors of AM have a good grasp of the theory but those less familiar with the practice of AM are confused by the diverse application under the banner of AM.

AM is applied at different scales, regions and under different management contexts with different interpretations and without full and complete understanding of correct implementation (Rist *et al* 2012).

Another reason for the confusion around AM is a drift from the original concept, likely from misunderstanding its original intent and form. Westgate *et al* (2013) pg 2 performed a large review of papers that reference AM which “...found that excessive use of the term ‘AM’ is rife in the peer-reviewed literature.” In their analysis they often found confusion about what it means to use AM. In one statement about the review they state “The concept of AM appears to be differently understood by researchers, policy makers and resource managers, with many agencies claiming they are doing AM while in fact they are using *ad hoc* approaches...” (Westgate *et al* 2013 pg 21). What concerns Westgate *et al* (2013) about these applications of AM is that they will negate the need for robust experimental studies of different management options in the eyes of policy makers and resource managers. As Rist *et al* (2012 pg 26) summed it up, “If used loosely, the concept risks being weakened, its core ideas obscured and its utility limited.” There exists an enthusiasm for AM which has led to its application in a variety of situations in an attempt to solve complex problems of environmental management. However Gregory *et al* (2006 pg 6) insists that AM is not designed as a “one size fits all” solution. There is a large body of work that tries to address this issue by providing guidance for applying AM and pointing out the common misconceptions of AM.

2.7.1 Misconceptions of Adaptive Management

With the use and popularity of AM, many claim that the concept has been abused or misused.

Likely with poor or insufficient understanding, the term is used, as Lee (2001 pg 7) puts, it: “as a buzzword”. In a review of literature performed by Rist *et al* (2012 pg 9) they mention one paper in particular which had “AM” in the title but was found nowhere else in the paper. Others, likely with good intentions are assuming they have a full understanding of the concept and that they are in fact effectively applying AM. Williams (2011) points to natural resource managers who commonly claim to be applying AM but at times are doing so incorrectly. Wilhere (2002 pg 21) found managers who support AM as a good management approach but believe that to fulfill AM would only require from them a willingness to change. This view is similar to that of stakeholders who consider AM to be “flexible management” (Wilhere 2002 pg 21 citing Halbert 1993). This lack of understanding for what is required leads some to believe that they are already practicing AM. Rist *et al* (2012 pg 2) support this stating that “Indeed, managers who use a trial and error approach to contend with changing resource systems argue that they are already using AM.” Those believing what they are already doing as AM need to understand that AM has a set of requirements laid out in seminal papers (Rist *et al* 2012). For most, to embody AM represents a “thoroughly new paradigm for managing natural resources” (Wilhere 2002 pg 21); and it is not “business as usual” (Allen 2007 pg 1). What many may not realize is that it is a demanding process that requires a great deal of effort and dedicated resources Doremus (2010)

There are also some inaccurate or unrealistic expectations placed on AM; “the term “Adaptive Management” means different things to different people” (McLain and Lee 1996 pg 437).

A common manifestation of misunderstandings is that AM is a form of management that allows for flexibility to address new challenges (Rist *et al* 2012). AM is not just “managing for adaptation” (Rist *et al* 2012 pg 10). Without a sufficient understanding of the AM concept, too much emphasis or attention is given to the “adaptive” portion of AM, which can skew people’s perceptions. There are a few more ways in which the concept of AM can be misappropriated. The following list was created from Kwasniak (2010) who believes that in order for the concept of AM to be correctly applied it:

“...cannot be used as a “substitute for committing to specific mitigation measures.

...cannot be used to cover a situation where a proponent is not sure how to mitigate a negative environmental impact, but commits to finding the technology or science in the future, if a problem arises.

...must not be used to attempt to reduce uncertainty with respect to likely significant adverse environmental effects.

...cannot be asserted to, in effect, say, if there is a significant impact, we will adapt to deal with it.

...cannot be used to attempt to reduce uncertainty regarding proposed mitigation measures.

...should not be used as an “offset” to the precautionary principle” (pg. 427).

2.8 WHEN IS ADAPTIVE MANAGEMENT APPROPRIATE TO APPLY?

There are a number of places where authors question the efficacy of AM practices and:

“...suggest major barriers confront efforts to implement AM effectively” (Allen and Stankey 2009 pg 3); “Its implementation has failed more often than not” (Allen and Gunderson 2011 pg 1379).

Proponents of AM believe that it is an effective tool but recognize that difficulties and roadblocks during implementation will arise when AM isn't applied to appropriate problems (Allen and Gunderson 2011; Rist *et al* 2012; Kwasniak 2010, CEAA 2009). Gregory *et al* (2006) see appropriate application as the biggest hurdle for successful AM. An issue that warrants consideration is the conditions or scenario to which AM is applied. The area of proper application can be improved by establishing criteria for managers to help determine what types of problems are suitable or not suitable for AM techniques (Gregory *et al* 2006). Gregory *ET al* (2006 pg 2) contends that “...the problems facing AM may have less to do with the approach itself than with the indiscriminate choice of contexts within which it is applied.” Rist *et al* (2012 pg 10) express a similar concern: “Until AM is consistently defined and elaborated, it remains to be established in which management contexts it can most appropriately be applied.” Many papers support the utility and the strengths of AM but temper this optimism with caution not only for noted misapplications but also for documented hurdles.

2.9 WHAT ARE THE POTENTIAL ISSUES AND HURDLES WHEN ATTEMPTING AM?

There would seem to be a duality in the literature discussing the concept of AM; it has achieved notoriety for some as the preferred approach while others struggle with difficulties in implementation. Westgate *et al* (2013) mention that AM is considered to be the best approach for biological systems with inherent uncertainty while also only seeing rare successes in its application for improving biodiversity outcomes. There are papers that identify difficulties and barriers to the successful implementation of AM plans (Gregory *et al* 2006, Allan and Stankey 2009). Many identify these issues but maintain that they can be overcome with more study (Rist *et al* 2012) and while there are difficulties “major progress is occurring” (Allen and Stankey 2009 pg 3).

While there is a call for more research into how to improve the AM process, there is also the suggestion that issues and barriers identified in AM applications are not unique to the idea itself but are common problems found in management in general (Rist *et al* 2012). Rist *et al* (2012) see a need to distinguish instances where AM has failed (where a different approach would have succeeded) or where management itself had failed. Rist *et al* (2012 pg 10) identifies examples: “Cost, institutional barriers and difficulties with stakeholder engagement are not particular to AM and it would be more accurate to discuss these barriers to effective management in general.”

While there may not be fatal flaws in AM implementation, there are noteworthy hazards that can be very problematic for a program. When attempting AM it is important to be aware of where other applications have discovered issues. Identifying problem areas ahead of time in practice may be a sufficient way to develop solutions or at the very least efforts to avoid them.

As Allen and Stankey (2009) point out, there are faults and failings of the AM process and those that arise through application of the AM process. It is important for practitioners to understand and to identify which has occurred.

Among the enthusiasm for the concept of AM there are some dissenting voices who are concerned that AM has not been fully explored and developed as a method. Rist *et al* 2012 pg 11) calls it a “...relatively underdeveloped area of research” and expresses that there is “... a need to foster more analytical dialogue.” One of the areas identified for development is to bring application back to AMs core concept and “...suggest refocusing on a formalized learning process and/or deliberate experimentation as the defining features of AM.” (Rist *et al* 2012 pg 11). There are a number of papers that see the value of AM but have identified many problems that can prevent successful application.

2.9.1 Documented Issues with Adaptive Management implementation

Through the literature that discusses implementation of AM, authors have identified challenges or issues that have revealed themselves while undertaking AM activities. Table 1 identifies some of the commonly cited issues, separated into categories and the papers they were cited from. The first category “Trust in the value of AM” stems from a lack of understanding and or trust in AM. This lack of appreciation can lead to actions that undermine its success. The second category “Individual Roles and Responsibility” speaks to the importance of individual participants or actors in AM and their need to support the process and leadership initiatives. The third category “Hurdles familiar to the AM process” are those that are typically associated with AM, such as risk aversion seen in managers and the need for them to embrace risk as a part of management which will allow for experimentation. The Fourth category is “Institutional Barriers to AM” which are committing to monitoring that requires longer terms, increased stakeholder involvement and embracing change. While these are significant challenges when encountered, they may not be insurmountable, and being aware of them is an important first step. It is also important to note that some of these issues could potentially be encountered in other management situations and aren’t necessarily unique to AM.

Table 1- Commonly cited Issues encountered with AM Implementation

| <i>Issues with Implementation</i> | <i>Citation</i> |
|---|--|
| Trust in the value of Adaptive Management | |
| Uncertainty in whether the AM approach works (Lee, 1999). | Allen and Gunderson 2011 pg 1380 |
| The failure of decision makers to understand why AM is needed (Walters, 2007). | Allen and Gunderson 2011 pg 1380 |
| Valuing action more than learning (Lee,1999). | Allen and Gunderson 2011 pg 1380 |
| An agency belief that single best policies lend credibility (Walters, 1997). | Allen and Gunderson 2011 pg 1380 |
| Using bureaucratic and political inaction as a policy choice (Walters, 1997). | Allen and Gunderson 2011 pg 1380 |
| A lack of emphasis or attention to the processes required for building shared understanding and shared decision making among diverse stakeholders (Gregory <i>et al.</i> , 2006). | Allen and Gunderson 2011 pg 1380 |
| Individual Roles and Responsibility | |
| Risk aversion of some managers. | Schreiber <i>et al</i> 2004 pg 180 |
| A lack of leadership for the complex process of implementing an adaptive approach (Walters, 2007). | Allen and Gunderson 2011 pg 1380 |
| The failure of scientists to understand the array of management possible or to recognize the need to provide information that can be directly used by decision makers (Gregory <i>et al.</i> , 2006). | Allen and Gunderson 2011 pg 1380 |
| The tendency among scientists to overstate their capability to measure complex functional relationships through experimentation (Gregory <i>et al.</i> , 2006; p. 2413). | Allen and Gunderson 2011 pg 1380 |
| The failure by overlapping management agencies to clearly define their responsibilities for implementing AM plans (Gregory <i>et al.</i> , 2006). | Allen and Gunderson 2011 pg 1380 |
| Hurdles familiar to the Adaptive Management process | |
| Difficulties in translating learning into practice (Lee, 1999). | Allen and Gunderson 2011 pg 1380 |

| | |
|--|----------------------------------|
| The cost and delays associated with gathering information and learning (Lee,1999). | Allen and Gunderson 2011 pg 1380 |
| AM experiments that entail long time frames and large areas have not been carried out in many systems because of high perceived costs (Walters, 1997; Moir and Block, 2001). | Allen and Gunderson 2011 pg 1380 |
| Other programmatic failures can be attributed to the unwillingness of managers to risk experimentation with rare or vulnerable resources (Feldman, 2008). | Allen and Gunderson 2011 pg 1380 |
| Embracing risk as part of management- the risk of economic loss or risk to the resource is uncertain. Trying to maximize benefits we may also increase risk. | Johnson 1999 pg 3 |
| Integrating stakeholders more effectively into decision making- involve stakeholders in developing objectives, difficult due to different values. | Johnson 1999 pg 3 |
| Institutional Barriers to Adaptive Management | |
| Long term commitment can be difficult for large agencies. | Johnson 1999 pg 6 |
| Uncertain or inadequate funding for monitoring and analysis. | Schreiber et al 2004 pg 180 |
| Incomplete or ineffectual implementation of a study plan. | Schreiber et al 2004 pg 180 |
| Lack of commitment to monitoring, evaluating and reporting. | Schreiber et al 2004 pg 180 |
| Institutional 'memory loss' regarding what has been learned. | Schreiber et al 2004 pg 180 |
| Inadequate institutional structures and stakeholders participation. | Schreiber et al 2004 pg 180 |
| The hijacking of management goals for research interests (Walters, 1997). | Allen and Gunderson 2011 pg 1380 |
| Inadequate funding for the increased monitoring needed to successfully compare the outcomes of alternative policies (Walters, 2007). | Allen and Gunderson 2011 pg 1380 |
| Developing institutions that are amenable to AM- Most management institutions are resistant to change, which is the basis of AM, need to view themselves not as providers of solutions but rather facilitators and partners with citizens to find joint solutions. | Schreiber et al 2004 pg 180 |

2.9.2 Risk Aversion

A common hurdle is the inability of managers to admit that uncertainty exists let alone to embrace it, with the difficulty being that there is risk associated with doing so. The culture and psyche of personnel of many agencies "...may be threatened by the risks posed by admitting they do not have complete knowledge about a given issue" Westgate *et al* (2013 pg 23 cites (Lindenmayer and Franklin 2002). Embracing uncertainty is an important step to realizing the potential of AM (Stankey *et al* 2005). As Westgate *et al* (2013) identify, the culture and psyche regarding the unknown make the prospect of management experimentation difficult and threatening for senior staff of an organization that are inherently risk averse (Westgate *et al* 2013). This can also manifest when proposed to people who feel a kinship to an area or resource and are not willing to put it at risk with experimentation (Johnson GL 1999). They may support and be willing to experiment if it means progress but may not want to risk what they perceived to be their own, and as such the Not In My Back Yard (NIMBY) syndrome (Dear 1992) can take effect. Johnson (1999 B) uses an example of a trout fishing club being unwilling to risk negative effects for "their" system to demonstrate this hurdle.

2.10 BEST PRACTICES AND FACTORS CONTRIBUTING TO SUCCESS

Having understood and identified the stages and steps of AM provides a framework for developing a plan or program. However, there are a number of pitfalls and hurdles to implementation as identified in Table 1. There are factors that an organization undertaking AM should be mindful of as they are thought to contribute to success of the concept. McClain and Lee (1996 pg 437) have identified three elements from social learning theory “...rapid knowledge acquisition, effective information flow, and process for creating shared understandings...” which if not utilized sufficiently may cause attempts at AM to suffer. There are a host of other factors that are identified as having a positive influence on the success of AM activities. Allan and Stankey (2009 pg 22) provide a list of factors which includes:

- The presence of a ‘champion’ for the activity;
- The effective coordination of bodies and processes ;
- The previous history of management or dispute between parties;
- The political climate, and structure of the participating institutions;
- The timing of the activity in relation to natural and institutional cycles;
- The extreme natural events such as tropical storms, droughts or floods;
- Other external factors drawing attention from, or to, the problem situation; and
- The economic health of the region, state or nation.

Being aware of implementation difficulties is important at the planning stages so that those factors can be accounted for and possibly evaded but just as important are identifying components that foster success. The research on AM has demonstrated what steps can be taken or what considerations can be made that will increase the chances a program will be successful. This information should be incorporated and built upon at the planning stage before an AM design is in place. Diduck *et al* (2012 pg ii) provide six general guidelines for AEM best practices; these principles should provide a framework for any AM application:

The first principle, **understanding context is crucial**, reinforces the importance of a broad-based, inclusive, and participatory approach.

The second principle, **understanding adaptive approaches**, involves being careful, honest and public about what it means to undertake AM so that safe and rewarding conditions can be created for experimentation and learning for better management.

The third principle, **purposeful and deliberate**, suggests that good AM starts with the framing of good questions, which directs subsequent undertakings, guides monitoring and evaluation, and emphasizes the social and political nature of the process.

The fourth principle, **careful documentation**, calls for documents that are transparent and open to scrutiny, and designed to encourage thoughtful and constructive debate.

The fifth principle, **designed to promote learning that translates into action**, requires acknowledgement that AM is hard, time-consuming, and requires ongoing investment, all of which necessitates organizational commitment and will to act.

The sixth principle, **supporting the “right” people**, highlights how important it is to have suitable AM participants, and that the participants must have the latitude, organizational support and resources to undertake their work.

2.11 CONCLUSION

As is found with many human activities, success will often rely on the people involved in the process. As Allan and Stankey (2009 pg 22) state: “Willing partners provide the raw power of successful Adaptive Management”, indicating that attitude towards the process is important. It would seem that having trust in the process is an important aspect, especially due to the duration and expense of AM (Walters 1997). With some of the unfamiliarity that comes with AM, Allen and Stankey (2009) mention that often it is the stakeholders and managers who have seen the limitations of other management styles who are most willing to try AM. Discussions on what contributes to the success or difficulties in AM will continue and become more refined with increased attention and research on process. There is information for those practitioners, managers and companies who want to employ an AM strategy. There are celebrated applications of AM considered to be a success. Mclain and Lee (1996) indicate three case studies (spruce budworm management and fisheries management in Canada and hydro power and fisheries in the USA). CEAA (2009) provides examples from the Vancouver port authority and the Ekati Diamond mine in NWT, while a table found in Westgate *et al* (2013) highlights several more examples of successful AM in industries responsible for extraction of renewable resources. With continued documentation and review of what are considered successful applications, the body of knowledge on the topic will continue to grow.

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3.1 RESEARCH METHODS

A literature review was conducted to gain a better appreciation for the history and the current state of Adaptive Management (AM). Through the Literature review I was able to develop a working knowledge of the requirements to fully implement an AM program. Through that lens I analyzed Manitoba Hydro documents, Environmental Inspector daily reports, weekly meeting minutes, annual construction reports and prepared questions and interviewed members of both the Environmental Implementation and Management Teams looking for evidence of AM or opportunities for its implementation. The information collected through the semi-structured interviews was transcribed and entered into a database form using NVivo 11 (qualitative data analysis software) and coded into Nodes (themes and sub-themes). The primary Nodes (themes) relate to the objectives, while Nodes with particular complexity or depth were further broken down into child nodes (sub-themes). The table 2 provides a summary of each theme and subtheme that the information was divided into, while the remainder of this section further defines and describes the information that was gathered.

3.2 DATA ANALYSIS STRATEGY

Ten people were interviewed with some in two separate sessions. Each interview was completed between 2014 and 2016 and ranged from an hour to two hours in duration. Where permission was granted, audio recordings of interviews were taken to help ensure accuracy of quotations. Audio recordings were transcribed into word documents using “Listen N Write 1.14.0.5” manual transcription software. These interview transcripts were provided to participants for review. This process allowed them the opportunity to clarify statements or object to their use in the study,

and there were instances where information was not used for that reason. The collected transcriptions were then coded into themes using NVivo 11 qualitative data analysis software. These emergent themes underwent a second evaluation and themes (nodes) were further divided into sub-themes (child nodes). A second round of review was done to help refine the theme definitions and some re-coding occurred.

3.3 RESEARCH QUESTIONS

Research question one (RQ1)- What is required to adopt an Adaptive Management approach?

Objective- Through a literature review, a full understanding and description of AM will help to appreciate and describe what is required of a corporation or agency when claiming to be practicing AM

Research question two (RQ2)- Within the Transmission Environmental Protection Program (EPP) what are the applications of Adaptive Management principles used towards the management goal of environmental protection?

Objective- Informed by the literature review, an analysis of gathered information and interviews will reveal to what extent the EPP exhibits AM principles and any areas that may be lacking.

Research question three (RQ3)- Would an increased investment in an Adaptive Management approach increase the efficacy of the EPP with respect to Manitoba Hydro's mandate of environmental protection?

Objective- Is to assess current EPP activities through EPP document review and interviews with Manitoba Hydro employees working in the program. A comparison will be done to determine what changes would be necessary to fully implement an AM process given insight found in the literature review. Recommendations will be made as a result of this assessment.

3.4 SETTING AND PARTICIPANTS

The recruited participants of this study were all Manitoba Hydro employees working for the Transmission Business Unit. All of the employees held positions directly related to environmental protection and were selected for that reason. The participants consisted of six Environmental Inspectors, two Senior Environmental Assessment Officers and one Biophysical Analyst. The Environmental Inspectors were the ones employed between 2014 and 2016. There were employees who were in short term placements that didn't continue as well as contracted consultants filling positions that were only employed for a month or two that weren't interviewed. The Senior Environmental Assessment Officer of Construction permitted the Environmental Inspectors to be interviewed but suggested the Construction Supervisors would be too busy to participate and didn't want them included. Participants were called to introduce the study and then were e-mailed a copy of the consent form which described the study and a list of the questions I intended to ask. There were two other Environmental Inspectors that declined participation, and one that submitted answers in text. Interviews took place on the road while traveling to the project or shadowing the Environmental Inspectors work for the day, while other interviews took place during a lunch or in a meeting room at Manitoba Hydro. All in-person interviews were conducted and recorded in a quiet neutral location where participants were at ease. Only one participant declined having the interview audio recorded.

The small numbers of participants was very enthusiastic about the project and were willing to share good quality information at great depth. This type of small sample size in qualitative research lends itself to gaining a better understanding of the participants' perspective and experiences (Creswell, 2009). While a minimum sample size for qualitative research continues to be debated, there are authors indicating that saturation (the point at which no new information can be gained) can happen at very low numbers (Manson 2010; Creswell, 2009).

Interview participants were members of the management team and the implementation team (Figure 2) members of the implementation team were all Environmental Inspectors. They were all contacted by phone and a follow up e-mail providing the interview questions as well as the ethics consent form which provided additional context and information on the study. Of the eight Environmental Inspectors that were contacted two declined, one provided written answers, one had agreed to be interviewed but declined the audio recording request, and the remaining four interviewees agreed to audio recording which were later transcribed. Three Management Team members were interviewed and agreed to audio recordings. All interviewees were contacted to approve the transcripts and to do quick follow up to ascertain if changes had occurred since the interview a year or two prior.

3.5 ETHICAL CONSIDERATIONS

3.5.1 Potential Concerns

There is a potential for the research interview questions to overlap with work related questions that I ask out of the responsibility of my position at Manitoba Hydro. While writing this thesis I am employed as an Environmental Protection Officer, working for Licensing and Environmental Assessment in the Transmission Business Unit at Manitoba Hydro. My principle duties involve authoring and maintaining the Construction Environmental Protection Plans used during the construction of major projects. I am involved with the Environmental Assessment process as well as developing mitigation measures for minimizing environmental impact during the construction process. One of the expectations of my position is that I am continually looking for ways improve and contribute to the success of the Environmental Protection Program. This may present a risk because potential participants who decline to be a part of the research may still be asked similar questions by myself for Manitoba Hydro work purposes only. This may create confusion and even minimal tension if I am unable to effectively differentiate the two contexts in which I may ask questions regarding AM. To eliminate the risk for those who decline participation in the research, another member of my department (Licensing and Environmental Assessment) will ask any of the work-related questions that bear a resemblance to my thesis topic.

The other potential concern for participants may be anonymity; in some cases there are only three or four people that hold a particular position. To counter this problem, the information will only be analyzed and the results discussed in such a way that I can ensure that people cannot be individually identified and connected to their responses. Anonymity is also easier to secure for

those positions such as the Environmental Inspectors which involve the movement of employees between different construction sections of the project.

3.5.2 Potential Benefits

Potential benefits of participation would be the ability to help improve the efficiency of the process of environmental protection. Participation in this study would serve as an additional opportunity or avenue for employees to effect change or have suggestions heard and respected. Manitoba Hydro can benefit from the evaluation of the EPP by identifying areas that are in need of improvement. Addressing these susceptible areas will enable Manitoba Hydro to “continually improve its Environmental Management System” as directed by Manitoba Hydro’s Environmental Management Policy. Through support of this thesis, Manitoba Hydro’s Licensing and Environmental Assessment department shows an interest in self reflection and continual improvement. The evaluation process of this thesis has the potential to increase defensibility of the EPP as an effective way to help mitigate the impact of transmission line construction. The recommendations which will be a product of this thesis will help to develop documentation or tools that will assure that AM is in place and can be implemented.

3.5.3 Privacy and Security

Interview audio recordings and transcriptions were stored on a desktop computer at my residence only and not on the Manitoba Hydro shared network, where people might gain access to them. The desktop computer was password protected and audio and word files were titled using a coding system. The names of participants were not used. I alone had access to the information collected; my thesis supervisor would have been granted access to the files but that

request wasn't made. The data will be held until successful completion of the thesis work. When it is evident that the information is no longer needed the files will be deleted.

As indicated by the consent form signed by the Environmental Inspectors, precautions were made to maintain anonymity as much as practicable. From transcribed interviews, attempts have been made to keep the quotations free of any information that may be used to determine a participant's identity. I have removed references to particular sections, location information, as well as the names of Environmental Monitors, Construction Inspectors and Supervisors. If a simple code was used to distinguish participants, a co-worker may identify someone if they recognize a familiar statement or viewpoint. To counter this issue, while maintain defensibility and tractability, each quotation was given a unique id, eg (EI-9, 2015) which indicates "EI" (Environmental Inspector) and "-9" (the ninth quotation in the findings) and "2015" (indicating the year the interview took place). Should there be the need to trace the information back to determine who contributed that quote, a corresponding table has been created that can be used to cross reference the unique ID.

Three members of the Environmental Management Implementation team were interviewed as well:

1- Senior Environmental Assessment Officer working for the Licensing and Environmental Assessment Department (LEA) which will be cited by the code (LEA SEAO).

2- Senior Environmental Assessment Officer working for the Transmission Line Civil Construction Department (TLCC) which will be identified by the code (SEAO TLCC).

3- Biophysical Analyst working for the Licensing and Environmental Assessment Department (LEA) which will be cited by the code (LEA BA).

NOTE: The findings section was provided to each the participants to review and comment on the accuracy of their representation.

3.6 RESEARCH DESIGN

Potential participants were contacted by phone so they were aware of the study. They were then e-mailed the consent form and additional information on the topic as well as the ethical precautions. Those who accepted the interview request were scheduled at a convenient time and place of their choosing. Many had permitted me to record the audio of the conversation. The interviews consisted of a semi-structured format. The Environmental Inspectors were asked a standard list of questions and conversations into other areas emerged from those questions as the conversation flowed. The audio files were transcribed into text. That text transcription was provided to the participants for an early review and approval. The text was then coded into themes using qualitative software. A second round of coding was done to refine the products. From those themes emerged topics that were used to populate the findings section and further categorized as they related to AM. The findings section was used for evaluation in comparison to the information found in the literature review. Weekly progress reports underwent the same treatment but didn't yield the same level of quality material related to AM. Daily reports produced by Environmental Inspectors were also reviewed but didn't produce any new information. However, these reports were used at times to confirm events.

The interview participants were all provided with their own copy of the findings section on which they were asked to provide comment. Some interviews had occurred over a year ago and over a construction season. Each participant was asked if any of the information had changed through their additional year of experiences and, where it had, context was provided to those findings.

3.6.1 Interview Instrument

The following sets of questions were used as the interview instrument in a semi-structured interview. A semi-structured interview combines pre-determined questions that prompt discussion while giving the interviewer the opportunity to explore emergent themes or responses further (EvaluationToolbox.net). The first set of questions was used for interviews that had taken place in 2014. A further refined set of questions was used in 2015. These questions were used only in interviews with the Environmental Inspectors. The two Environmental Assessment Officers and the Biophysical Analyst were asked direct probing questions, delving into particular topics.

Questions 2014

1st Phase – (gaining an understanding of the positions and how they interact and workflows)

- What does your typical day consist of?
- Do you have an established pattern to your daily tasks? If so, what are they?
- What is the most challenging part of your job?
- Are there things you would like to try or to see done to increase the effectiveness of your job?

- Do you feel that you can bring issues or concerns to the construction supervisors?
- What things do you feel would improve the effectiveness of your position?
- Do you feel that you are supported in the responsibilities of your position?

2nd Phase, probing into the Adaptive Management aspects

- Is the EnvPP suitable to address unanticipated specific site issues and/or emergencies?
- Are the EnvPP provisions understandable/user friendly?
- Are there any other aspects (quality and design) of the EnvPP that you want to comment on?
- Do you find the process of filling out daily inspection forms useful/adequate/cumbersome?
- Does the plan allow managers to receive a continuous process of feedback, leading to a reformulation of problems, tactics and strategies?
- What is your interpretation of AM and have you seen evidence of it, or a lack thereof?
- Do you feel that contractors are active participants in finding solutions to environmental problems/mitigation solutions?
- Is Manitoba Hydro willing to accept and act upon information that may be contrary to existing beliefs, values and policies?

Questions asked in 2015

- What is your interpretation of AM and have you seen evidence of it?
- Have you seen instances where different methods were attempted to achieve a goal, solve a problem or overcome a challenge? (In the field or in the office)

- Have you seen instances where contractors are active participants in finding solutions to environmental problems/mitigation solutions? Any examples?
- Do you feel that Manitoba Hydro personnel are willing to accept and act upon information that may be contrary to existing practices?
- Can you see opportunities for change that would increase the effectiveness of your position?
- Do you have support in fulfilling the responsibilities of your position?
- What is your typical process or work flow used to address an unanticipated environmental issue or situation in the field? (ie If you needed advice or a solution to a unique problem)
- Are there any aspects of the Environmental Protection Program that you would like to comment on to help improve it?

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| | |
|--|------------|
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4.1 INTRODUCTION

Information gleaned from daily reports, construction weekly progress meetings and interviews with both the Environmental Protection Management and Implementation Teams is contained in this chapter. This chapter contains the review of documents such as Specialist Monitoring Annual Reports, Environmental Assessments, supporting documentation as well as personal anecdotes and communications.

There are elements of Adaptive Management (AM) in past, present and future initiatives of the Environmental Protection Program. The analysis focused on information related to AM or demonstrated where it could be used to improve the Environmental Protection Program (EPP). Findings of this analysis have been divided into the following topics: Communication, Past Influences of the EPP, Basic AM Steps (Plan, Do, Evaluate/Learn, and Adjust) and three major types of Experimentation (Active AM, Passive AM, Trial and Error). Table 2 below is a summary table of the major findings for each topic.

Table 2 – Summary Table of major findings by topic

2.1 Recognition of Adaptive Management Processes within the EPP

| Subtheme | Characteristics | Finding | Format |
|--|---|---|-------------------------|
| Employee Understanding | Employee responses when asked to define Adaptive Management | Found good understanding existed One interviewee states : “Adaptive Management to me would involve learning from your experiences, changing your actions or behaviors and continually improving on your performance” | Interviews |
| Requirements for Adaptive Management Use | Inquiries into when Adaptive Management will be used | When asked about how the EPP plans to deal with the unknown, the LEA SEAO responded saying: ‘We encounter all kinds of scenarios, we could plan for some of them, but we could never plan for them all, so we | Documents Interviews |

| | | | |
|---|--|--|-----------|
| | | plan a process around Adaptive Management” | |
| Adaptive Management references in EPP documentation | Locations in the EPP documents that mention the use of Adaptive Management | Adaptive Management is found referenced in several places in EPP documentation “Audits and reviews will be conducted to facilitate updates to the program through an Adaptive Management process.” | Documents |

2.2 Communication within the Environmental Protection Program

| Subtheme | Characteristics | Finding | Format |
|-------------------------------|---|--|------------|
| Field Communications | Communication between Contractors and Manitoba Hydro (MH) staff and differences between construction sections | Environmental Inspectors being a new position and responsibility for any project met with initial resistance from contractors. Involvement in Weekly meetings was later deemed necessary and beneficial | Interviews |
| Field to Office Communication | Reciprocal communications that take place between the field and home office in Winnipeg | Field staff required advice or help making judgment calls or clarification of Environmental Protection documents. Due to different work hours and cell coverage issues, communication was made difficult. At beginning of project a big conference call happened once a week but stopped. It was difficult but effective. Environmental Inspector wants to re-instate that practice. They see it as a big benefit to clearing up issues and learning from other’s circumstances. | Interviews |

| | | | |
|---------------------------------|------------------------------------|--|------------|
| Interdepartmental Communication | Communication between LEA and TLCC | Need to foster better communication between departments on what the issues are; work on improving program. Harmonizing CEnvPP and Contract Specifications is recommended | Interviews |
|---------------------------------|------------------------------------|--|------------|

2.3 Past Influences

| Source | Characteristic | Response Example | Format |
|------------------------|--|---|-----------------------|
| Shad Valley Evaluation | In 2009 Shad Valley Students were employed for a summer to do an internal review of the Environmental Protection Program and provide recommendations based on their findings | Recommendations were largely accepted with changes being: -The Addition of Environmental Specialist to the Construction department who oversees 5 new Environmental Inspectors -The development of the Environmental Protection Information Management System (EPIMS) | Documents, Interviews |

2.4 Experimentation

| Type | Characteristic | Example | Format |
|-----------------------------|--|--|----------------------|
| Passive Adaptive Management | | | |
| | Clearing in Moose sensitive area GHA 19A | In an area of particular concern for Moose habitat, a zig zag method of clearing access trails into the area to minimize line of sight was developed. A method that hasn't been tried before. Many different mitigation efforts in this area and the potential to learn from them. | Documents Interviews |

| | | | |
|----------------------------|--|---|---------------------------------|
| | Evolution of the Environmental Inspector position | Progressions through training, evolution of responsibility and the potential for a change in total structure of reporting and auditing | Interview |
| | Evolution of the Community Monitors and Liaisons | Change in the program for better participation, inclusion and effectiveness throughout several different projects | Documents Interview |
| Active Adaptive Management | | | |
| | Prescriptive clearing for Golden-Winged Warbler (GWW) habitat | New contract model which allows span by span evaluation and prescriptions to promote GWW habitat | Documents Interviews |
| | Bird Diverter spacing | Experimenting with two different percentages of span coverage to find the optimal effective number in habitats with different risk levels | Document Interviews |
| | Caribou hotspot clearing | Two different methods were used to clear trees in known high traffic crossings, testing the efficacy of clearing mitigation up to 3 years after clearing | Document Interview |
| | Comparing two different clearing methods and the effect on understory plants and regrowth? | A portion of the Transmission line in which two different types of equipment were used to clear an area. Subsequent vegetation monitoring studies to evaluate communities as they recover from clearing. | Document Interview |
| Trial and Error Approach | | | |
| | Signage for access trails and identifying ESS | A couple of different ways of identifying what access trail was identified and where it was in relation to the transmission line. Different signage has been used to identify the start and end of an Environmentally Sensitive Site (ESS). | Interviews, Personal Experience |

| | | | |
|--|-------------------------------|--|------------|
| | Flagging challenges | A response to a need for consistent and distinct flagging tape. As well as modifications in color and style to aid operators with color blindness | Interviews |
| | 45deg Vs 90deg clearing angle | As a result of contractor request a different angle was tried at water crossings to allow smoother transitions between general clearing and the designated no machine zone | Interviews |

4.2 RECOGNITION OF ADAPTIVE MANAGEMENT PROCESSES WITHIN THE EPP

4.2.1 Employee Understanding

An important question when evaluating the use of Adaptive Management (AM) within the EPP was the level of understanding Manitoba Hydro employees had of the topic. While AM isn't prevalent in the Environmental Protection documentation it would seem as though a familiarity with the topic does exist amongst the employees interviewed. When asked to define AM, the interviewees gave varying responses from the succinct:

“Adaptive Management to me would involve learning from your experiences, changing your actions or behaviors and continually improving on your performance” Manitoba Hydro’s Licensing and Environmental Assessment Biophysical Analyst (LEA BA)

The variations of comprehension were evident in interviews, with definitions varying from the succinct to some more detailed explanations suggesting a working knowledge of the concept:

“What context? Because from a resource management perspective it’s very different from an implementation of mitigation measures I think”[...]” on the monitoring side I think that more the pure science of Adaptive Management, it’s actually tied to that uncertainty and then you plan, ect and then you monitor that whole circular checklist” Manitoba Hydro’s Transmission Line Civil Construction Senior Environmental Assessment Officer (TLCC SEAO)

All participants had some level of understanding of what the concept was meant to accomplish, and that it was used to improve processes or understanding. The distinction was made between what is possible to implement in the field and what was possible when there was more time to plan and implement such as in Active AM with monitoring programs etc. In the field, it was explained there was not the luxury of time if a mitigation measure is not working and a decision has to be made right away (TLCC SEAO). When necessary in the field AM is considered useful as a reactionary tool, whereas one would adapt a process when it no longer appears to be working (TLCC SEAO). Throughout the interviews, it became evident that some stages of AM were

present, this information unfolded through conversations with employees as they described situations encountered on the project. Interviewees repeated constructive criticism and suggestions for change, which they had volunteered in the past. These suggestions included form and document changes, as well as process suggestions, such as conference calls on a weekly basis to have a forum to ask questions and clarify processes and procedures in different scenarios. Those suggestions have contributed or have the potential to contribute to an AM process themselves.

4.2.2 Requirements for Adaptive Management Use

When evaluating the use of AM in the EPP it is important to understand from where the motivation to use that management style would come. Characterized as the ideal method, AM has been applied to many management plans in industry with suggestions for broader application within resource management and in some cases where it has been legally mandated as an appropriate approach (Johnson 1999(B). When asked about the use of AM (LEA SEAO) had mentioned that it is not mandated per se, but:

“Industry in general includes Adaptive Management because it is a way to deal with the unknown, otherwise then they would have to plan out for each potential scenarios and all of the different unknowns and have different process and procedures, contingencies for things that may or may not occur.” [...] “A lot of the requirements by the government have more to do with sustainable development and its philosophy. Manitoba Hydro simply uses Adaptive Management as a way to reach those sustainable development goals in a construction atmosphere that is ever changing with the weather, ground conditions, and natural environment that is unpredictable and it uses Adaptive Management to manage that unpredictability and respond to the unpredictable nature and to meet some of the schedules and timelines that they have.”(LEA SEAO)

Another question posed to LEA SEAO in the interview was: Are you aware of any examples where Manitoba Hydro has been requested to use AM in order to improve the work done in LEA? The

LEA SEAO spoke about the questions posed and the critiques provided by interveners who participated in the Clean Environment Commission hearings and what was gained from that experience:

“The only place that we have ever been requested to use Adaptive Management was through the BPIII Clean Environment Commission recommendations, and the review of the environmental protection program through interveners who interviewed us and asked us about our AM framework and how we were doing it and what we were doing to implement it and provided a critique on that. They provided some more insight into active AM and how some of the things we could be doing to be active, because we were primarily a passive AM focus. So we always get asked by interveners or the GOV, what if this happens, what will you do? well there all kinds of what if scenarios, we could plan for some of them, but we could never plan for them all, so we plan a process around AM that we will watch for these mechanisms that aren't working and we will review those mechanisms that are working so that we can learn from those experiences and adapt as required and also to put out these very strange scenarios that pop up, that people wouldn't have thought of” (LEA SEAO)

However, its use is implied for the Bipole III Project in its Environment Act Licence #3055, clause #57. It indicates the requirement to submit an annual report on mitigation issues and a description of the AM measures undertaken to address these issues:

“The Licencee shall, during construction of the Development, submit annual reports to the Director on the success of the mitigation measures employed during construction, a description of the AM measures undertaken to address issues, and recommendations for improvements of mitigation in future projects...” (BPIII License #3055, clause #57)

The 2015 Biophysical Monitoring Report was not published at the time when this thesis was authored.

The 2014 report was reviewed to evaluate how AM was implemented to address clause #57 in the Licence. The report describes an AM framework that will be used for unexpected outcomes or results from monitoring. In the summary the report states:

“Monitoring results have been reviewed and used to develop appropriate responses consistent with an AM approach to ensure environmental protection throughout the implementation of the Bipole III Project.” (Bipole III 2014 Biophysical Monitoring and Mitigation Report Page 24)

The report however lacks specific information on what the “appropriate responses” were. Clause #57 in the License requires that “a description of the AM measures undertaken to address issues...” In the monitoring plan they describe that as a result of findings *“protection of wetland zones are being reviewed with the Environmental Inspectors for potential improvements in the ESS flagging and communication with clearing contractors...” pg 16* as well as *“Winter stream crossing guidelines will be reviewed to determine if they can be improved to further reduce the potential for bank slumping and erosion.” pg 10*. These actions describe a component of AM but do not describe the necessary steps to provide recommendations for improvements of mitigation in future projects. However, a greater appreciation and description of the AM process is found in the documentation of subsequent projects (the MMTP EIS Monitoring and follow up chapter 22) described in the next section.

4.2.3 Adaptive Management references in EPP documentation

Throughout the EPP documents the term AM is used, and therefore these documents were reviewed in order to appreciate the level of understanding expressed there. The Bipole III Transmission Project Environmental Protection Plan Final 1.0 (sec 6.2) describes the use of AM in the Environmental Protection Program as this:

“The Environmental Protection Program is designed to be adaptive and responsive throughout the Project lifecycle. Program documents, processes, procedures and mitigation measures will be continuously evaluated by inspection, monitoring and communication programs. Audits and reviews will be conducted to facilitate updates to the program through an AM process.” (pg. 41)

In the Glossary of the Environmental Protection Plan, “Adaptive Management” is defined as:

“The implementation of new or modified processes, procedures and or mitigation measures over the construction and operation phases of a project to address unanticipated environmental effects.” (Pg.46)

There is a notable difference between the information presented in the BPIII documents and the MMTP EIS document. There would seem to be more recognition of AM practices in the MMTP document, which indicates a better understanding of the AM approach and what is required to apply it. The following is an excerpt from that chapter:

“Adaptive Management is an approach that has been around for several decades in which learning and managing natural resources happens collectively (Williams 2011)” [...] “ This planned systematic process is employed with the goal of continually improving environmental management practices by learning from their outcomes. The Environmental Protection Program for the Project has established the principles of Adaptive Management allowing for flexibility in the mitigation of adverse environmental effects that may result from the Project. Information gathered during follow up and monitoring activities will be used to verify the accuracy of the environmental assessment (EA) effects predictions and the effectiveness of implemented mitigation measures. Adaptive Management is an iterative process that involves planning, implementation, evaluation and learning, with adjustments made at any stage of the process where needed. McLain and Lee (1996) used three elements of social learning theory to evaluate the application of Adaptive Management: rapid knowledge acquisition, effective information flow, and processes for creating shared understandings. These elements are considered during the design and implementation of the Environmental Protection Program.” MMTP EIS pg 22-2, 2015

The MMTP EIS document was prepared after the BPIII documents and the lengthier description indicates an improved understanding and potentially increased level of commitment that is required to undertake the process of AM.

4.3 COMMUNICATION WITHIN THE ENVIRONMENTAL PROTECTION PROGRAM

Through the interview process, participants often referred to communication directly or talked about instances where communication was an important consideration for them. Communication amongst its members is crucial to the success of any program and to the utilization of AM processes:

*“As long as an atmosphere of trust and open communication exists, AM can provide the framework for the decision-making and experimental aspects of these approaches. Failures in collaboration can limit and impede the ability to conduct AM experiments”
(Porzecanski, etal 2012)*

If AM is to be used in the improvement of the EPP, the communication that is already in place must be evaluated. There were three main sub themes that were evident in the information that was gathered: Field Communication, Communication between the Field Staff and the Office staff, and Communication between departments at Manitoba Hydro

4.3.1 Field Communication

Effective communication in the field is necessary for the implementation of environmental protection measures. The Environmental Inspectors communicate environmental precautions and mitigations to field staff (contractors and other MH personnel). Efforts or difficulties in this area could be considered as the “Doing” portion of the AM model (Figure 4) where plans or processes made are implemented. Interviews with the Environmental Inspectors shed light on some of the challenges that exist in a field situation.

4.3.2 Communication between Manitoba Hydro and its Contractors

Communications in the field occur in a variety of ways including structured scheduled meetings. There are daily tailboards that occur, hosted by the contractor and delivered to their employees in the mornings before the day's work starts. Another important opportunity for communication for environmental protection came in the form of weekly progress meetings. BPIII is divided into eight sections, each with its own working groups, construction supervisors, and Construction Inspectors that were assigned to and responsible for their own sections. As such, each section had different personnel and working relationships that led to variations in how each section operated. In the first year of construction, it was evident from the interviews that Environmental Inspector involvement in weekly progress was not consistent across sections. Topics that are addressed in these weekly progress meetings are safety, environment, general progress updates (percentages of work done etc), proposed schedule of upcoming work, outstanding issues that require follow-up, community issues or concerns and a round table discussion. For the first year of construction, different sections handled this weekly progress meeting differently. Many of the Environmental Inspectors interviewed mentioned that in the first year they were not invited to attend the weekly meetings:

“weekly meetings were different than from last year (2014), “Last year they would have meetings in the evening at the contractor camp and we weren't invited, they would make decisions and would pass it down to us, such as developing a new method for clearing the permafrost areas, the next time out they would be doing it differently, when asked the response we got was “your manager made that decision”, the EI would then say “oh nobody told us”. EI-1(2015)

“In first year MH environment representatives were often not invited to progress meetings and as such did not have a good opportunity to hold contractors accountable for actions in contravention of EPP requirements or other (provincial guideline, WP conditions, etc) and also did not have an opportunity to provide an environmental perspective or input when

activities of upcoming activities or methods were being discussed. Now that environmental inspectors regularly attend progress meetings the communication had greatly improved.” EI-2(2016)

In these particular construction sections both management and the Environmental Inspectors realized the necessity of having the Environmental Inspector participate in the weekly meetings.

The Project Manager addressed the issue and they were involved the following year:

“...it was recommended because (the Project Manager) wanted to have an environmental section and get input from environment for issues or what was coming up.”...” I guess it was his style, he recognizes the CEnvPP is important and a requirement, just part of his planning.” EI-3(2015)

“This year (2015) - (the Project Manager) and (the Construction Supervisor) of my section both agreed that it was necessary for Environmental Inspector to be included in progress meetings” EI-4(2015)

“Having an environmental section presence at progress meetings and other project management meetings provides a valuable role in relaying an environmental perspective of upcoming or current project activities that can potentially allow environmental concerns or issues to be avoided that can easily be overlooked by those who do not have an environmental education or background.” EI-5(2016)

Environmental Inspector positions were new to construction and BPIII was the first project for which they were introduced. Perhaps roles and responsibilities weren't yet fully identified and established in the construction group. The project manager in this instance realized the benefit of having better involvement and communication from the Environmental Inspector to help follow up and close the gap with regard to follow up and addressing environmental concerns with the contractor. Thus the process evolved to ensure their involvement.

4.3.2.1 Interaction between MH staff and Sustainable Development

Initially started in one section during the first construction season, the interaction was weekly summary reports being sent by the Environmental Inspector for that section and the Construction supervisor. The reports contained information on the week's events, construction progress and what was planned for the upcoming week. Any spills or reportable environmental incidents or findings were included as well. As the regional conservation officers were not able to make it out on a weekly basis this kept them abreast as to what was happening on site and provided a line of frequent communication. The practice was appreciated by the Regional director and in May 2015 during a large "Post Season Bipole III Environmental Protection Workshop" between SD (formerly Manitoba Conservation and Water Stewardship) and Manitoba Hydro, he had asked if the practice could be expanded. According to the Environmental Inspector that was interviewed about the topic, the practice expanded to four other sections and was done in the last construction season. When asked their opinion about the practice they commented that:

"I see both sides...it is additional work when we already have not enough time to complete some of our "required" activities (I often worked on the weekly reports after the work day on unpaid time)...at the same time it is a good communication tool between us and the regulator. Often I would get positive feedback or questions about report information." EI-102(2016)

I spoke with the original Environmental Inspector who worked the section that first year that started the practice and he had seen value in doing weekly reports:

"I figure that the weeklies helped keep conservation informed on what is happening, if things aren't going well, they might bump up their trip, or postpone it if it was going well, kept them informed. It was good way to build up trust." (EI-103(2015))

Since these interviews took place, the practice of providing Sustainable Development weekly summary reports has been adopted across all sections of the project and are submitted on an ongoing basis.

4.3.2.2 Interaction between MH staff and contractors working on the project

The Environmental Inspectors interviewed stressed the value and necessity of establishing lines of communication with both contractors and construction inspectors. One particular statement expressed this context eloquently:

“As environmental considerations often slow production and increase costs it can be very challenging to be the often lone voice in the field that is continually reminding other workers on the project of our environmental conditions and requirements. I feel as though I have developed a good rapport with MH staff as well as contractor staff by voicing reasonable and well considered options and guidance for meeting the environmental responsibilities of the project” EI-6(2016)

Communicating and stressing the importance of environmental protection was considered both challenging and frustrating for the Environmental Inspectors as stated in one response to the question “What is the most challenging part of your job?”:

“Conveying the message to the contractor, make sure they understand that there are areas of importance and you are there to do a job. Having a conversation with them and knowing they understand what you have told them and then they turn around and don’t do it anyway. It is hard to stress to them that there are stream crossings in the morning and getting ahead of them to flag etc. Hard to stress the importance, it is new to them, they aren’t used to environmental protection, and they are used to cutting a path by any means necessary. The younger guys are more cautious than some of the more senior contractors whom are used to going full steam ahead.” EI-7(2014)

Environmental Inspectors have mentioned that they found it challenging trying to communicate environmental protection measures to the contract staff doing the work. At morning meetings they have an opportunity to address concerns and speak to staff that will be out in the field.

They stress important areas and try to educate the contractor staff on what is needed from them environmentally during construction for that day. When asked “Are there things you would like to try or to see done to increase the effectiveness of your job? One EI responded by suggesting the need for more efforts applied to contractor orientation:

“I think better orientation for everybody, we have talked about this in our section but to actually sit down with everybody on the construction crew and make sure that they understand everything, sit down and go over drawings of each type of ESS that they could encounter, Tell them what to do and have them repeat it back. Like show them drawings, here is the 66m right-of-way, this is a water crossing, this is the buffer and have them explain to me what to do, not just have me talk at them because I don't think that they really listen. I think that if they have to actually absorb it (quiz them at the end basically). "So when you get within 50m what do you do? When you are in the 7m what do you do. So they think about it, so that when they are out there, they think about it. I don't know how else to convey that message to them. There were drawings made up but some of them were so basic, and not very descriptive, there was too much left to interpretation. I made up one with a stream, and all of the different boundaries, everything you are going to encounter. You could hand it to them, a picture is worth a thousand words. But I found that they were confused about the direction the buffers went, they thought at one point that the buffers were along the side of the right of way- parallel not perpendicular at the stream crossing. So at one point they were hand clearing 7m from the centreline as a buffer.” EI-8(2014)

4.3.2.3 Miscommunication of Contractor Interactions and “Prime Contractor”

During the interview process it would seem an example of miscommunication and misunderstanding of protocol was revealed. This issue may remain unresolved and may still need clarification. At the time of the interviews there was a commonly held understanding among the Environmental Inspectors that they were technically not supposed to engage the contractors directly with issues. It was believed that they were required to follow a chain of command through the Prime contractor which would then be relay information down to a Sub-contractor which is often the one working in the field. According to the EIs this interpretation stems from

the language found in the contracts as well as language and figures found in Figure 5 Environmental Communication Reporting Structure. This misunderstanding did not prevent communication but may have caused confusion and trepidation among the Environmental Inspectors, as explained by one Environmental Inspector:

“As listed in CEnvPP diagram is not accurate rep of how EI communicated in the field, according to diagram the EI is not supposed to talk directly to the contractor, but this was impossible. Tactful discussions were necessary, it would be all day or longer if you were to follow the chain of command, if something needed to be addressed the EI would address it then and there.” (EI-9,2014)

It is also understood that there are implications and restriction provided by the way the contracts are set up, as stated by an Environmental Inspector:

“Something that I struggle with is not being able to tell the contractor what to do in regard to using specific machines, you can tell them what the outcome needs to be, you can suggest things, but you are not supposed to tell them you will use the shear blade here and leave brush this high, as they are the prime...” EI-11 (2015)

There seems to be a range of understanding among the Environmental Inspectors regarding what restrictions they have when it comes to this relationship and the implications it has. One Environmental Inspector expressed the implications are that they can put themselves or Manitoba Hydro in a position for being responsible for providing direction or instruction, which can lead to hesitation:

“I realize from that the perspective of Manitoba Conservation Water Stewardship it is Manitoba Hydro that is ultimately responsible for the actions of any contractors that are operating under a work permit that we have been issued, however, if prime contractor is contractually responsible for all of their activities while working on the contract we as the purchaser retain the ability to take recourse if required rather than assuming all risk. Without the necessary contract and EPP wording being tightened up I feel that we are assuming additional risk for activities that are for the most part out of our control as we are unable to provide direction to the “prime contractor” without opening ourselves up to potential liability (e.g. errors, extra costs, etc.)” EI-12(2016)

There is a perception of risk that the Environmental Inspectors have when communicating with the contractor because they are cautious of providing explicit directions. One of the interviewees provided an example of the problems that can be caused by that type of scenario:

“Yeah, we are in a position of telling them what to do even though we are not supposed to, even last year the contractor would get mad because the operators would come up to the flagging and ask “well what does this mean?” so we would tell them what to do and the requirements and the contractor would get mad eg, you can't tell my guys what to do because...”

KW- I have heard that from a number of you, kind of hog ties everyone..

“Yeah, the way our contract had it, if we wanted to contact the contractor, we had to talk to (person X) who talked to (person Y), to (Z), to (a fourth person) who would talk to the sub, K- all the way up to the prime and then back down again? Yeah” EI-2(2015)

In the follow up to these interviews one Environmental Inspector did say that there were big challenges with this Contractor and EI relationship that first winter of construction. At first there was a lack of trust that came with lack of clarification of roles and responsibilities but those things did improve afterwards as time went on. Although this relationship had improved, the way it was set up could make situations difficult to navigate and involved caution by some:

“It's very difficult for MH, because we are put into a predicament where we are not the prime contractor and the Prime contractor is seeking our recommendation, our advice for the work that they are doing. And sometimes that can be misconstrued as us directing, which causes problems from a contractual point of view”...“which poses problems from trying to administer that contract and typically it always revolves around payment items, “I couldn't do this and you told me to do that and that is why we have ended up with an undesirable result” EI-14(2015)

This topic was introduced in the form of a question to the Senior Environmental Assessment Officer of TLCC who is the direct supervisor of the Environmental Inspectors and who the Environmental Inspectors report to and receive clarification.

The TLCC SEAO was very surprised to hear that this confusion existed and was very concerned about such a misunderstanding existing and wanted to address it right away. This is an excerpt from that conversation:

“A-I don't know why they think that they can't talk directly to the contractor. Who was it that said this?”

K-Every one of them, they didn't feel that they could.

A-Then I will have to correct that from our end, because they have the ability to talk directly to the contractor.

*A-I will have to key on that in terms of when we have our meeting next week, but no that is not correct they are allowed to deal with instances or issues directly with the contractor, they just have to keep the construction supervisor informed and let them know that there is an issue and hopefully they have talked to them before they have gone to the contractor with the issue, this may just be construed as, I have to go see them and this person and then this person. All it is, they have to keep the construction supervisor in the loop that is all it is, or it's like you know what, I had to do XYZ with the contractor because of this, that is the discussion point. And even when we do environmental improvement orders, they don't go out unless there been a complete vetting of what is being served (it has huge implications). But even if all of the sudden it's like ok, you know what guys, you have five jerry cans without spill trays so fix it. So that is a field day to day thing, so not sure in terms of the communication, they are allowed to talk directly with the contractors, that has never been an issue, so, but I don't know if it had to go through a chain of other people.”
(TLCC SEAO)*

“A-Yeah, so let me know if there are some specific examples so I can deal with it from my end. Because if that is what they are feeling then we have a problem” (TLCC SEAO)

KW-Like I say, that was through almost all of the interviews.”

It would seem that there are issues with clarity on this point and communication on a particular process needs to be improved. It may be that further explanation of boundaries needs to be documented, or that the language of both the contract and CEnvPP needs to be updated or amended to establish the intended protocol. This is an example of where a process of AM may have helped in opening these lines of communication and clarified the misunderstanding, by Els addressing this frustration during a feedback stage or reporting period.

4.3.3 Communication between Construction Sections

The BPIII Transmission project is divided into approximately eight construction sections with staffing for each section and little to no overlap of MH staff, although occasionally there is movement of personnel when coverage issues come up. Contractors may or may not be working on just one section depending on how contracts were awarded. The interviews presented evidence from the EI point of view that the different BPIII construction sections seemed to operate in information silos. It may not have started out that way, but as construction continued, it progressed in that direction. This can pose issues when there are differences among sections. When people do travel from section to section there may be differences in how things operate and how problems are addressed. If a lack of consistency exists, when changes and adaptations are made, it could be difficult to properly assess the success of that particular adaptation. Within the different sections there have been stories of success and challenges. With proper communication learning can take place and those lessons can be shared during construction and possibly be implemented as policy going forward.

4.3.3.1 General Communication

In the first year of construction, 2014, not all sections were working and there was a full deployment of Environmental Inspectors, with many of them being new to transmission line construction and some were new employees to Manitoba Hydro. In that first year there was overlap of Environmental Inspectors and they would move around from section to section depending on demand. Each section had working groups that developed contracts independently but used a template to guide their development. With different Construction Supervisors and different Construction Inspectors the Environmental Inspectors describe a lack of consistency or shared understanding. In the second year of construction, the Environmental Inspectors would be assigned to a particular section and only cover other sections infrequently when relief was necessary. Under these circumstances, they describe a lack of communication between sections.

"I never heard from anyone else up there, just my section alone while I was up there. There should be a conference call or something between the environmental groups, so what is happening? Did anything change? If so then other sections would know that our section had change, or clarify that it is just for our section or does it change for everyone? At least then people would know and that would get communicated. Sometimes it took another Environmental Inspector to come to my section to find out about a change" EI-15(2015)

"If I have a problem in my section, and get an answer, I never thought to spread that news to other sections. You are so focused on yourself and your own group and you think everyone else is doing fine because you don't get a question about it ever, if you were getting a question from someone saying hey I am having this problem, you would be like oh! Actually I did have it, and here you go. As much as we would like to work as a team, you're very solo out there sometimes." EI-16(2015)

The Environmental Inspectors identified areas where additional communication would help them to contextualize the problems they were having, for example, with clearing and access management. They had identified the perceived lack of consistency between sections and

confused this with a need to clarify changes to environmental documentation or approach in dealing with environmental issues. Below are some of the examples of the issues as well as some potential solutions that the Environmental Inspectors have provided.

4.3.3.2 *Right of Way Clearing Activities*

The first stage of construction is to clear the right of way (ROW) proper of vegetation to allow construction equipment in to install towers and foundations and string conductors. Arguably the biggest impact during transmission line construction is at the clearing stage where trees are removed through mechanical means and workers need to observe boundary flagging to protect sensitive areas. Environmental Inspectors flag and identify environmentally sensitive sites (ESS) such as water crossing boundaries, plant species of concern or areas of heritage and cultural significance. At this point their ability to communicate with the contractor and follow a protocol from the CEnvPP for clearing and mitigation is very important, but issues of consistency exist here:

“One reason clearing methods varied by section and contract is that contracts including the clearing quantities that are estimated for each contract are not being all generated using a consistent method. Contracts with similar contract requirements (such as clearing contracts in different BPIII Sections) use a similar template but are being completed by various individuals without much internal discussion/consultation with others doing similar work. The lack of communication in generating these contracts has resulted in a lack of consistency across the project.” EI-16(2016)

“At one point they changed the water crossing clearing diagram, the buffers went diagonally, and it was like ok that is what we are doing, so printed a bunch out and after having our guys shown a different one. And then you get guys that had worked on another section and then come back to your section and put back onto clearing and he would just continue doing it the original way not knowing that it had changed. Two different options for clearing type is what we told the contractor. Pick the one they want to do and stick with it, two options but consistency and confusion was a problem. Some found it easier to do a 45 and some found straight, perpendicular lines easier, both were approved methods for clearing.” EI-17(2015)

A solution offered by the interviewees was increased documentation and a call to establish and standardize communication processes:

“Manitoba Hydro needs to provide more explicit requirements for the clearing contracts. One example is the clearing diagrams that were developed jointly by MH environmental inspectors and MH engineering technicians after the first winter to provide clarification to the contractors and to increase consistency between sections. Need better communication between all those involved in the project in all capacities. Most of the mistakes or areas to improve would revolve around miscommunication or lack of communication. Communication procedures should be well defined and standardized across the project.”
EI-18(2016)

4.3.3.3 Access Management Plan

One of the environmental protection documents that are provided every year for a project is an Access Management Plan. This plan describes the environmental precautions around accessing the transmission line as well as identifying where access trails have been created or approved. There is an approval process in place with Manitoba Sustainable Development (SD), (previously Manitoba Conservation and Water Stewardship). There is a requirement to get approval from SD for any new access trails that are requested from the contractor as well as any new bypass trails that are longer than 1000m. A bypass trail is made outside the ROW to go around obstacles that equipment cannot get past any other way. When one is proposed that needs SD’s approval, information is needed about the site from the Environmental Inspector in order to facilitate that approval:

“Even the access management process, we were doing our own thing, e.g. sending a request and back and forth with conservation, with them needing more information etc, later to find out that another section was using a standard form, so we adopted that, and that could have been streamlined a lot sooner. Each office has their own process and although now that most of the clearing is already done, as they said in one meeting, glad that we have all of this worked out now too bad most of the work is done LOL.” EI-19(2015)

For most sections this was not an issue but in other sections there was frequent beaver activity that meant a higher number of bypass trail requests. Some sections also had no cell coverage, which made communication delayed and onerous, added to by the fact that work happened through the weekends when nobody was in the office. This led to a change in protocol whereas the contractor would identify their suggested bypass, the Environmental Inspector would walk it, flag it and look to see if there were any concerns, GPS it and forward that information for documentation. For bypasses over 1000m information was sent to the TLCC SEAO and to the provincial government for approval.

“I feel that we have got the permission to go ahead and make the call ourselves based off the information that is available to us, if the information that I am using to assess that, in my opinion isn't sufficient enough to be able to approve that, that is when I seek, your input, the TLCC SEAO's input. However on any given day, that could be 2 to 3 times a day, and now we are down to the end of the schedule, and we only have 2 or 3 weeks at best, these are going to be coming up very quickly at an adhoc basis. And for the most part in addition to this, I am in areas where I have little or no communication coverage, so the time it would take for me to get this information out to you guys is half a day, and return? a day. So if this happens to be on a weekend, or isn't available we may be waiting a day or two” EI-20(2015)

“This is why I am fairly comfortable letting you guys know that yeah, we are not following the established process in the AMP, but you know what? I am very ready to justify how I manage this utilizing the intent of the AMP and utilizing the processes that are somewhat in the AMP to achieve what we need to achieve in a cost effective manner.” EI-21(2015)

The need for consistency among construction sections in the access management process was brought up by an Environmental Inspector to make the process more efficient and safeguard against unapproved access:

“The protocols detailed in the AMP should be revisited in a group setting for discussion and consistency. Some identified steps are unnecessary while there are other steps that should be considered for inclusion. A standardized template request should be provided to the contractors in the contract to be submitted to Manitoba Hydro for any proposed additional access or bypass (beyond those outlined in the AMP). Details of the potential repercussions or penalties for using access that has not been approved should also be outlined.” EI-22(2015)

4.3.4 Solutions Suggested for Communication between Sections

One suggestion for improved communication was the value of conference calls; this suggestion was made by a couple of Environmental Inspectors in the interviews. Due to the difficulties encountered with communication while in the field these conference calls would be a means of touching base, confirming a new course of action and clarification. In the following example, the Environmental Inspector describes an instance where a large conference call took place early in the construction process and suggested that it has value and should be re-instated and practiced regularly:

“The first day I was up north we had a conference call, and everyone from all of the sections conference called in, it was difficult and it was hard to hear but we were having a conversation and listening to each other’s issues. And that was the first and the last time we did it. The thought was that we would continue with that but people get busy and I think that is one thing I put in my report, that I believe we need to re-instate that, I think it could be set up a bit better, we need to have a private room where you were capable of doing that and there isn't a lot of background noise, eg we were in the cafeteria. The TLCC SEAO is in Winnipeg, we were in (one section) the other guys were in (another section), but if we could all express our issues in one place. If you could do that once a week at the

beginning and once every two weeks once you are rolling and those major things have been smoothed over. Everybody is checking in with everybody, because we were told to talk amongst yourselves, uh I never did, (mention two other inspectors they talked to one more than others). But uh, I didn't really seek help from my cohorts all that often, I was directly going to Construction supervisor or the TLCC SEAO, whereas when you are on the phone and someone brings up a question, you will say "yeah I had that too" K-Or if all three of you say, I had that problem, they may take it more seriously EI- and that too, or maybe you don't want to bring something up, but someone else does and then you are like "yeah" I agree." EI-23(2014)

Along with daily reports, the EI are responsible for submitting additional documents and paper work. These requirements include permit applications, submissions for access and bypass trail approvals as well as gathering the reports and plans that the contractors are responsible for. To track and make sure they are supplying the necessary paperwork throughout and by the end of the construction season, one Environmental Inspector suggested:

"A detailed and standardized form outlining the inspection and reporting requirements for MH Environmental Inspectors prior to the end of the construction season should be developed so that there is consistency between sections and projects. A comprehensive checklist of the end of the construction season environmental considerations should also be compiled for use by the contractor and by other MH staff conducting final inspections as they may also provide valuable input if prompted." EI-24(2016)

4.3.5 Communication between the Field and the Office

4.3.5.1 Support for the Environmental Section

An important part of Adaptive Management is to support the right people to help in implementation of the program and contribute to its success. The Environmental Inspectors discuss that at times they feel unsupported in the field when expressing environmental concerns and enforcing commitments. They do receive relief and assistance from Construction Inspectors but claim that the level of interest and commitment to environmental protection varies depending on the individual. There is the support of Construction Supervisors who are available

to discuss issues or concerns. However, as was described in the interviews, they are coming from a different viewpoint. As one Environmental Inspector explained it:

“Additional environmental opinion would be nice, instead of bouncing information off of construction supervisor, need more support in the field”...“With only having feedback from construction guys, one voice often Environment gets watered down.”(EI-26(2015)).

Since the first construction season when the Environmental Inspectors were introduced, the acceptance of their role by other workers on site is said to have gotten better reception as time has gone on. When asked about their relationship with the Construction Inspectors, one Environmental Inspector said that they were encouraged by some progress that had been made and had this comment:

“Hard to say but I guess that we are now seen as more of a requirement this year and they are more welcoming even like last year “Aww you environmental guys are just here to slow us down and hold us up” and then this year those same people have gotten better, even in our section it has gotten better, it’s like the safety growing pains that they were having 20 years ago when it was hard to have a guy wear a hard hat and a safety vest. EI-27(2015)

Some of the Environmental Inspectors expressed feeling challenged and needing advice or feedback to help make a judgment call on a situation or interpreting the CEnvPP mitigation measures. The Environmental Inspectors were able to get some support from a few different individuals in the field but still felt as if their primary support network was all back at the office in Winnipeg. Despite the Environmental Inspectors having different levels of experience and support requirements, each section had some unique challenges and many of the Environmental Inspectors expressed frustration with the level of support they receive while in the field.

One Environmental Inspector, when asked “Do you feel supported?” responded:

“Some days more than others, sometimes as an environmental person you feel like you are on your own out there, everyone that supports you and your goals is back at the office. A lot of the Construction Inspectors are like, environment “schmirement”, you get the occasional person who is on your side...” EI-28(2014)

The Environmental Inspector positions were new to everyone at Manitoba Hydro, as were most of the people that were hired for the positions. Identified in the interviews was a gradient of contact with the Winnipeg office depending on the Environmental Inspector involved. An important consideration at this point is there may be a large amount of questions and need in the beginning for some people more than others. To clarify, the question was asked if support was needed to clarify roles and responsibility as learning took place in the new positions or if general feedback was needed for Environmental Inspectors. The response was:

“I think it is both, I mean it would have been really good to have this year, I mean; the TLCC SEAO says use your best judgment. I have a judgment, but is it hydro's judgment? Do I align completely with the company's core values if you want to put it that way, we could be a little bit off. I mean I am a tree hugger and if I could save that forest I would and to say use your best judgment on certain things it's always going to default towards that mentality. I just need those few key examples, yes or no? If I didn't do it right, then what could I have done better? Ok, then that sets precedence for the next time.” EI-29(2014)

It was evident in the interviews that the Environmental Inspectors understood that their direct supervisor, the TLCC SEAO, has an extremely busy workload and found it challenging to respond to their needs as fast as the TLCC SEAO would have wanted to. They were also aware of a position that was created to help elevate or assist in their workload, but at the time it hadn't been filled.

This statement was in response to a question regarding support and what would be needed to help the some of the more inexperienced staff:

“Well I think better support from the TLCC SEAO with regards to issues that are brought to their attention, and I don't know all of the factors or reasons as to why the TLCC SEAO does or does not, is or isn't able to respond to them in a timely fashion. You know the TLCC SEAO's position doesn't just cover the sections that I am working on they can cover the whole entire thing, and there are issues that are ongoing in other sections which we haven't even started working in”. EI-30(2015)

Environmental Inspectors also identify the timeline of request for support or advice as a big challenge. Most Environmental Inspectors start early in the day, 6:30-7:00 am and they travel to the trailer or worksite and then work an average 10-12 hour day. In many of the locations, cell coverage isn't reliable and making calls back to the Winnipeg office can be logistically challenging. On average someone working in the office would only be there eight hours per day in a range between 7:30-5:00, Monday-Friday, whereas on a construction site the work does not stop over the weekend. Onsite there also may be issues that take inspectors right out on the line away from the office trailer early in the morning. With busy schedules it is also difficult to get in touch with someone in the Winnipeg office to get difficult questions answered.

“[...] If you need an answer right away, pick up the phone and call them, but the TLCC SEAO is busy and you feel bad, or the TLCC SEAO is working and you aren't, the TLCC SEAO isn't getting home at 9:00 at night, you are but that is when you are able to make the phone call, or early in the morning, at 7, the TLCC SEAO isn't even in the office yet, so when do you make that time to make that important call? EI-31(2014)

Phone calls to the office may work but difficult to time, and if the response is complicated that information may be lost. E-mail may be a good solution but can be lost in the massive amounts of incoming mail, so it isn't a dependable method either.

One Environmental Inspector described their frustration with communication difficulties and that sometimes they can feel like they aren't being supported:

"Maybe I have to change my form of communication, like when I am in the field and busy, just firing off an email to the TLCC SEAO is the quickest and easiest way for me to do it because I don't know what they are doing and I don't want to bug them and I feel if I send an e-mail it will give them time in the next 24 hours to respond and then sometimes I don't hear anything. The TLCC SEAO says, if it is an issue then you have to call me, yeah ok but I want the written response as well. Sometimes it is what I need, instead of me trying to write it out after a phone call, plus they can spell it out much more concisely, that way I can read it back and be sure that I have it right and I can pass it along to the people that have the same question." EI-32(2015)

This same Environmental Inspector suggested scheduled communications to resolve this difficulty in connecting:

"It is trying to find a happy medium of communication, which is why I think that if you have that regular time set up, to have your meetings if you can't all be together. Even if they were individual meetings, ok I will call you every second Wednesday at 7pm and you make your calendar work around that, do what you can. There needs to be a pre-set up scheduled time, and if you need to, you reschedule it to be sure it happens, even if it is a 2min conversation and everything is good, ok great to hear!." EI-33(2014)

As a number of Environmental Inspectors noted, the TLCC SEAO has a large workload and a number of issues in the office that demand attention. This makes it difficult, if not impossible at times, for the TLCC SEAO to make it out to the field for a site visit. The Environmental Inspectors expressed the desire to have office staff out from the Environmental Management team out so that they can discuss the work that they are doing and get clarification on the interpretation of the CEnvPP.

Doing so will help to open the lines of communication and the inspectors will feel as though they have support, as one Environmental Inspector explained:

“Regular communications and discussions both in the office and in the field on environmental practices should occur as much as is practical as it provides a forum to explain the rationale for decisions and an opportunity for others to provide feedback and make suggestions on how to improve.” EI-34(2016)

There were a couple of opportunities during construction in which LEA SEAO and the Environmental Protection Officer, both separately and together, were able to make site visits to several sections. The purpose of the visits were to give us more opportunity to see the work that was being done and get a better understanding of the challenges that construction crews and the EI face. As authors of the CEnvPPs this meant fielding some of the frustrations and, at times, taking intense criticism. It provided an opportunity for face to face discussion on how the documents were made and to explain mitigation measures, which in the end was received with appreciation.

When I commented that often there is the perception that by being one of the authors of the CEnvPPs, the LEA SEAO is the sole source of the challenging mitigation measures that have to be implemented, the response from the Environmental Inspector was:

“Not the source, but... having the LEA SEAO in the truck today gives me a lot more respect and a lot more appreciation for the decisions they have to make and how they have gone about making those decisions. And there is no need and no, you don't get any value in point out things that aren't going well, not to the LEA SEAO anyways I am sure he is well aware of them, and if there was an easy way to fix them, he would. At least having the LEA SEAO in the truck today can give me a better understanding and take some of the bitterness out of some of the issues that I get frustrated with and hopefully he will have a better understanding of some of the challenges that we are facing out here and a little more accepting and appreciative of us having to alter certain methods and processes to accommodate all of us, not just LEA department, which comes into that common goal in my opinion.” EI-35(2015)

4.3.5.2 Suggested Solutions to improving Support

During the interview with the TLCC SEAO, the comment was made that it seems as though the TLCC SEAO has so much on the go that communication was a challenge. The TLCC SEAO agreed and said that there is something extra with every single day of the week. The TLCC SEAO mentions wanting to have the Environmental Inspectors become more technically oriented in their ability to resolve some of the issues that arise. Doing so will reduce the need for the TLCC SEAO to act as a go between. The TLCC SEAO also wants to encourage the development of contacts and connections with the regional provincial Conservation Officers so that issues can be resolved without the need for the TLCC SEAO to get involved. Another solution identified early on was a position to help the TLCC SEAO deal with some of the smaller issues. This need for an additional staff member was identified early in the project and a position was created but not filled until recently in 2016. When asked about it, the TLCC SEAO provided a perspective on it:

“The position was always there, the way I wanted this to be was, there is me the section head and I have got Env inspectors and I have that buffer in between me and the day to day nitpicky stuff that the guys need a little bit of guidance they can provide on, but when it comes to the bigger issue stuff, of course it comes back to me, but the day to day kind of direction here and direction there, that position would be able to do that but that position would also be able to do things like review of CEnvPP going through, if there was a big red flag bring an issue or things to discuss bring that to me and have a discussion. But having that person with enough knowledge and understanding to be able to pull all of that out is what was needed” (TLCC SEAO)

The Environmental Inspectors knew that another position had been created to work with the TLCC SEAO. There was speculation on what the position would be like and how it would be beneficial for communication between the office and the field. They envisioned this person would travel among projects and between sections, making evaluations, potentially sharing and improving processes and communicating them to the people working in the field. They saw the

position had the potential to improve how things could be done by sharing ideas and information.

“Yeah and I heard that it is supposed to be a 70/30 split, in office more but still be out in the field for a week or week and a half and be travelling to each section and then a month later do it again.”...“Travelling from section to section you can see what is being done differently and what is not, what is working what isn’t and that can be communicated back to the TLCC SEAO and let them know, this is what they are doing and this is what I think is working best, should we convey this to everyone else? Yes/No?” (EI-36(2014))

“The TLCC SEAO has a lot to do, and the additional position that was created to help them, someone that if the TLCC SEAO can't get to the field, can get to the field on their behalf at least, and be their eyes and ears. Someone to go through the reports and bring things to their attention, and filtering that information for them and say hey I think you should take a look at this.” EI-37(2014)

4.3.6 Environmental Protection Information Management System

For a project the size of Bipole III there is a large volume of information that needs to be stored in a central location that can be easily accessed and exchanged among a number of project personnel. Considering the communication and documentation challenges of the project, a system was developed that was intended to facilitate timely exchange of updated information among a network of people. The Environmental Protection Information Management System (EPIMS) is an internal SharePoint based site that is created as a common location for the exchange and storage of project information. Each major project that the LEA department is involved in has a dedicated location in EPIMS which Manitoba Hydro personnel or consultants working on the project can access through user permissions.

Environmental Inspectors can submit daily and weekly reports and photos, work permits, plans, GPS tracks, new environmentally sensitive sites etc. Contractor information is loaded into the

database as well such as weekly progress meetings, contractor reports, and annual construction reports. Consultants submit work plans, book field work and helicopter bookings and load biophysical, socio-economic and heritage monitoring reports into the EPIMS database as well. LEA also loads in all final Environmental Protection Plans that have been approved by the regulator so that they can be accessed by project personnel for reference or download. The latest copies are stored in EPIMS along with a version history as documents are updated and amended as needed or annually at the start of a new construction season. During the construction season, new documents or amendments to existing documents are provided through notifications, communicated to staff through EPIMS via an e-mail notification.

There is an online mapping component to EPIMS similar to Google Earth where project infrastructure and Environmentally Sensitive Site information can be reviewed by EPIMS users. Through this application, users have the ability to create new geographical information to provide to others as well as the ability to create their own simple maps that are often used to communicate permit application information to the province. From an AM perspective it has the potential to maintain communication and information sharing between different groups involved in a construction project; however, some hurdles remain for it to reach that potential.

In talking with the LEA SEAO about the introduction of EPIMS, it would seem there was more interest and acceptance of the system initially. Users were willing to put some effort into figuring it out and using it in the beginning, but over time people lost interest as they experienced technical problems, connection issues etc and it was hard for people to maintain that enthusiasm and work through the issues. There were limitations to what was technically possible with the functionality of EPIMS and while solving some of the problems, headaches and LEA lost people

because it didn't look like LEA were doing enough about it. The LEA SEAO agreed but points out that people are still using it; *"Yeah, I think that all of those bugs have gotten worked out or they come to realize that this is the best it is going to get and they started using it, because they are inputting reports"* (LEA SEAO). Many of the Environmental Inspectors interviewed have mixed feelings about the system. They see the utility it offers but still find it very time consuming and connection issues in remote locations coupled with low network speeds seem to exacerbate their aggravation. Many of them are only utilizing it to load their obligatory reports and nothing else.

4.3.6.1 Daily Report Writing

Of the information that feeds into EPIMS, Daily Reports were created as a means for the Environmental Inspectors to provide information on the important activities of the day and any notable events. They were a means to document contractor infractions related to Environmental Protection. EPIMS utilized electronic InfoPath forms to enter information about who were working, what the work was and any other notable information. Mitigation Categories were used to characterize the information that was found in the free form text description of events. This allowed the information to be easily recalled in a database form. This information was intended to be Dash-boarded where it could be examined in an attempt to discover trends in the information that could then be used to make decisions. The hope was that it could be used as a tool for evaluating a contractor's environmental performance. When an Environmental Inspector found a particularly egregious infraction they could complete a Compliance Form that provided more details about what occurred and what was understood to be the cause at the time. The form was also assigned a date for follow-up to see if the situation or site had been addressed or remedied for final documentation.

There were a number of technical challenges with the implementation of EPIMS, combined with being in a remote location with poor internet connection tested users patience and resolve.

There were instances of difficulty logging in that required a technical solution, as well as confusion in some cases where people experienced frustration in understanding how to navigate through the site and find things they were looking for.

“One I didn't appreciate was they updated it (EPIMS) and you needed Silverlight to view it, it's just a 5 min fix, ok well I am out here I am not in the Taylor Office, I am only here before and after office hours and they require me to be on the phone with them to talk about why I need it and manager approval, why it is a requirement for the job etc (trouble with IT). It took about 3 weeks to get it installed, after that I didn't really want to use it anymore, a bit jaded at that point. I was a good user of it, then we had the update that could have waited for summertime and after that, same thing, everything changed, that was kind of the straw, many people gave up.”EI-38(2015)

Loading environmental monitoring and inspector photos was time consuming, as photos were often numerous and had to be categorized with metadata and filed with a proper naming convention. Internet connection speed would also make the task onerous, especially when many people chose to do a mass upload of photos. As described by one Environmental Inspector: *“I know last year I uploaded all of my pictures, I must have had more free time last year than I did this year because I don't have any loaded, it is a week long process.” EI-39(2015)*

As part of their responsibilities Environmental Inspectors were required to fill out the daily inspection forms, as well as load any pictures they had taken, work permits issued, contractor-developed plans and compliance forms. The daily reports were intended to document and demonstrate to the regulator that Manitoba Hydro was practising due diligence with daily events, good or bad, being recorded. The daily reporting (with a week or more grace initially to have them loaded) was also to serve as a means of communication so office staff could have an

understanding of what was taking place in the field at the various construction sections.

Originally there was an approval process in place where they would be submitted and their supervisor would read and approve them to be logged in the system (approved that no additional clarity or info was needed). With multiple construction sections working at once, the potential was there for eight or more daily reports to come in for approval, which quickly proved to be too time consuming and the approval process fell behind and eventually was stopped. While the daily reports were being read intermittently by TLCC and LEA, feedback from those reviews wasn't done consistently, which may have affected the level of effort into the entries. The Environmental Inspectors commented that they would have appreciated more feedback in the first year of construction on the level of effort required to fill out the daily reports, which would vary the amount of detail that went into them. This scenario created frustration and generated questions about why the time consuming process was necessary at all. This came up often and became a bone of contention:

"Kris, I have gone onto EPIMS and every report that I have submitted according to the version and access history nobody has even looked at, nobody has even accessed my report since it has been submitted, which is not to say "who the hell is reading them" but who the hell is reading them?, and if you aren't reading them in real time or at least in a time efficient manner in relation to when the observation was made, it's lost, who the hell is going to care nine months later, you know that there was ruts here, you know what I mean, like. Or there was a release of sediment impacted water into this tributary right? Well it was in the notes, nobody picked up on it?" EI-40(2015)

With the review and approval process stopped, that shifted the use of daily reports from a means of communication to that of a simple reporting and documentation purpose for audits or contractor disputes which compounded the Environmental Inspectors' frustration:

"I get so frustrated, it is one of those things I have been told to do, so I do it. Sometimes I feel that it is useless because nobody is actually reading the dailies. The TLCC SEAO says "if

it is important you should call me”, Sometimes I just want the TLCC SEAO to read the daily because it is all there and I don't have to go over it twice! so it is hard.” EI-41(2015)

The opinion has also been expressed by more than one Environmental Inspector that the daily reporting was redundant and a duplication of effort with the Construction Inspectors who are also on site filling out daily construction reports.

“I don't see the need for me to spend the 30-45min at the end of the day filling out. Realistically at minimum it takes 30-45min to properly populate that form, upload the photos in a format that is conducive right, like. [...] “Because the contractor is filling out his own form, and I will include that documentation attached to my form, that is a good hour and hour and a half a day is dedicated to reporting, which I have no problem doing when it is warranted, because not only that the construction inspectors from this section are very good at documenting their own environmental issues within their own daily reports, and really we are duplicating that information, is there not a better way for us to mine that data, acquire that information, we are all the same company, you know, everything is getting uploaded to a shared drive somewhere.” EI-42(2015)

Although the daily reporting remains a contentious issue with some people, others found utility in some of the other capabilities of EPIMS. EI-43(2014) had said that the second year they used EPIMS they had a better understanding of what they could use it for and over the winter had more time to explore and learn how to use it including understanding the utility of making maps.

At the time (2014) the Environmental Inspector suggested the value of another training session and mentioned that:

“At the time EPIMS was underutilized or people weren’t aware of it or comfortable with it. Once back at the office in the off season, we could have time to explore and also have an appreciation for its utility.” EI-44(2014)

The issue of awareness and understanding of EPIMS was identified in a recent audit of the Lake Winnipeg East Project. The Lake Winnipeg East Project had started its first construction season in 2015 and also had its project information housed in EPIMS. The LEA SEAO had commented that all of the Construction Supervisors were new to EPIMS and a briefing wasn’t done with them, so they didn’t even know it existed or what was in it. Some knew they had passwords and accounts but did not know how to access EPIMS. There is recognition that improvements have been made in how EPIMS is used:

“We had tried to a certain extent to be adaptive with EPIMS, we tried to hold meetings and make changes where we could. Are we still trying? Could we do more? Yes. Is it just one of those things that just take so much time that we have other things on our plate and is that the best use of our time, like you say uptake we should always try and nurture.” (LEA SEAO)

The Environmental Inspectors said that the benefit they saw with EPIMS was as a useful tool for the storage and availability of data and project documentation:

“That’s the thing, it is very organized, things are where they are supposed to be, because it is organized that way, it’s not like someone made a folder and then put it in a subfolder and named it something else and didn’t attach a date, so we don’t know which one is the newest one. With EPIMS, it is all there.” EI-45(2015)

“EPIMS can occasionally be very frustrating but is still generally working well and serving its intended goal of being an organized central repository of up to date project information. Some additional protocols or general guidelines for completing reports would be beneficial to help standardize the way that information is being entered.” EI-46(2016)

While challenged by the use of EPIMS internally for its ability to foster communication, it has seen unanticipated success in other areas. It has been a functioning asset for document storage and dissemination as well as successful use on the contract consultant's side. From LEA's perspective, what was originally a side benefit of having consultants access EPIMS turned out to be very productive. Consultants can consume information from daily reports as well as other entered project information which kept them better informed. It also allowed for better communication between LEA and the consultants involved in the environmental monitoring programs:

EPIMS has been a big boon for the consultant side of things, as for the consultants, central, organization, submission, that has been huge, saving us tons of time and effort in just managing fieldwork, schedules and helicopter bookings and getting field reports, knowing and getting all of the data submitted. EPIMS is not just the front end, EPIMS is also all the data on the back end, all the organization there, that has been huge time saver for us. (LEA SEAO)

4.3.7 Use of Construction Environmental Protection Plans (CEnvPPs)

Construction Environmental Protection Plans (CEnvPPs) are LEA's mechanism of communication to the Environmental Protection Implementation Team (Figure 2) working on a particular project as to what the environmental considerations are for a project. Environmental Inspectors, Construction Inspectors and Contractors are all provided hard copies and electronic copies of these documents when the tender for work goes out. The format and delivery of this information has gone through much iteration in hopes to optimize the effectiveness and use of this communication method. Amendments to the information are made when issues arise with

accuracy or new information is discovered and provided from the field. For example, an amendment would be made if a culturally significant site requiring protection from disruption was discovered on site and not identified during map development. Recommendation for improvements to the layout and information provided is often discussed on an ad hoc basis or a call is put out to users for any issues or recommendations that need to be evaluated.

Often the use of the CEnvPP as an effective tool for communication comes into question because it can be difficult to determine how much they are utilized in the field. Since it is LEA's main method of communication the department is interested in how useful they are and how they can be improved. Questions were asked to try to gather more information in this respect:

When asked (in the first year of construction) how often you see people using the CEnvPPs, one Environmental Inspector replied:

"More than I thought they would be, yeah, the main supervisors on the contractors' crew usually had one, and a handful of people on the CAT would have one, which at times was the downfall, because they would be using the mapbooks and not the GPS. Sometimes it was helpful because they could see ahead and pick a better route, knowing that only half of the ROW was permafrost instead of thinking it was straight across. That is one problem with the CEnvPP, a point indicates a point on centerline, but in reality ESS feature cuts across at an angle, and you are into your buffer before you realize it, this makes flagging your buffers difficult. As the EI, you can't always be there right away, so you tell them to stop 20m ahead but they may already be into the buffer because true centerline is a bit off to the left of their GPS centerline. When on the site, you can see the tree line and interpret the permafrost. EI- they think in terms of 90 degrees. EI- I made a list of the little things that can make things easier in the CEnvPP," EI-47(2014)

A number of variables and circumstances may affect CEnvPP usage, such as project timeline or particular personnel. From the information LEA has gathered it would seem that utilization is a problem. To help resolve this LEA needs to identify where the product can be improved, because how "User-Friendly" it is may be part of the problem. When participants were asked "What

aspects would like to see or what suggestions do you have to help us improve it?” more

comments were collected on the CEnvPPs:

“I think it was pretty good, the only thing is Contractors don't read it, and then half the problem is we coddle them too much when they can't meet the requirements” EI-49(2015)

“The CEnvPPs need more information, because for the clearing areas, it doesn't show clearing processes, like in certain areas and different clearing types and how they are cleared, like a birds eye diagram so that is agreed how it is cleared. Methods or diagrams on how to fulfill mitigation, instead of reading about it, show a picture, prevent meetings and confusion and frustration on the worksite” EI-50(2015)

“In some cases the mitigation measures are not clearly defined in the EPP. Black and white direction is not usually possible as often site characteristics and constraints need to be assessed prior to a decision being made on best way to proceed with operations with best efforts to meet occasionally conflicting contract specifications and the intent of mitigation measure requirements.” EI-51(2016)

“Further refinement of recommended and discouraged practices (Do's & Don'ts) through regular ongoing discussion on operational implementation is important to maintain consistency and to minimize issues recurring or being magnified over time.” EI-52(2016)

4.3.8 Opportunities for Feedback

Communication in Adaptive Management is crucial and in the major stages of AM, feedback is needed the most. It is at this stage where findings are reported and recommendations for adjustment are made. In speaking with both the Environmental Management and Implementation teams it is clear that feedback is recognized as being important but more effort is required from all of the people involved to make sure that learning takes place. What often came up in the interviews was that more discussion needs to take place involving the CEnvPPs. Improvements were needed in how documents are reviewed between groups, the content they ultimately provide and the importance of agreeing on what wording is to be used in mitigation measures.

The mitigation measures are written into a CEnvPP well before the project starts and are based on current best practices to suit certain conditions, situations and applications. Changes to the wording of a mitigation measure or the need for additional stipulations may be necessary when a new and or unforeseen circumstance dictates an update. Changes can take place, provided they respect the intent of the original mitigation and do not violate the project's licence conditions. This would constitute the "Adjust" stage of the AM cycle (Figure 4). Some Environmental Inspectors consider a certain amount of latitude to be an important part of implementation, while maintaining the intent of mitigation:

"Yeah, and realistically speaking from my perspective being in the field, what AM is for me, for example looking at the CEnvPP there are broad general mitigation measures that could be applied depending on the situation, assess the ESS that has been identified or not identified in the book and you apply the mitigation strategies that are available to you, now should those mitigation strategies need to be revised to be more applicable to the specific situation, that is where in my opinion I am using AM almost on a daily basis or on an issue basis, by utilizing the CEnvPP documents that have been developed for that purpose to help the assessment to determine whether or not additional mitigation, alternate mitigation or even the mitigation itself is even required." EI-53(2015)

Environmental Inspectors must make judgments as to what general or specific mitigation measures are necessary in any given situation. They do not have the latitude to change mitigation without communicating just cause and approval but this statement does identify the need for a feedback mechanism. The interviews did show that there is a feedback mechanism, one of which came in the form of annual "End of Season Reviews" which the TLCC SEAO asks each Environmental Inspector to complete. A template was given which provided suggested topics such as: CEnvPP, Spill Reports, Safety, Resources, Interactions with others, EPIMS, Mapbooks and Access Management Plan. Each section had additional questions probing for more detail or thought. Those reports were then summarized, merged and submitted back for everyone to read.

The group then met to discuss the issues and make plans on how to improve things for next year.

This activity is an excellent feedback mechanism but the AM loop doesn't close completely back to the "Planning" stage where adjustment is needed. The TLCC SEAO has said that mitigation measures are usually discussed but for resolution to take place the TLCC SEAO needs that information to be communicated back to LEA so conversations can take place. In their words "close the loop" which is something that hasn't been consistently happening:

"Yeah, we are looking at it like, pure mitigation measures perspective right, so looking at the end of the season reports, what worked what didn't work and what could be changed and that kind of thing and I think it is great but the only problem is we don't do a follow up loop on all of that in terms of sitting down and then going ok, this measure needs to get taken out because it's not working, and I think that is the piece that we are missing in this process. Its great I get the guys to do the end of season reports and they get filtered over to you guys to be used for the annual report, but we miss that step of getting everyone together and saying ok, mitigation A,B,C, throw those out these are the problems and why they aren't working so let's re-jig them or they aren't relevant to what we are doing so let's just take them out all together, so that is the only step that is missing in that whole process." (TLCC SEAO)

The TLCC SEAOs mention the need to have a process for this. At the end of the season hold annual meetings to go over the CEnvPP as a large group in one room and come to a resolution on what the mitigation should be and how it should be worded. The opinion expressed was that an annual basis would not be sufficient and that communication should happen as needed to make that feedback more effective:

"[...]to make it better now would be to give the Environmental Inspector the ability to communicate either to you guys (LEA) or the people that have been instrumental in generating the CEnvPP information, just so we can have a better understanding of the intent or maybe our ability to be flexible with some of the mitigation measures with not knowing the reasons why they were included, the limitations of those mitigations, it is very difficult for us to make a field call. The way that it is structured right now there isn't a feasible way to be able to communicate in real time, to be able to accommodate everyone's input or even maybe providing a decent set of guidelines or flow through chart

the ability to navigate and help us to identify more clearly when we are able to make the call and when we are not.” EI-54(2015)

4.3.9 Departmental Communication

4.3.9.1 TLCC and LEA open lines of Communication

Licensing and Environmental Assessment (LEA) manages the annual Biophysical monitoring for the BPIII. LEA hires consultants to do assessments annually after each construction season. They produce a report identifying the work that was done and if there were any instances where the mitigation measures were not observed or any issues needing to be addressed. There was one particular instance where a consultant had gone out and assessed all water crossings and found a number of notable issues and submitted a report. As a result the TLCC SEAO had an issue with the accuracy of that report and disputed the assessment. The senior consultant went out to tour the sites from the ground (original assessments were made from a helicopter). The trip involved LEAs Environmental Protection Officer, the consultant and the Environmental Inspector responsible for that section. From the ground survey it was evident that many of the sites were actually done rather well, and only a few of the sites originally flagged were of any concern. In another example, a water crossing that had been flagged as not having retained a buffer of understory vegetation and the consultant had documented it as such in his field report. The TLCC SEAO disputed this claim and demonstrated that along the river large trees existed with a tight canopy and a dark forest floor. As a result there was no vegetation of any size to retain (shrubs etc). The TLCC SEAO cites these as examples where the two departments do not share information often enough and there is a need to be more open. The TLCC SEAO points out the benefit to the

consultant and Manitoba Hydro to have that discussion ahead of writing a report so the construction department can provide that context. A solution that the TLCC SEAO suggested was that, going forward, construction personnel should be open to discussing any flagged infractions ahead of time with the consultant or LEA.

In May 2015 a large “Post Season Bipole III Environmental Protection Workshop” took place between SD (formerly Manitoba Conservation and Water Stewardship) and Manitoba Hydro. One of the products of that meeting was that department managers recognized the need to improve communication between the TLCC and LEA departments. To accomplish this, biweekly meetings were established with the department managers, the TLCC section head, the LEA SEAO and the TLCC SEAO as well as an Environmental Protection Officer. These scheduled meetings identified outstanding issues that needed to be discussed as well as future initiatives; products were established timelines and action items. The status of each action item from the meetings was tracked, which was considered to be very beneficial because it “forced the opening lines of communication” (LEA SEAO). Subsequently a new Environmental Specialist position was established to assist the TLCC SEAO in their work responsibilities. Both the LEA SEAO and the TLCC SEAO found that the meetings were worthwhile and valuable to foster communication.

In discussions with the TLCC SEAO, it was suggested that the additional position of TLCC Environmental Specialist would allow the TLCC SEAO to delegate some of their workload by moving from being the technical expert on issues and free up some of their time. By having this position to delegate work and to establish someone to act as an intermediary, as well as handling some of the smaller issues would assist in clearing some of the backlog. The TLCC SEAO intends on having the Environmental Protection Officer from LEA work with the Environmental Specialist

and participate in the biweekly TLCC/LEA meetings, the two could continue discussions and continuously resolve some of the smaller time consuming issues; leaving more time for the LEA and TLCC SEAOs to handle major items and issues (TLCC SEAO).

4.3.9.2 Solutions to Improving Inter-departmental Communication

As part of the LEA department's strategic planning for the corporation, there is recognition to improve communication between the two departments (TLCC and LEA). LEA believes that the paper mediums used to communicate environmental protection measures (the CEnvPPs) aren't getting the desired result because not everyone reads them. As with most documentation, there are varying degrees of uptake or interest in the information depending on the position, perspective or the individual. One Environmental Inspector indicated their frustration in the following statement:

"Nobody reads the documents outside of the people who really need to be reading them, or they rely on people tell them what they need to know. Or you get people asking the EI questions, and they would say, it's in the CEnvPP!! Don't you read it? (Construction inspectors) or why do we have to do that? "It's in the CEnvPP" EI-55(2015)

The goal of this communication strategy is to effectively communicate the reasons behind the documentation to the contractors and Manitoba Hydro staff. This involves helping to ensure they understand the requirements placed on Manitoba Hydro by the regulator and the reasoning and importance behind the mitigation and supporting material. Wanting to try a new approach to actually get in front of that audience to deliver the information supporting the documentation the LEA SEAO commented:

"Licensing writes these CEnvPPs, we can write it in as plain language as we can, but the authors of the plan need to articulate them to the contractor and to the construction

supervisors, need to explain each part, what it does and why it is there, you can't rely on a third party that really has no idea how it was created, to explain it do people." (LEA SEAO)

This is a concept that has shown to be effective. LEA has done this successfully with cultural and heritage awareness training in a workshop format for contractors before work starts. Contractors have a better appreciation and understanding when that format is used and heritage specialists are there to answer questions. You get solid discussion and you have specialist consultants in place, who facilitate that learning process.

Another issue that has been identified through this strategic planning process is the need to target the right audience with the environmental protection information and tailoring it to the different users. The LEA department is considering a method that uses a bottom up approach, targeting the needs of the people in the field first and working your way up. Often documents are produced with both the public and the regulators in mind but when that knowledge gets down to the end user, LEA may have missed the mark with some of its audience. First to understand the Environmental Inspectors' needs, a structured and targeted process would be used in which members of LEA meet with the Environmental Inspectors in the field. Through discussing the EPP program with them and find out what their information needs are for a document to help them do their job more effectively. Secondly LEA would then talk to Construction Supervisors and so on up the chain to ensure the authors understand what everyone's needs are so that they are adequately served. This would prevent providing documents to them that deliver extraneous information or providing it to them in a format that they aren't finding very useful. This initiative could be considered doing a better job of the planning stage of AM. This approach would also have the added benefit of building relationships and as a result strengthening the opportunities for feedback.

Past experiences have led to a relationship developing between LEA and TLCC where LEA has begun to take on a negative connotation. In some cases the only experience TLCC staff have had with LEA has been when something has gone wrong during construction and more information is required to ameliorate the situation (LEA SEAO). In those instances LEA will become involved and will advise everyone of the license conditions or agreements in place that have to be abided by and may liaison with the regulator for a resolution. In talking with the LEA SEAO, he describes the proposed strategy to foster a trusting, healthier working relationship:

“We need to be approaching construction supervisors on their own turf, we don't need to sit them all in a room and preach to them as that won't work. We need to go and sit in their trucks and in their construction trailer and explain things to them. We have kind of done that in an ad hoc basis, I've done a road trip, you've done a road trip and we have answered ad hoc questions. They could know what the bigger picture is, so that when they say to themselves “what is this all about?” at least they have some prior knowledge about it. And that way LEA isn't a faceless entity, you have met us and you can contact us if you need clarification about the documents.”(LEA SEAO)

Environmental Inspectors understand that LEA, being the authors of the Environmental Protection Plans, can help them and support them in the interpretation and defense of the mitigation measures. Difficulties can arise when the wording of mitigation measures needs to be interpreted and defended as described by one Environmental Inspector:

“[...] typically some of the areas, because the words aren't rigid and the matrix hasn't been established to define what the parameters of the mitigation is. That we have an inability in the field, listen that is not the intent of the wording, the intent is this... and what you are doing is not the intent, you are meeting the literal sense of the word not the intent, right, so, and that is one of the problems and you have probably found that the environmental industry as a whole is interpretation, if it's not a criteria and it's only a guideline lookout, does that ever open it up to interpretation.” EI-56(2015)

It is evident that the wording of mitigation measures has large implications and that difficulties do arise. This supports the argument for more effort and involvement in the planning stages of

AM. LEA had developed mitigation measures for use in the CEnvPP with an opportunity for TLCC supervisors to read and approve them. However this consultation process was considered an insufficient amount of time for proper vetting of the information. The TLCC SEAO has suggested that there was not enough consultation with the TLCC group ahead of time before the CEnvPPs were authored, with a need to evaluate mitigation measures before they minted into a document:

“And as you are getting ready to write the CEnvPP or whatever, I provide that support back to you in terms of the review saying this works, this doesn't work, let's change this. So we still haven't ironed out all that and I think that is still the one piece that is missing is that, I don't get into the CEnvPP mitigation discussion early enough in some respects and all of the sudden it is a mad dash we need to get this out the door, because it needs to get in. Ok well I haven't had a full time to review it and I don't this is whatever, you know. So now we are stuck with whatever we get, and the process to try and change it is a pain in the ass, because there is no process.” (TLCC SEAO)

The relationship that LEA has with Construction Supervisors, Environmental Inspectors and the rest of TLCC is one that LEA hopes to improve upon by creating more opportunity for engagement. LEA is interested in being more involved right up until the start of construction as well as providing field support afterwards.

One Environmental Inspector describes why they feel it is important to maintain those lines of communication and how mitigation measures should be a part of that discussion:

“Tell you what man, that goes right back to the goal, everyone knows what the goal is and what the plan is, there should be no animosity between departments. Honestly if it is only the relationship that is hindering the process, being able to have department heads that are responsible for that duty, ensuring that they can work together, at that level ensuring the communication is not being misunderstood. The people working under those people need to be able to have a healthy and productive discussion so issues can be resolved and so that you have a better understanding of how that mitigation may have been interpreted, relaxed, revised and altered to accommodate the specific situation, because as you said general mitigation are general and they are not to be applied to every single situation, to be utilized, massaged, they are very fluid with regards to what is going on, to retain that fluidity.” EI-57(2015).

4.3.9.3 Experience of LEA directly involved in the construction of Gas Pipelines

In discussing this topic, the LEA SEAO had pointed out a recent gas project where LEA was directly involved in Environmental Protection, which they consider was a successful as a proof of concept.

On the Northwest Winnipeg Gas Project, LEA had written the Environmental Assessment, the CEnvPP and provided environmental support on site, LEA staff members performed bird sweeps ahead of work as it progressed to scout for the presence of nests. Weekly environmental inspections took place and issues were brought to the attention of the Project Manager as well as attending the weekly progress meetings to represent the environmental interests on the project. It was a relationship that worked well. LEA advised the crews of where they were at risk of infractions and the crews brought potential issues to us to contend with and resolve. Having the LEA licensing group embedded in the construction group worked on the scale of a 100 man daily work force crews and it has shown to be effective. *“The challenge would be how to scale it up to transmission construction.” (LEA SEAO)*

4.3.9.4 Communication and Contract Specification Development

In speaking with the Environmental Inspectors, another area they have identified as needing improved communication is in the writing of contracts. They have indicated some of the issues they find with how the contracts are written and the importance of that tool when enforcing environmental protection measures. The majority of contract issues involve the initial clearing of vegetation. The Environmental Inspectors claim discrepancies between what the CEnvPPs indicates and what the contracts say aren't harmonized and this can complicate enforcement with contractors:

“The contract is the contract and the only legally binding piece of paper that is actually out there is that contract and that is all that the contractor is going to be held to, and luckily we have the savvy in the fact that we have started to slip in the CEnvPP into the contract, now it is an appendices of the contract so we can hold them legally bound to that contract.”[...]” And what am I getting back to again, is the contract, the more that we can get our mitigation measures in line with methodologies and specifications requirements, the less me and you are going to be talking about problems and issues with construction and environmental commitments.” EI-58(2015)

Clearing of Vegetation in Contracts

Many of the Environmental Inspectors had issues with the clearing portion of the CEnvPP. The biggest problem they identified was the term “Low-Disturbance Clearing”, which caused many issues because it is a subjective term which made enforcement troublesome and confusing.

Reference to low disturbance clearing in the EPP should be revised so that terminology is harmonized with the contract. I do not consider any clearing activities with a KG blade to be low disturbance”[...]” “Acceptable clearing methods in boggy areas (outside of the 24m centerline or roadway and tower footprints) where selective low disturbance clearing is required should only include feller buncher, pro mac type or stump grinder type mulching attachments on excavator, and/or hand clearing as these cutting methods have by far the least impact on upper layers of peat as well as the ground vegetation (Labrador tea, etc.). In areas with solid soil conditions large drum mulchers may also be considered acceptable. In future contracts and EPP I feel as though stump heights should be relaxed outside of the

24m centerline or roadway and tower footprints to a minimum of 8 inches (8 inches is used by Line Maintenance in their contracts) as this would allow almost all of the ground vegetation to be retained. Recognition that extra time/effort and low disturbance equipment (this should not include LGP dozers) is required in the most sensitive of ESS should be considered in planning stages so that expectations are clear in the tender process.” EI-59(2016)

Lack of Consistency across sections

Other issues that were problematic for Environmental Inspectors were differences in how contracts were written up between sections. They identify a need for standardization across the project and cite better communication as the solution for that:

“One reason clearing methods varied by Section and contract is that contracts including the clearing quantities that are estimated for each contract are not being all generated using a consistent method. Contracts with similar contract requirements (such as clearing contracts in different BPIII Sections) use a similar template but are being completed by various individuals without much internal discussion/consultation with others doing similar work. The lack of communication in generating these contracts has resulted in a lack of consistency across the project.” EI-60(2016)

“Yeah I was talking to the LEA SEAO and he said that when (one of the Construction Supervisors) was writing up the contracts for (one of the sections) they were constantly going back and forth to figure things out and hashing out details and the LEA SEAO figured that that good information would be passed along to the other contracts (sections) but no, nobody passes anything along, no body passes good information or good ideas and you are left to struggle on your own”. EI-61(2015)

Need to have more environmental aspects written into contracts

Many reasons may exist as to the how and why contract specifications were written the way they were. That in itself is a reason for internal dialogue. Doing so would foster understanding from authors and Environmental Inspectors who could also provide insight or input into the process. The Environmental Inspectors offered suggestions about some of the changes they feel would be beneficial. Two examples were: more stipulations regarding the equipment that could be utilized

to do the work as well as holding the contractor to a communicated clearing plan when performing the work:

"I think we need to write into the spec, what type of equipment should be used A,B,C, not D. You cannot use a shear blade in a riparian area, no, out of the question!!! You have to use hand clearing, hydro-axe or feller buncher,"[...] "Our contractor had to hire a feller buncher, and he knew what he was doing because he had done work in other areas and he was good, if you know you need to use that type of that equipment you either bid on that job or you don't." EI-62 (2015)

[...] "it would help too if the contractor had a clearing plan, you know, they wouldn't always do plans for where they were cutting on a weekly basis, if EI knows what sections they will be cutting in advance, can skip ahead and walk the mile roads walk in and do some flagging. They would say one thing and they were bouncing all over the place, no plan just going to play it by ear is what they wanted to do. Find out the day of cutting" EI-63(2015)

All of the Environmental Inspectors interviewed expressed the opinion that there must be more communication and involvement from various departments to write the contracts. They consider proper representation and discussion to be the solution needed to harmonize and to create mitigation that is achievable and easily enforced:

"Yeah, get everyone together, property, design, construction, all the players because there is so much miscommunication. Yeah get people together and writing contracts together" EI-64(2015)

"I think a lot of this stuff provided in those contract specifications, the LEA SEAO realistically he should have had that and a seat at the table when they were deciding that stuff. Other departments use that process (not the best) but did work effectively, to ensure the contract didn't contradict the CEnvPP, and foster consistency." EI-65(2015)

"Yeah, but that's not your job (to dictate in the CEnvPP what clearing methods need to be used), you know what I mean? that where I think the people that do know that need to sit down with you guys and when you say, this is what we have committed to doing and they say "hey we can't do that" and that would spur on the discussion as to is there an alternate method, then it gets fleshed out then at the end of the day that is what we end up committing to. (to get achievable mitigation measures into the contract) I think it is instrumental that the LEA and TLCC SEAO's are included and are a part and are included in the contract spec review process, and if that means that is an added responsibility onto

their plate, then they need to facilitate that and provide them the resources to be able to do that.” EI-66(2015)

Since the interviews in 2015, there has been a restructuring of upper management that oversees the Bipole III project. As a result there has been a change in the process for contract review. Now there are more people invited to participate and be involved.

4.4 PAST INFLUENCES FOR ENVIRONMENTAL PROTECTION PROGRAM DEVELOPMENT

4.4.1 2009 Shad Valley Evaluation of the EPP

“SHAD (formerly Shad Valley) is a registered Canadian charity that empowers exceptional high school students – at a pivotal point in their education – to recognize their own capabilities and envision their extraordinary potential as tomorrow’s leaders and change makers. Students selected through the rigorous, competitive process for places in the summer program are top performers who are also well-rounded emerging leaders demonstrating initiative, creativity and flair.” <http://www.shad.ca/About.htm>

In August 2009, two Shad Valley Students: Suzie De Luca and Tanya Tran (DeLuca and Tran 2009) produced an Environmental Protection Plan Implementation Evaluation for Manitoba Hydro’s LEA Department. Their evaluation was intended to make recommendations to improve its effectiveness. Their work involved “background research regarding the Wuskwatim to Rail’s Island Transmission and the Riel Reliability Improvement projects completion of an EnvPP checklist, site visits and interviews with Manitoba Hydro employees.” (DeLuca and Tran 2009) This evaluation resulted in recommendations on how to improve effectiveness of CEnvPP implementation. The LEA SEAO took this feedback into consideration and adopted many of the recommendations into the program.

The following is a numbered list of the recommendations they had provided to Manitoba Hydro.

The LEA SEAO was asked a question about each of the recommendations and what actions were taken as a result to improve the effectiveness of EnvPP implementation:

1- “EnvPPs should clearly state how environmental provisions should be implemented”

(pg. IV).

Q- DeLuca and Tran (2009) talk about communicating mitigations measures in a procedural format (page 13, sec 4.2.1) what was the result of this suggestion?

“The CEnvPP, way back in Wuskwatim there was an CEnvPP and an implementation guide that went with it, we shouldn't have two, it was confusing so the whole structure of today's CEnvPP was to eliminate the need for an implementation guide, that is why in our specific mitigation measures we were trying to be more prescriptive of how it was supposed to be done and how they were supposed to achieve it. Instead of stating “protect the wetlands!” well how? Now we state the prescription (Use low ground disturbance equipment in frozen ground conditions)” (LEA SEAO)

2- “Organize EnvPP provisions into a chart for an on-site reference system” (pg. IV).

Q- Do you feel that the general mitigation measures in the CEnvPP satisfied this?

“That was the reason for the General mitigation tables, I think the Shad Valley folks wanted a key or onsite reference system, so when they talked about onsite, and that was kind of one of the motivations for EPIMS, it was kind of a decision tree and kind of an APP, you could have it on your notebook and you could look up mitigation measures, it was onsite that they could get a little bit more detail about CEnvPP provisions. And then that is kind of what has led into doing it by activity and doing it by component concept of grouping things, like when Mel (consultant), who supervised the Shad Valley students as well, drafted those general mitigation tables, he did that, under the direction of us saying hey we want to do this from the (product of the Shad Valley report) and that is how he came up with organizing it by project component and by activity, so it was kind of procedural side of it. Ok while I am doing this task, tell me everything I need to know in this one spot and that is where that whole concept came from. Basically we created duplication amongst categories because different folks thought about things differently and would look for their situation under different categories.” (LEA SEAO)

3- "Utilize training courses or workshops to educate new staff or update existing staff"

(pg. IV).

Q- What examples can you think of where this was done?

"There is the annual safety/environmental meeting before construction start up, is one example.

There is a training manual that was developed to train onsite people about environmental protection, which is now being further developed into an online computer based training course.

Three Environmental Inspectors did presentations to contractors in a pre-work start up meeting and topics included the use of the CEnvPP, Timber Salvage process, and stream crossing procedures.

Cultural and heritage was a big part of the CEnvPP, so those workshops were done annually for each contractor. That was a direct response to the realization that we really have to educate people about cultural awareness and cultural artifacts and what we are going keep an eye out for and how to report it. We decided to use a workshop format for that topic in the CEnvPP. That is kind of what we are hoping to do going forward because we have seen that it works. People have a better appreciation and understanding, people are there to answer questions, you get a lot of back and forth and you have experts in place for that learning process. We have a video created and we have a consultant who is on the project to give these workshops before work starts." (LEA SEAO)

4-"Seminars updating field staff and managers on project changes" (pg. IV).

Q-What do you consider to be in place that satisfies this?

"I know they are doing tailboards, weekly progress meetings with an environmental section addressed there, those things all get reviewed and talked about on a weekly basis. And those meeting minutes flow up into managers, they are provided with them." (LEA SEAO)

5-"Annual conferences convened to provide for an exchange of new environmental protection methods and approaches" (pg. IV).

Q-What examples can you think of? Other than external meetings like moose conference, the ROW management conferences, to a lesser extent Manitoba GIS Users Group (MGUG)

"We never did that, we thought about doing those across the environmental groups, where we get into power supply and talking about similar things, I don't know why we didn't. It is something that we should be doing, by project, like when Keeyask is done and when BPIII is done, what worked, what didn't work or different phases of BPIII, like we probably should have done something after clearing phase. Ok let's just talk about clearing

mitigation for clearing, breaking it down into pieces, instead of waiting until the end of the project.”

“After year one on BPIII we did have that one meeting, we brought the construction supervisors end of season meeting, it was done at the beginning of the second season and everyone is like, “well I kind of don't remember, we should have done this at the end of the season”. We haven't had one of those since, it was a debriefing, what issues did they run into in the field, both environmentally and other challenges, that was in 2014. They may have happened after that but not that I am aware of” (LEA SEAO)

6-“Specialists from each department to be present on site to facilitate mitigation measures and mentor fieldworkers” (pg. IV).

Q- Do you think this happens? I think this is poorly done.

“No, this is poorly done, I don't think we have done a good enough job of training the inspectors, providing support and explaining to them why things are the way they are. The TLCC SEAO and LEA are their only support; we are the only ones that will give them an answer to something when they ask. When you are field staff it is good to have a bunch of people that you can ask, not just one, so you can get from the horse's mouth on some things, not someone's interpretation of things.” (LEA SEAO)

“Essentially the authors of the CEnvPP would be the specialists to provide clarity and support on problems with mitigation. Yes we don't know more than them, as far as how the mitigation could be implemented, they are the ones that watch the tracked machine go up and down, and how it can do and what it can do. Let's just talk about it and make sure it fulfills the intent of what we are trying to protect, because they may not know the entire reason why that stream crossing is being protected, because we can't write the whole reason in the CEnvPP.”(LEA SEAO)

The TLCC SEAO has indicated that they are looking at a new structure where existing seasoned Environmental Inspectors that are on staff now will become permanent support for hired consultants who do the environmental inspections and tour from project to project providing that mentorship. (SEO TLCC)

7-“Establish a website to archive monitoring and inspection reports to enable efficient updates on the project” (pg. IV).

“EPIMS has had technical challenges and issues with implementation (See Sec 4.3.6) but what it has been most successful at is archiving monitoring and inspection reports. Although this function may be underutilized, it is still readily available for consumption. Many of the Environmental Inspectors mention that it is “generally working well and serving its intended goal of being an organized central repository of up to date project information.” (EI-67,2016)

4.5 FORMS OF ADAPTIVE MANAGEMENT EXPERIMENTATION

4.6 Active Adaptive Management

During the interview with the LEA SEAO, the topic of Active vs Passive Adaptive Management (AM) came up, (for more on this conversation see section 2). When asked what barriers, if any, do you see to employing Active AM? The LEA SEAO stated:

“The biggest challenge with Active AM is perhaps cost. To do these experiments, for example, you are doing two different kinds of clearing methods to figure out which one works better, obviously it costs more when you have two different pieces of equipment there when you may have only needed one. Sometimes when you are doing an active management, you are doing it first for the first time so, if you are clearing an ROW for caribou trying to maintain some character there, the operator of the equipment needs to be trained on how to operate that equipment to create the vision that people are trying to achieve and there is a large learning curve for the operator and what trees he should take out and how to cut them, access them to retain the other stuff you want to leave so there is a lot of training, and training takes time, so it is costly to do Active AM” (LEA SEAO)

Active AM has shown to be a much more involved process than other forms of management and for that reason may be less common. However, there were components of Active AM experimentation found in some of the initiatives that LEA’s follow up and monitoring program is working with.

4.6.1 Caribou crossing area mitigation

Woodland caribou (*Rangifer tarandus*) ranges intersected by the BPIII transmission line were identified as sensitive areas requiring a mitigation plan, as noted by Condition #20 of the Bipole III Transmission Project Environment Act License (3055) which states:

“The Licensee shall consult the Wildlife Branch of CWS regarding the design and implementation of mitigation measures for the protection of moose and caribou in known sensitive ranges along the transmission line right-of-way. A mitigation plan for these

ranges shall be submitted to the Director for approval prior to clearing of the transmission right-of-way in known sensitive areas". BPIII 3055 (2013)

Mitigation measures were developed in consultation with the Wildlife Branch to help in the reduction of impacts in the identified sensitive areas. Due to the required complexity in outlining these mitigation measures, Manitoba Hydro produced a separate document called "Moose and Woodland Caribou Sensitive Range Delineation and Mitigation Plans" (The Mitigation Plans and an updated version was produced January 11, 2016.

Sensitive areas for woodland caribou are areas that have been determined through collaring studies to be crossing points between summer and winter habitats. In talking with Licensing and Environmental Assessment Department's Biophysical Analyst, they were able to provide some of the history of the department's caribou monitoring program performed with the aid of GPS collaring data and trail cameras that serve to provide baseline data of movements.

"We have the benefit of pre-project collaring and trail camera data on these caribou. We understand where they tend to move on an annual basis. Woodland caribou don't make large migrations, so we can learn whether the specific clearing or management prescriptions we apply are effective, and whether the caribou continue to use these areas. The study area is within in a big dynamic ecological system, and caribou can be very mobile in responding to various environmental pressures, but we try to understand their movement patterns and apply our best mitigation." (LEA BA)

This information provided locations of high use areas in which mitigation measures of clearing prescriptions could be concentrated, as explained by LEA SEAO:

"So it was intentional that we focused on areas with a high degree of crossing concentration from the telemetry data where we did the prescription, not to say that where we didn't do the prescription they don't cross there, they crossed there too. Just that we focused on the hotspots (intense amount of crossing). Using the collar data we can compare between the hotspot and outside the hotspot to see if crossing frequency changes post construction. If we do the analytics of the collared data and they find out after a couple of years that the animals are still using the hotspots that they used to go then we had some degree of success". (LEA SEAO)

Methods

Two major locations were identified as requiring mitigation for The Wabowden and the Bog Woodland caribou herds. The crossing area identified for the Wabowden herd didn't see intensive use but data did show a statistically higher usage than surrounding areas. As a result, special clearing methods were prescribed in an attempt to minimize line of sight for predators and human hunting pressures. The prescription was to selectively clear danger trees (trees at risk of being in violation of clearance limits with the line). From the edge of the cleared centerline a 40 degree sight line angle was taken towards the outside of the ROW; any tree tops violating that line of sight were too tall to be retained and would be removed. This would leave smaller trees, shrubs and herb plant communities largely intact (Moose and Woodland Caribou Sensitive Range Delineation and Mitigation Plans (Table 1, page 5). The Regional Sustainable Development office approved this method of clearing and the technique was used for the Wabowden crossing. The results were not what Sustainable Development had envisioned. They had expected to see much many more trees retained. There were no extensive surveys of the area ahead of time and many of the trees were too tall to retain, which resulted in less vegetation retention than was expected. (LEA SEAO)

With the results of the technique agreed upon for the Wabowden crossing not meeting the expectations of Sustainable Development, the mitigation technique for clearing caribou areas was re-evaluated. Using the lessons learned from the Wabowden area, mitigation measures and techniques were amended in preparation for clearing the Bog Woodland caribou crossing areas. The areas were flown ahead of time with Lidar which "...stands for Light Detection and Ranging, is

a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth” (oceanservice.noaa.gov). This produced accurate representations of the forest canopy and accurate measures of tree height. With the crossing area mapped, Sustainable Development would be able to see in advance what trees would be retained and what would not. This information was used by the clearing contractor to remove only the trees that were over 10 meters in height (clearance limit for the future line). Areas of forest that had dense tall trees were cleared by low disturbance methods retaining only the organic layer. The areas that had varying tree heights were selectively cleared, again only removing 10m trees. (LEA SEAO). The TLCC SEAO who was involved in the process, commented on the consultation process and the clearing result:

“Working with Manitoba conservation to make sure they are ok with it, so they were really working hand in hand as we did those caribou crossings. And it worked out well, Conservation is really happy with the outcome.” (TLCC SEAO)

Monitoring and Results

Interested in the possibilities that resulted from the different clearing methods, I had asked the LEA BA to comment on what monitoring will take place, to which they responded:

“A lot of the AM or monitoring that we are conducting is not set up as a perfect experiment; we are applying the best available knowledge before the project to minimize our affect on wildlife. It is not like a laboratory where we can clear everything under controlled conditions and can compare and contrast direct response from our project. As a part of project design, we have tried to apply the best protocols we can in important caribou areas. Monitoring will help us, to a certain degree, understand whether our project mitigation was successful, but it’s not a perfect laboratory setting. I am sure we will have some difficulty in determining exactly how successful we were, due to the wide range of factors that influence large ungulates in a natural environment.” [...] “But we have a lot of experts and consultants working collaboratively with provincial wildlife managers. We will be able to share the data and try to figure out if it was effective, and if it was, perhaps it can be applied to other projects in the future, and maybe we can improve some of the ongoing maintenance techniques based on the results from this

work. If the caribou continue to migrate through a certain project area the same way they did before and there was no measurable change then we can say, with some level of comfort that it worked. Other project or maintenance projects can apply the same or similar techniques. So that is kind of your feedback loop. Everybody gets together afterwards to look at the data, evaluate the results, and see what worked and what should be done in the future..” (LEA BA)

Caribou monitoring will continue for three years after the clearing has been completed. Between trail camera activity and the GPS collars there is the ability to analyze movement patterns pre and post transmission line. This information, in combination with other herd population information should help us to determine if there was a preference or change in behavior that has resulted from the different clearing methods. (LEA SEAO)

4.6.2 Comparison of two different clearing methods

Manitoba Hydro intends on pursuing an opportunity for experimentation that presented itself on the BPIII project. There is a portion of the transmission right of way (ROW) in which different contractors with different equipment converged on a corner. One section was cleared with a drum mulcher and the other section was done with a shear blade on a dozer. This is a place where the two types can be reviewed experimentally to see how vegetation re-growth occurs and monitor it on a long term scale. To provide more information about the area the EI who was interviewed had this explanation:

“In the C2 Section the clearing contract was directly negotiated with Treaty 2 First Nations who did not want timber burnt in their area. They joint ventured with Sawridge out of Alberta (where some of the environmental regulations are more stringent) who brought in forestry (sustainable forest management certification requires most of the similar mitigations laid out in the BPIII project EPP) and low disturbance clearing expertise and opted to use mostly large powerful drum mulchers to complete the section. The low disturbance results of using alternative equipment could be seen in various areas of comparison after clearing was complete.” EI-68(2015)

This area came up in a couple of interviews with EIs and many realized the value of exploring this further experimentally:

“Yeah, I like the idea of the mulchers, the whole ROW becomes a sensitive area, you aren't working up all the organics and the large mat of woody debris is going to smother everything but at least the ground is intact. It's almost too bad that they didn't do test sections, 1km sections one half of the ROW mulch, one half with shearblading

KW- Yeah that would be purposeful Active AM Experimentation

“Yes and that is what they do on highways, they pour different type of concrete to test for the best mixture or type.” EI-69 (2015)

This site was brought up in the interview with the LEA SEAO who oversees biophysical monitoring for the project and had visited the site first hand. I had asked them what plans he had to monitor the site, and the response was:

“It has been interesting that we have been able to monitor the results of the re-vegetation. So as far as Active AM, we now task the consultant to measure things differently based on what we saw. Opportunistically, we said “Ok, let's measure this, because it is interesting, and what it will mean for us long term.” Basically it was two different contractors that had showed up with different equipment for two different sections. We will use it to gather some good information, there was a lot of thinking that the mulching is going to produce a great mat to restrict re-vegetation and that may or may not be true. I think based on the annual monitoring report, it appears to be no differences, or no significant differences in diversity or structure between the two, that was a concluding statement in the annual report summary that I read yesterday, I haven't gone to the report to see exactly what area he is talking about (because it was like really? no difference at all?, that was kind of interesting). Everyone had this perception that mulching would be a no man's land of vegetation, but turns out the vegetation pops out of there, no problem, but we will continue to monitor it and see what happens long term.” (LEA SEAO)

4.6.3 Golden-Winged Warbler (GWW) and the Manitoba-Minnesota Transmission Project (MMTP)

The Manitoba-Minnesota Transmission Project (MMTP) is a new international transmission line project that goes through the south east portion of the province into Minnesota. In a portion of the proposed transmission line Environment Canada has identified critical habitat for a threatened species, the Golden-Winged Warbler (*Vermivora chrysoptera*). Desktop reviews and fields surveys confirmed the presence of this species in the project area. In an interview with the Biophysical Analyst from the Licensing and Environmental Assessment department (LEA BA) they provided their perspective about what steps are being taken to mitigate potential effects:

“We spent a lot of time talking to a number of biologists prior to filling the EIS to try and identify how we can minimize impacts to this species. Golden-winged warblers do have federally identified critical habitat and the proposed line does go right through these blocks of critical habitat. We have found golden-winged warblers as part of our pre-project EIS surveys. We found a couple dozen of breeding birds, they are not very populous, but we did find some and they do occur in the project area. So yeah, we consulted experts, read literature and we put together a forest clearing plan for these birds outlined what we are going to do. We submitted the plan to the Province and Environment Canada. They are reviewing the project because it is a federally reviewed project. We identified some mitigation measures that we could apply to minimize the impact to those birds and maybe enhance habitat to a certain degree by applying the best available information we can” (LEA BA).

Mitigation Measures

The mitigation measures for this particular part of the project rely heavily on targeted and specific span by span forest clearing. When clearing a transmission line, Manitoba Hydro must maintain compliance with the North America Electric Reliability Corporation standard FAC-003-1 for Transmission Vegetation Management. Transmission rights-of-way must be developed and maintained to design standards that specify a maximum allowable tree height near the

conductors. When asked what habitat types are needed by the Golden-Winged Warbler, and if forest tree removal would be problematic, LEA BA had this response:

“Well, after our EIS and other pre-project research, we identified the best habitat for GWW required a mixture of shrub, grasslands and mature forest. In golden-winged warbler habitat, we plan to maintain a larger percentage of shrub habitat in the right-of-way. The hope is that it is going to create a preferred mosaic of habitats. Short grassy habitat will be created along the centerline (20m in the center will be grasses), and shrubs will be maintained adjacent to the centerline to the edge of the right of way. We are going to clear the trees in this area with a lot more diligence and care to ensure we create the preferred habitat for GWW. We are taking these added measures because we know we are in critical habitat. It will probably take a little bit more time and more money and probably a little of extra care with our contractors to achieve this preferred outcome. We have a plan dedicated to showing how we are going to do it. The GWW plan was submitted to regulators for review, back last year in 2015.” (LEA BA)

The MMTP GWW plan can be found in the “Response to a Request for Information” (in the public registry of Manitoba). This plan outlines the approach as well as the utilization of “AM” techniques to achieve desired habitat characteristics:

“By utilizing an integrated vegetation management approach, application of standard operating procedures, best practices and the usage of AM techniques, Manitoba Hydro will endeavor to maintain or enhance the critical habitat of the golden-winged warbler within the Project right-of-way (ROW).” (Question # EC/MH-003 April 29, 2016)

Methods

With proposed mitigation measures established questions on the details of how the actual clearing would be carried out were posed to the LEA SEAO had this comment about methods and their objectives:

“The Golden-Winged Warbler (GWW) plan, I believe is an example of an Active AM approach that we are taking on the MMTP project. We will be doing various degrees of clearing and different prescriptions, trying to create as soon as possible, habitat that is suitable for GWW and retain the habitat that is there, while still being able to construct and operate a transmission line. There will be different prescriptions for different habitat

types to try and achieve some of the habitat objectives which are a feathered edge with a variety of vertical diversity in the shrub layers. It will take longer as it's going to be a lot of hand cutting and selective cutting, trying to achieve retention of as much understory along the ROW edge as we can.”(LEA SEAO)

Guidance for clearing prescriptions will be provided to the contractor by a wildlife specialist or specifically trained Environmental Inspectors. On site instructions would be given to the contractors for each forest and habitat type as well as specific instructions within the ROW. For example, the centerline and the tower foot prints have to be cleared completely but vegetation can be left in the remaining areas and at increasing heights as they approach the towers.

Depending on the understory that exists in a particular forest stand the prescription could be influenced, as described by LEA SEAO:

“It will be managed on a span by span basis and then based on what the habitat type is, the prescription may be to mow it to the ground because there is no understory there to protect. By mowing it to the ground we are going to create new understory. In another spot where there is multiple structures, or many level canopies, you would cut the tallest canopy and leave the others. You would basically do an analysis along every span to figure out what you have and what the best prescription is for each span. “(LEA SEAO)

Contracts

To achieve this level of granularity in the clearing prescriptions the traditional method of construction environmental protection plan mapping won't be sufficient. As well these prescriptions require onsite guidance of the contractor as well as new contract structure allowing more flexibility.

“If you didn't manipulate the contracts at all and how we implemented the contracts you would have a very expensive method of clearing for GWW, so the Adaptive part is the fact that we are trying to clear it differently, but we are also adapting how we do it so that we can reduce the cost of that active experiment “[...]”So there is a bunch of different things we are testing, looking at a different model perhaps of even how the contract work is tendered out. So traditionally the contract work is to be paid to clear an area, per hectare, so in that they obviously want to clear as much as to the ground as they can because the

more money they get. So there is not a lot of incentive to leave things standing when they get paid to take things down. So having an hourly based contract with more direct supervision by vegetation managers will hopefully create that habitat to GWW as well as a habitat that is conducive to the operation of the transmission line and hopefully reduction to Integrated Vegetation Management costs due to the retention of understory.”(LEA SEAO)

Monitoring Process

With objectives in place regarding the habitat type that is trying to be achieved through these specific methods of clearing the question posed to the LEA SEAO was how is success determined?

“It will be a trial, comparing areas where we try intensive management vs the areas where we did clear it to the ground because there was no understory and looking at how the birds respond to those two spans. Because the one we cleared to the ground, we are going to manage over a longer term to try and create that habitat. That makes it a longer term experiment; it’s not a short initial clearing and let’s see what happens a year later. We are trying to retain the birds that are there as much as we can but knowing that we are building a transmission line we expect some loss, so we are trying to build a transmission line ROW that will grow into future habitat. We are taking GWW habitat that never was GWW habitat and we are creating it (converting forest into edge habitat) because GWW require very specific environment to be in.” (LEA SEAO)

“One thing that we did that I think was really innovative was we went to the nearby transmission lines and did surveys there which serve as really good proxies, those lines have been in existence for the past 30+ years, they provide what appears to also be decent habitat for GWW, they are utilized by GWW, because they do offset the preferred habitat, we do know that they do breed successfully on ROW of south East Manitoba that are currently within critical habitat squares, so we do know and the regulator does recognize that ROWs, if managed correctly do offer some important habitat for GWW. So we will find out once we start the project, if and when we get approval we will learn about how the birds respond.” LEA SEAO

To monitor for birds and their response to the clearings and the habitat created, bird counts will be performed and those numbers will be compared to numbers found in control spots. By doing so the hope is to measure the response and how effective it was. To us it may look like wonderful habitat for GWW, if it is or isn’t, it may take a while for it to be utilized by the GWW.

4.6.4 Bird Diverter type and placement

While routing of a transmission line is the primary method of avoiding bird habitat, this situation cannot be avoided completely. Large-bodied birds, such as waterfowl, tend to be the most vulnerable to colliding, or striking, transmission lines. These birds are most susceptible near their preferred habitat which includes wetland areas, agricultural fields and other sites that support roosting habitat or food sources. There is also some potential for migrating birds to strike transmission lines, especially during inclement weather (e.g. fog, rain). As mitigation measure against bird strikes, there are several products that transmission corporations can install on the conductors and shield wires to flag or alert the birds. These devices are typically made of plastic and can be clamped on to a wire effectively creating a larger visual warning. Bird diverters do not need to be placed on every span along the entire length of a transmission line, but rather only in potential “hot spots” which support suitable bird habitat or migration corridors. The Licensing and Environmental Assessment department will be experimenting with both the design of bird diverters as well as the placement and spacing on the Bipole III project.

Bird Diverter Design

Bird diverters are products that are available in several different designs, produced of different materials and with different design theories for effectiveness. While the cost per unit of these products may be low (\$8-\$20), costs add up over hundreds of kilometers on a transmission line. Another consideration is product quality and longevity; the product must withstand the elements over many years. The labor cost to change or replace bird diverters is very high on in-service transmission lines. With this consideration, LEA did an evaluation of what was being used and

what research had been done on others to see what the state of the science was. In conversation with the LEA SEAO they had this to say:

“We wanted to be sure that we were using the right tool, so we started to look at what other tools were out there and found other corporations doing a lot of experimentation. Some of the tools we were looking at were the ones they were taking off of the conductors because they weren't working, so that was very good, actually it was a consultant that prescribed that particular brand that was being removed from the wires. So that was good, we did our own investigations otherwise we would have ended up in the same predicament.” [...] “They weren't working, weren't effective, they were breaking, they were a little flag that fluttered in the wind and it wasn't as effective as they thought it was going to be, and a lot of longevity issues. So we started going down the road of bird diverter selection and talking with other utilities, and landed on another bird diverter type so that was part of our AM; to try different bird diverters on the BP1111 project. If they work it may become the new standard.” LEA SEAO

“By working with other utilities, actually knowing what products to apply, so we have a new prescription of bird diverters we are applying, something we have learnt through APLIC, Altalink and other utilities that have shown or demonstrated there are other options to prevent birds from striking. Over the years I think Hydro has learnt and adapted and changed practices with respect to where and what is utilized to avoid bird collisions, and that has probably been very helpful. (LEA SEAO)

Coverage Experimentation

Typically, consultants would do a desktop analysis to locate areas that look like good candidates for bird diverters such as flyways or waterfowl habitat. If required they will conduct an aerial or ground survey to verify the need for mitigation. These areas are then defined as high, medium, or low risk. This was done for Bipole III and the number of span prescribed diverters was higher than what had been seen by previous projects including the Wuskwatim project. Portions of this project run parallel in close proximity to Bipole III).

This prompted a review into the practice:

*“With the consultant’s prescription in mind, we looked at some of the other science and decided that we were going to use a different placement methodology in open areas vs river crossings and we are going to experiment with that to see if there is a difference.”
(LEA SEAO)*

Utilizing the designations of risk, areas of lower risk (such as open areas) will receive an adjusted prescription that requires less bird diverters near the towers where they are not as necessary.

The lower risk areas will see a prescription that has only 60% diverter coverage. River crossings and other sites deemed high risk will receive the full prescription 100% installation of diverters tower to tower. During the interview with the LEA BA, they were asked to further explain the study design:

“So we did an analysis on all the areas that were identified by the consultant as high risk areas. These areas are going to have diverters installed from tower to tower, at 5m spacing, alternating between a spiral design and a flap design at 100% coverage., In these areas we want to maximize wire visibility.” [...]“There were other sites that were identified as having a medium probability or a medium likelihood that there will be a large number of birds using that particular area. So in these areas we are only going to be applying a 60% installation. Literature has shown that most strikes occur within the center of the span. Birds tend to avoid the towers, as they are highly visible. But in the center of the span the birds are more vulnerable to being struck, [...]“The number of required diverters is less. The 20% of the span adjacent to the tower does not need to have diverters applied. This represents a significant cost savings but still allows us to provide valuable bird protection in marginal areas. Those savings can be passed along to other environmental protections or however the budget can be allocated to other products”. (LEA BA)

When asked about the monitoring that will be in place to test the effectiveness of this experimentation, the LEA SEAO had this to say:

“So that is the prescription we are testing out on the last number of projects (BP III, LWESI, and MMTP). Certainly the analysis on the bird wire collisions is part of the monitoring plan, just how it is going to play out is, once the lines are strung up they will probably do a one year survey. They may have to adapt after year 1, year 2 is usually learning and refining and the analysis you conduct will help you refine your study design to ensure that you are getting statistical data for your analysis. The consultants will be

looking at bird collision rates where there are diverters in that locations and those where there isn't (control) to compare and then also comparing to studies as to what is excessive amounts of bird mortalities vs what is expected based on the amount of density of birds, I think they can calculate the number of potential bird collision rates based on density, they have done enough studies that they can determine based on the numbers in the area.”
(LEA SEAO)

The product of this monitoring plan is to not just blindly apply diverters that have been recommended by consultants and other reviewers. Manitoba Hydro is also trying to do a better job of understanding flyways and which water bodies are hotspots and have bird crossing issues. So by spending more time on understanding where birds actually are crossing Manitoba Hydro can be more effective in applying these bird diverters, and knowing where to apply them. (LEA SEAO)

4.7 PASSIVE ADAPTIVE MANAGEMENT

4.7.1 Evolution of the Environmental Inspector Position

The Environmental Inspector (EI) Position reports to the TLCC SEAO and performs field and office duties to ensure that transmission construction and related projects are undertaken in compliance with any Environment Act Licences, permits or approvals and/or environmental protection plans. The EI positions were created for purposes of compliance monitoring of the Bipole III transmission project and that is where they were first introduced and this was new to TLCC. The position was brought about as a result of lessons from previous projects:

“One of the lessons we have learned from the construction of Wuskwatim was that we didn't have enough environmental oversight, which is one of the things that came back from the province and hence the reason the Environmental Inspectors program started in TLCC, because of issues we had with Wuskwatim.” (TLCC SEAO)

The people filling the Environmental Inspector positions brought with them a variety of experience but for many, the experience of working on a transmission project and working for hydro was new to them. The first construction year was short due to a late start and, while challenging, proved to be a productive introduction, as one of the Environmental Inspectors describes the process of feeling things out:

“Not necessarily me but us as inspectors need to know that it is within their realm of responsibility and role. And granted, the people that we have hired in these positions, have two things working against them, 1) they are new to Hydro and 2) being new to the project, so they didn't get a lot of forewarning before last year's activities started, so for them it was a learning on the fly, not only to the project but new to the corporation. So you are trying to navigate all this stuff at the same time and in a remote setting at the same time trying to do a good job and a good worker, you know what I mean? I just got a job I want to be seen as productive and to be able to have enough confidence, to say no, I know this material enough (CEnvPP) and I am replying to you as my position on this right, they didn't have that last year, and just starting to get it this year.” (EI-70,2015)

Since the first Environmental Inspector for Bipole III was hired there has been a number of people cycle through. Some felt it was not for them, others were let go, some found other positions and some remain and have done very well and provide a solid example for upcoming employees that take on the challenging position. The evolution of the position is a good example of Passive Adaptive Management as there have been some changes to roles and responsibilities (what works and what doesn't) and continues to evolve. In speaking with the TLCC SEAO, discussion was about challenges in the past and what hope there is for changes in the future. For the more senior Environmental Inspectors the TLCC SEAO is challenging them to take on more of a resource role for the department and to provide more of the technical expertise.

The TLCC SEAO wants the positions to move in that direction as they aren't always able to afford the time to help think through some of the details:

"We are constantly evolving it right, so there is a constant change and evolution of it, and at first everybody still relies on me from a technical perspective and I am trying very hard to get out of that and pushing it back onto the Environmental Inspectors and saying these are your resource go to people, but I am still finding that I get bogged down into the weeds and the minutia of stuff, that it's like, ok, well if you did it this way this is how you could deal with it, it's like Ok, guys I need you to start thinking a little bit bigger and be the technical expert on stuff, because I don't have time." (TLCC SEAO)

Because these Environmental Inspector positions are term positions, the TLCC SEAO recognizes the value of good, well trained staff and wants to retain these individuals. A concept is favored that would see a further evolution of this position and would see the EIs take on more of a supervisory and audit role which would allow the TLCC SEAO to manage some of their larger responsibilities:

"I can't do it all, I am trying to manage and do all the extra corporate stuff that I need to do for the division and the business unit and I can't go out to site for all of these projects, so there needs to be two or three full time Environmental Inspectors embedded in. And then eventually what that will look like is yeah we may have contractors fulfilling it, but then those MH Environmental Inspectors will be in charge of the contractors and they will be providing that guidance and technical help and they would be overseeing, so I could say to one of our MH Environmental Inspectors, you have two people from AMEC that will be working with you for this section of this project, you are responsible for the environmental protection plan and responsible to be sure they are doing what needs to be done and more of an audit spot check, so that MH Env Inspector goes out to spot check them to make sure everything is being done properly." (TLCC SEAO)

This change to the structure and responsibility would allow for a greater coverage which is beneficial.

In some circumstances Environmental Inspectors have felt stretched on larger sections:

“Increased environmental presence is needed especially during clearing contracts. Covering a section of 200km (sometimes multiple sections) with multiple clearing fronts is not feasible given the various environmental requirements of a project of this magnitude.” (EI-71, 2016)

This proposed format has the potential benefit of better communication and response to issues as well as an audit style reporting structure:

“The change would see their role evolve from going out and being Environmental Inspectors into a kind of audit function. The EI’s now know what is required of them and so they are going out and doing those spot checks right, and then building documentation for what is required for the license because the license is asking for an environmental audit at the end of it all. To be able to say, ‘here is some of the audit stuff, we started that audit process earlier to say that we have to do, this, this and this’. I would love to be able to be functioning in that role, but I don't have the time and capacity to do that, because I just don't think I will have the time to get out to do it. Then I can provide that information back and that can come back into LEA, at least you have a baseline, for when you have to do the full audit as per the requirement of the licence.” (TLCC SEAO)

With staff changes during the last construction season there was some turnover with Environmental Inspector positions. Coverage was needed so consultants were brought in to fulfill those roles. While this may have worked as a stop-gap measure one Environmental Inspector had an opinion with regard to training and some of the shortfalls of this situation:

“Having an additional consultant Environmental Inspector assist for brief stints was helpful although also requires time spent for onsite training. Consultants are ok to provide temporary assistance but it is difficult for them to see the big picture as they are often not on project for long periods and have no MH training or access to files or project correspondence. Consultants are also not able to help out with some of the internal documentation and reporting requirements (e.g. spill reports).” EI-72(2016)

During the interview the TLCC SEAO had mentioned some of the initiatives they want to develop to supplement and augment training needed for new Environmental Inspectors;

as well as increasing the overall environmental awareness in the construction department by providing this training to all of its members:

"I think one of the things that we have identified going forward is that we want to include our Environmental Inspector training manual and plan (training module). Put together originally for Wuskwatim, it evolved and changed to be a more project broad scope thing; we were thinking of putting that into a CBT (Computer based training) and actually having it as part of the E-Learning. Because there are a lot of people who are construction inspectors who may want to get to the next level but may not have the education right? By having this, it is also an environmental overview for everyone. So anybody working on a project, this is a requirement and this why it is important...and we are probably making it a requirement for the department for everyone to go through it, it's just a matter of sitting down sketching out what are the key items that we want to do on this environmental awareness, and keying in with Corporate Environmental and maybe making it a corporate wide one. Saying that it is a requirement for everyone in the corporation, just we have for spill awareness, and all that other stuff, I think there should be a CBT on Environmental awareness." (TLCC SEAO)

With the seasoned Environmental Inspectors that have been working on the project, the TLCC SEAO doesn't have the same level of concern with aptitude with existing EI's as for the new hires:

"Well I think the positions have evolved in such a way that now with a couple of years under their belts, they are comfortable with what is required and what the requirements are, they are more comfortable with what is in the mitigation, understanding what the mitigation is and they are much more familiar with construction practices and stuff."(TLCC SEAO)

With the introduction of new staff and various backgrounds, training is something to be considered so that new Environmental Inspectors are up to speed and familiar with the program. The TLCC SEAO had mentioned that the province is often looking for the use of checklists, something that the TLCC SEAO doesn't like necessarily but sees that there may be value in including them in the CEnvPPs. It can also serve as a reminder or a memory hook for Inspectors. The TLCC SEAO has had concerns with using checklists in the past as they become too automatic and the checklists will become the sole focus and other factors will be missed. The TLCC SEAO

wants to develop checklists that aren't looking for small details but rather broad categories that will act as reminders to evaluate those particular situations. The TLCC SEAO is considering this addition as they are reviewing external applicants who don't necessarily have a full background with inspection.

4.7.2 Mitigation measures of the Game Hunting Area 19A

In the southeast of Cowan MB and east of Pine River MB in Game Hunting Area 19A is an 8km stretch where the BPIII transmission line crosses, and has been deemed to be important to moose populations as it is used as a wintering area for moose coming from the Duck Mountains. This moose population is under pressure. Specific mitigation for this area is directed by license condition #49 in the BPIII license #3055 which states:

"The Licencee shall, during construction and maintenance of the Development, clear only tower locations, danger trees, and trees in excess of 17 meters in height within the transmission line right-of-way along the approximately 8 kilometer long section of Game Hunting Area 19A, which is currently inaccessible by means of existing fence lines and trails." (BPIII Lic #3055)

In consultation with the Wildlife branch of Sustainable Development, mitigation measures were developed to help in the reduction of impacts in the identified sensitive areas. Due to the complexity in describing these measures Manitoba Hydro produced a separate document which the CEnvPP referred to for direction this document is called "Moose and Woodland Caribou Sensitive Range Delineation and Mitigation Plans" Updated version was produced January 11,2016

The mitigation measures are designed to reduce line of sight for predators and human hunting activity which was a concern for this area. If cleared of vegetation moose can be spotted from a

long distance away which can increase predation and hunting pressure. To maintain as much vegetation as possible mitigation measures were to selectively clear the area and increase the maximum tree height to allow trees to be retained up to 15m. In order to accommodate these trees and maintain the maximum clearance to the conductor taller towers were installed in this particular area.

In addition to these measures a new mitigation measure is being attempted with regard to how the centerline or access trail is being cleared. Typically this trail is cleared in approximately a straight line up to 24m. For this area, the trails will be limited to clearing of 12m wherever possible (up to 24m where necessary) and cleared using a “Zig-Zag” method to limit line of sight.

Page 16 of the Moose and Woodland Caribou Sensitive Range Delineation and Mitigation Plans describes this mitigation as:

“Between tower locations, the access route will skirt along opposing edges of the right-of-way or will otherwise meander within the right-of-way limits to avoid introducing sightlines conducive to hunting or predatory conditions. Additional access and sightline barriers can be introduced within and especially near the outer extents of the 8 kilometer long section in question. Such features will be designed and installed in consultation and collaboration with regional Manitoba Conservation staff.”

The mitigation measures that were designed hadn’t been attempted and if proven successful may be used in the future where similar conditions exist. To reduce the need for access trails and bypasses in this area helicopters are going to be used for stringing the towers with their conductors. Brush piles or willows will be used to further reduce line of sight at the entrances of this particular area. Final decisions on what is appropriate are to be made at the end of the construction period in consultation with sustainable development.

4.7.3 Evolution of the Community Monitors and Liaisons Program

Through the First Nation and Metis Engagement Process (FNMEP) Manitoba Hydro continues to involve First Nation and Metis in transmission project follow up and monitoring activities. Since starting in 2008 with the Wuskwatim Transmission Project and the introduction of the Community Monitor position, Manitoba Hydro has worked at improving the concept. What was learned from experiences on the Wuskwatim Transmission Project was used to improve the community involvement programs for the Bipole III and Keeyask Transmission Projects in 2013-2018. Following the start of those projects was the Lake Winnipeg East Transmission project (LWESI) and now the future Manitoba-Minnesota Transmission Project (MMTP). With each new project improvements were made to accommodate unique aspects of each project and an evolution in engagement.

4.7.3.1 Wuskwatim

The Wuskwatim Transmission Project was the first project to have these new positions offered which at the time were called "Environmental Protection Workers". A description of this position is found in the Wuskwatim EIS:

"Compliance monitoring will be undertaken by environmental protection workers who will be on duty throughout the clearing and construction periods. The environmental protection workers will be supervised by an on-site Senior Construction Supervisor with experience in the clearing and construction of transmission facilities. It is anticipated that the environmental protection workers will be qualified local people with training provided by Manitoba Hydro. Local and Aboriginal TK will help to ensure that potential environmental effects are minimized" Wusk EIS Chapter 7.

This first position was important proof of concept but perhaps needed further development.

When the LEA SEAO was asked about the position they said:

“Wuskwatim was the first one where we did environmental monitors but they really didn't have a whole lot of structure about what they were supposed to do or collect, be on site and be there, just to talk, the env monitor and liaison was a combined role on Wuskwatim I believe.

4.7.3.2 Bipole III

For the Bipole III Project, responsibilities were split into two positions involved in compliance monitoring activities and their key responsibilities are found below:

The Environmental Monitor(s) who report to the TLCC SEAO and receive training from the Licensing and Environmental Assessment Department. Key responsibilities are as follows:

- Environmental Monitors conduct field monitoring activities as outlined in the monitoring plans (access, wildlife, vegetation monitoring).
- Provide liaison opportunities for the communities and report the protection and preservation of community natural resources.
- Assist in the locating and delineating of environmentally sensitive sites.
- Work with Environmental Inspector and reports to the Senior Environmental Assessment Officer.

The Community Liaison(s) is to be hired from local First Nation and Northern Affairs communities, along with the Manitoba Metis Federation. This position will report to both the community leadership and the Manitoba Hydro Construction Supervisor when on construction site.

- Primary contact for disseminating information regarding this project to their community.
- Develops project communication materials for their community.
- Identifies community concerns and interests and communicates to Construction Supervisor.

* sourced from the Bipole III Transmission Line Construction Sections Construction Environmental Protection Plan document (2016).

Due to the size of BPIII project and the number of nearby communities that wanted to be involved in compliance monitoring during construction, the delivery of the program underwent some improvements. According to the LEA SEAO there were still some gaps remaining in the effectiveness of the program:

“We are definitely underutilizing whatever information that they have given us so far, we aren't using it to its fullest ability and some of it is just the way it is collected and the nature of the job. The involvement does provide very good feedback to the community members and what they saw and what we did about it. The downside to BPIII was the sheer number of people that wanted to be involved and that represented logistical challenges to allow the communities meaningful involvement.”(LEA SEAO)

Environmental Inspectors perspective of the BPIII Environmental Monitor/Liaison Program

Environmental Inspectors were asked about their experiences working with the Environmental Monitors and Liaisons positions. The Environmental Monitors and Liaisons work closely with the Environmental Inspectors and could provide insight into the challenges and potential solutions. The Environmental Monitors would submit reports on what they did and what they saw and suggestions for improvement. The Monitors would accompany the Environmental Inspectors while on site and on average would spend two days a week with the Environmental Inspector while the Community Liaisons would spend one day a week with the EI and one day in the community. As would be expected there were a wide range of experiences discussed regarding this working relationship with some suggestions for improvement.

Contributions

The Environmental Inspectors indicated there were some very good working relationships and noteworthy Environmental Monitors that made valuable contributions to the workload of the EI as well as being beneficial to the progress of the project itself. Relationships were established and the situation in most cases was mutually beneficial. The Environmental Inspectors taught the Environmental Monitors about the environmental protection measures and mitigations that were used during construction. Training took place on how the GPS and mapbooks in the field to identify the locations of Environmentally Sensitive Sites (ESS) as well as other onsite training. The Environmental Monitors were a positive contribution in the field, helping in several different ways. They did so by assisting with the workload in the field, helping to identify acceptable timber salvage areas, the flagging of ESS, providing the history of areas, providing feedback on the

progress of environmental protection in comparison to previous projects, as interview

participants attest to:

“The Environmental Monitor that was working with me was a logger for Tolko, and helped me to determine a new salvage area to compensate for the areas that were marked salvage that actually weren't.” EI-78 (2015)

“Oh yeah, if they are with you, they are generally helping you, I mean, again some are better than others but there were some days when we were definitely tag teaming some work to make short work of it, I mean, I think of them as a kind of mini extension of me when we are in the field. They aren't going to write my reports for me but if I am going to be marking burn piles, then you are too or you know, she was good like that.” EI-80(2015)

“The Environmental Monitor I had worked with was very knowledgeable about the area, where fish spawn etch, eg identifying a rail siding that was in the CEnvPP as a water crossing, and said it is good that they are preserving it as it is part of our heritage, the steamer would pull water from that ditch.”EI-81(2015)

“The Environmental Monitor I had worked with had worked on the Herblet to Ralls Island transmission line, he said he noticed a big difference to how we are approaching this project vs that one, he said it was a big improvement, having these plans and following them, and having the EIs on site, said it looked like a lot less damage was done compared to that one and you look at that line now, it looks good now and that was 5 or 6 years ago and this line was done better, this one should recover a lot quicker.” EI-82(2015)

The Environmental Monitors submit their own daily reports which indicate the construction activities taking place, the environmentally related activities undertaken that day and any suggestion they may have for improvement. Many of the notations found are similar to what an Environmental Inspector would note. Some of the suggestions identified are site specific instances that need attention that they had discovered such as:

“clear away ridges of snow on snowmobile route to prevent accidents”

“clean equipment properly after a spill incident as to not drop to the ground”

While others are useful from a process perspective, information identifying areas of concern as well as provide good suggestions for improvement:

“Equipment to be kept on ROW or at a specified location”

“Make a flagging policy or S.O.P. where we all agree on same thing for next year”

“Better signage to indicate animal habitat area”

“New operators should be updated on ESS”

One Environmental Inspector talked about the value of the Environmental Monitor working on the project and how they were also able to fill the role of Community Liaison. By being directly involved they were able to dispel inaccuracies between what the community was hearing and what was happening on site during construction and clearing:

“My (Environmental Monitor) wasn't too familiar with that stuff but wanted to learn quite a bit and I think she had an expanded idea of what it was afterwards. I think that it was really good in our section because we had more of an unbiased view and she could tell the community the reality compared to what (the Contractor) was telling the chief and council. She would follow me everywhere and she was at our morning meetings and weekly progress meetings and at the end of the year she can say to chief and council, you know Hydro was trying this and that, they weren't making (the Contractor) do this as they were saying. The Environmental Monitor would come out with me to measure wood and when (the Contractor) says, chief we only have this much wood out here, the Environmental Monitor would say no there is way more wood out there, because I measured that wood with (the Environmental Inspector) so...” EI-83(2015)

“It was good to have the monitor go back to the community because they kind of support us, because sometimes all they hear is what the contractor tells them and even that one was different because the community actually had a lot of direct involvement instead of other sections that have a contractor do all the work and just wait for a cheque for their band when they are done.” EI-84(2015)

Logistical Issues

Some of the issues the Environmental Inspectors had were logistical issues which from their perspective hampered the benefit. In the first year some Environmental Monitors didn't have driver's licenses and would need to be picked up and dropped off. This could add as much as 2 or 3 hours to the EI's day, the second year a driver's license was a stipulation of employment. But one issue that persisted throughout the project was the requirements Manitoba Hydro has with employees being properly trained and certified on equipment. This limited the EI's mobility and planning:

"Environmental monitors were not of much assistance and often inhibited or reduced the amount of time available to the Environmental Inspector to complete requirements of the position." EI-78(2016)

"One particular monitor was really good, willing to help out and walk out flagging, I would take one side, and they would take the other that was helpful. But the one year the monitor was a little older and wasn't in as good a shape and didn't work out as well because he couldn't get out as much. Sometimes things can get slowed down because I may want to take an ATV to get to an area, but they have no ATV training, would change the planning a bit, and have to wait for a UTV to access an area and take them. I would feel guilty leaving them, I didn't want to make them wait in the truck or back in the office and tell them I will be back in three hours." EI-76(2015)

Suggestions for improvement

Some of the bigger concerns with having the Environmental Monitor working with the Environmental Inspectors was the frustration around roles and responsibility for the position. As well many felt that the Environmental Monitors didn't have a good start and didn't receive

adequate training. The Environmental Inspector believed they should have been involved in that initial training to help foster an understanding for both:

“Monitor/Inspector training- Poorly done, massive amounts of information in a short amount of time, and poor utility, eg quizzing inspectors on what type of fens and bogs were pictured (in summer) which is of little use to them during winter construction. Something that would have been useful is a training session on how to actually use a GPS!!! , which is something that not all of the Inspectors knew. We should refresh training, do it over again with Inspectors and Monitors and have them learn practical stuff relevant to the job they are expected to do, not binders of information. When producing materials they should also include an answer key in the back.” EI-85(2014)

“Additional clarification on the roles and expectations of Environmental Monitors/Liaisons and Environmental Inspector (as well as others such as MH Community Liaisons) responsibilities in regards to them would be beneficial. All of the Environmental Inspectors should be included in the environmental monitor and liaison training to increase awareness of the training and direction that they have received as well as to help identify what additional training they may require.

“My Environmental Monitor may have done better with more direction, like, yeah and I didn't go through the monitoring books to know that you guys wanted little surveys or studies, all we were doing was looking for tracks and marking them down. TLCC SEAO had suggested setting them up on little track studies for them to mark down what they saw, but none of that ended up happening. Is there a better way to do it? I don't know.” EI-87(2015)

4.7.3.3 Lake Winnipeg East System Improvement Transmission Project- LWESI

The LWESI is a smaller transmission project when compared to BPIII, consisting of 75 km of 115kV transmission line originating in Pine Falls and terminating at a new 115-kV Station near the community of Manigotagan. Changes were made to the community involvement in environmental monitoring program based on observations and suggestions made from the BPIII experience. This project had different staffing levels and proportionately more communities interested in being involved.

“The changes to the program for LWESI were an attempt to reduce the costs and logistical challenges that we had on BPIII while still maintaining what we thought the community

needed out of the relationship which was communication and a mechanism for the community to know what is going on as well as having representation on the line. " LEA SEAO

A member from each of the three First Nation communities in proximity to the transmission line (Sagkeeng, Black River and Hollow Water) is employed as a "Community Representative" (CR).

The role of the CR would be to meet with Manitoba Hydro's environmental and construction inspectors to share community concerns and to observe construction practices and project progress. The CR's were able to liaise with the local community stakeholders and resource users, contribute local knowledge, provide information regarding the business and employment capacity of the community as well identifying any concerns which may arise due to weekly construction activities.

In assistance to the (Manitoba Hydro Community Liaison) and TLCC department, I personally was assigned as (the Community Liaison Assistant) or "CLA" and hosted the Community Representatives (CR) for the 2016 construction season. This position was responsible for coordinating and planning activities with the CR's, as well as managing the intake of reports they were required to produce, and time carding their work. The CLA would produce daily reports of activities as well as record questions posed by the community or the CR themselves. The established schedule was to meet at the Black River First Nation Band office twice a week (Tuesdays and Thursdays). The 8 hour work day consisted of touring areas of interest along the entire line and throughout each section. The CLA would try to plan our activities based on talking to MH construction staff, depending on what construction activities were planned and what interests the community representatives had expressed. The intent of field activities was to travel

the entire line and observe all types of construction activities, practices and the implementation of the Environmental Protection Program documents.

On the LWESI project having a Community Representative fulfilling the role of both a Community Liaison and a Community Monitor is a transitional pilot from the BPIII concept towards what is envisioned for MMTP. This concept also differed from the BPIII approach as the CLA was assigned to host the community representatives, which was an improvement. On the BPIII Project one Community Monitor was assigned to an Env Inspector. This limited the areas they could see and the agenda was dictated by the tasks of the inspector. This format, which has a dedicated Community Liaison Assistant to host the CR's on the project, allowed the community representatives more autonomy than they had before. This format also allowed them to have input on the day's itinerary as to what areas were seen. As well each community rep was able to see the entire project, not just their designated section. The CRs were pleased with the opportunities the program provided and all were willing to continue next year. As well many participated in the monitoring activities that took place on the project. Mutual benefits of this relationship were described by the LEA SEAO:

“Specialist monitoring activities taking place on the LWESI project also involved the CR, giving them the opportunity to participate in those surveys. As realized on BPIII, this program provides us with a workforce that can augment our consultants and reduce our operating costs. The other benefit was to provide the communities access to training and knowledge of our systematic environmental surveys, change on the landscape and how we can quantify some of that change.” LEA SEAO

The Internal Audit Division of Manitoba Hydro performed an internal Environmental Management System audit of the LWESI project in 2016, and in that report was the following statement of the CR program:

“The hiring of Community Representatives and the assignment of a Community Liaison is a commendable initiative that is important for building a lasting and trusting relationship between Indigenous communities and Hydro.”

4.7.3.4 Manitoba-Minnesota Transmission Project- MMTP

The Manitoba-Minnesota Transmission project is the most recent transmission project of LEA’s currently under review. The project involves the construction of a 500,000 kV AC transmission line from the Winnipeg area to the U.S. border in southeastern Manitoba where it will connect to the Great Northern Transmission Line to be constructed by Minnesota Power. The Environmental Impact Assessment (EIS) for the Manitoba-Minnesota Transmission Project (MMTP) was submitted to Manitoba Sustainable Development for review in September 2015. The development requires a Class 3 Licence under The Environment Act (Manitoba). Manitoba’s Clean Environment Commission will hold a public hearing to review the EIS as part of the regulatory review process. (hydro.mb.ca, 2016)

Through each of the previous projects the Environmental Monitoring Program had adapted to better serve unique aspects of each project. Improvements were also driven by the desire to improve the effectiveness of the program both for Manitoba Hydro and the communities involved. MMTP is the latest project in which a new approach will be applied and evaluated with respect to community involvement and the monitoring programs:

“Each of these projects had a different approach tailored to the geographic region, scope/scale of project and the number of communities involved. Through these past and current projects, accompanied by the desire to use active AM in its community involvement programs for the construction of transmission projects, Manitoba Hydro has developed a new approach for this Project.” (MMTP EIS, 2015, pg 22-17)

On previous projects there were a couple of individuals from each nearby community involved in the program and reporting back to the community. On this project the communities are farther

apart but are still interested in being involved so the suggestion of having a tour was made. By doing so, more people from the community would have the opportunity to be involved and be able to visit the construction site.

There is a written description about how this approach will be implemented and how the community members will be involved and what they will be exposed to. The following is an excerpt from the MMTP EIS chapter on Environmental Protection Follow Up and Monitoring, page 17:

“The ongoing First Nations and Metis Engagement Process (FNMEP) would include regular field trips with community representatives to the construction areas with the focus being the highly valued undisturbed land or land with little disturbance (ATKS Management Team 2015) and areas identified as sensitive sites. Field trips with community representatives would take place throughout both the construction and monitoring seasons and would be guided by various staff depending on topic, including Construction Supervisors, Environmental Inspectors and environmental specialists including experts in botany, wildlife, traditional medicine plants, birds, etc and supported by a translator as required. During the construction field trips Community Representatives would learn and witness activities associated with various topics including:

- *Mitigation measures;*
- *Project schedule;*
- *Clearing and construction practices;*
- *Inspection results; and*
- *Monitoring results.*

During follow-up and monitoring field trips Community Representatives could participate in monitoring activities such as vegetation, traditional plant, stream crossing, mammal track, bird and camera trap surveys. Community representatives would also share concerns and ask questions of the Project staff along with receiving a materials package and copy of photos/video taken that day to share with their community.” [...] “To help build a better understanding of Manitoba Hydro’s EPP, environmental career opportunities for youth and enhance traditional knowledge transfer amongst generations separate field trips involving youth and elders and a Manitoba Hydro representative. The monitoring

trips would be similar in nature to the above but would focus on traditional knowledge sharing.” (MMTP EIS 2015 pg 22-17)

The excerpt goes on to discuss how the specific details about the approach need to be developed through working with First Nation and Metis people. The LEA SEAO was asked about how this would take place to which they responded:

“...We were looking for feedback through the environmental protection plan meetings with the communities, and we have only had a few about how they would like to be involved and engaged. We have floated this idea by and we will see what we get out of those meetings.” LEA SEAO

4.8 COMMUNITY CONCERNS

4.8.1 Kettle Hills (Cowen) Blueberry Patch

Of particular concern to the MMF, Duck Bay, Camperville and Pine Creek and other surrounding communities was a large area of great cultural importance, known by some as the Kettle Hills blueberry patch. This area supported an annual blueberry harvest that had great significance for the people of the area:

“The Kettle Hills and the blueberry patches were noted for their cultural, social and economic values. Interviewees noted that the blueberry patch was not only a means of economic benefit but that it was extremely important to social cohesion, cultural practices, worldview and traditional knowledge.” (BP111 Aboriginal Technical report #1, 2011 pg. 62)

The communities wanted to see the area protected and had concerns of impact to the natural productivity of the blueberries as well as increased access to the area. The blueberry area was initially identified as a very large area (polygon) drawn at a coarse scale on a map through an ATK gathering process. Prior to clearing starting in the area, community members had concerns about the mitigation being sufficient in protecting the blueberry plants through “Low-Impact Clearing”. Members of the construction department (TLCC) met with the communities in advance and were able to refine the areas of concern and closely manage them within the large area originally delineated. Discussions and consultations with the communities took place over methods and the equipment to be used which reassured the community of the blueberry plants protection.

The TLCC SEAO was asked about this area and what took place and how successful the discussions were:

“Original mitigation in there, they were concerned about what was going to be left and how it would hamper the growth of the blueberries so we went and met with the communities before construction and we said we can adjust the mitigation in here to take out all of the trees and re-assure them that we won't blade down to the organics and that we wouldn't be bailing up all of the blueberries in the area. And then figuring out, because at that point it was a giant polygon, we sat down and then said, ok tell us exactly where you have the concerns and reduce the polygon down to where it really is a concern. And then we made sure that the mitigation that was put in, was take out all the trees and not blade down to the organics, being very clear with the contractor that it was just pack and clear.” TLCC SEAO

Comments from community members and the vegetation specialists who are responsible for annual monitoring on BPIII about the health of the blueberry patch were positive. The community members were very happy with the condition of the site and are pleased with the results and the amount of plants that were fruiting. The vegetation specialists that have studied the area every year since pre-construction said that it was the best year they have seen for the blueberry plants and that they really came back. This was echoed by the TLCC SEAO who celebrates this area as an example of a successful community engagement:

“The blueberry field in Cowen, for example, they are very happy with what we did there. The blueberry patch, we did it as per what was asked for us from the community and actually it's been, the community response has been huge because it has now allowed more blueberries in the area, the area has open up more space and the blue berries have flourished and it has been a good year, there are a bumper crop of blueberries.” [...] “So there is another instance, where this is what we said we would do in the mitigation in the CEnvPP, we went above and beyond that, we re-jigged that to make sure we met the needs of what the community wants.”(TLCC SEAO)

4.8.2 Construction Weekly Progress Reporting

Another important opportunity for communication for environmental protection and community concerns came in the form of weekly progress meetings. BP111 was divided into sections; essentially eight in total, each with its own working groups, construction supervisors, and construction inspectors who were assigned and responsible for their own sections. The weekly progress reports are a mechanism to document conversations, resolutions of issues and a way of tracking follow up on ongoing issues. These weekly progress reports for the project were analyzed using Nvivo Qualitative analysis software and topics of interest were separated into themes. One of those themes of interest was community involvement in the project. Those themes were further divided into sub-themes that demonstrate Manitoba Hydro's commitment to local communities by ensuring issues are communicated and dealt with. The following sub-themes and examples of each are an indication of the ways Manitoba Hydro places importance on community involvement.

4.8.2.1 Community Respect

"Make sure snowmobile club is aware of activities – (new trail in bush)."

"The landowner near Tower 4126 wants the access that was developed near his property to be returned to its original condition. Notify the Environmental Inspector when this work is being completed as it will require inspection prior to equipment leaving the area. Landowner not wanting borrow to be taken from the ROW on his property, will have to be trucked in"

"Community, there are some individuals driving fast and wants everyone to slow down when passing through the community. "

"Contractor stated there has been an issue in a section with employees' faces showing up in pictures in Facebook, he is concerned that it will not show up on external Facebook pages. MH staff said the corporate photographers will just be taking pictures of the structures and if there is any staff involved, it would just include Hydro staff"

“Environmental Inspector noted the Trapper’s Festival is happening the 3rd week of February in The Pas so it will make the area very busy with snowmobiles and dog sled races. Use caution.”

4.8.2.2 Training and employment

“Line Worker Training” program – there are 16 local people attending.”

“MH Staff continues to send in updates for the community, regarding number of workers etc.”

“There are 31 training positions identified for On-the-Job Training in various capacities. (Safety, environment, equipment operators, cooks and administration). Will also accept four people for handcutting clearing. “

4.8.2.3 Community awareness and involvement

“Instances where elders have requested access to the ROW and others requested the opportunities to take video”

“Manitoba Hydro Staff attended a ceremony for the construction section conducted by members of local First Nations”

“Manitoba Hydro Environmental Inspector has been in contact with community liaisons, keeping them involved in the project and addressing their concerns. “

“At access 7, there are a couple bunches of tree length wood for the local people to pick up. There is enough room for vehicles to get in there and turn around.”

“Aboriginal Awareness training will take place on Tuesday.”

“Training/info sessions were held for the Environmental Monitors and Community Liaisons last Wednesday”

4.9 TRIAL AND ERROR MANAGEMENT

4.9.1 Change of water crossing clearing from 90 to 45 degrees

There are instances where a change in an established process or protocol is requested by the contractor. In these situations the change is considered, provided the change doesn't infringe on commitments to the regulators and is in keeping with the spirit of the original approved mitigation. In this situation a contractor was having difficulty with completing the 90 degree corners where the edge of a water crossing buffer and the edge of the cleared ROW meet. A contractor requested that they clear with equipment at a 45 degree angle and then clearing any necessary vegetation with hand clearers to finish off the 90 degree corner. While Manitoba Hydro suspected this new request was to accommodate a new operator with less experience, the 45 degree method was tried in one section. This was an example of trial and error; if it worked there may be efficiencies in this method and it may be adopted in the future if proven effective. The question came up in the TLCC SEAO interview, asking what the story was behind the trial and if it was something they may want to do going forward:

"That was the issue for one section, and it was funny because I'm going well "you guys were able to do it last year what has changed right? Is the change that you guys have a different operator? And that turned out to be a part of it, so let's try it and see how it goes, but then other sections were complaining "well if they are going to do it, how come we aren't allowed to do it?" And I said because we are trying in this one section to see if it will work and still maintain our mitigation as required, it did and it didn't and in some areas it was done well, others it wasn't done well" [...] "I am not convinced that the 45 was the best thing, I don't think it was, I think I want to go back to the other one, but we tried it. If it comes up again I think I will say no, we tried it and it didn't work." (TLCC SEAO)

The follow up question was asked regarding the contractor's reasoning to try that method:

"Their reasoning was they were spending too much time in the corners and that it was easier for the guys as they were coming down to go at an angle because of the way the blade sits on an angle and that is part of the issue, on a KG blade the way it sits on the machine it is already at an angle. So it's easier to maneuver it vs. it being a straight corner. Again before we do it again, I think I would probably be looking at going out try it at the 45 and see what that looks like and then implement it across the board if it works, but it is all contingent on the operator as well, I mean all the other operators don't seem to have a problem with it." (TLCC SEAO)

It was suspected that flagging would be an additional problem with using this method as it is difficult for the Environmental Inspector to identify and flag a buffer for the operator at a 45 degree angle. This was confirmed by TLCC SEAO:

"It is absolutely, so it's one of those where we tried it, I don't think it worked but at least we tried it, so we can say we tried to adjust the mitigation based on the type of equipment and based on the feedback and what it looked like in the end I am not convinced that is the right thing to do" TLCC SEAO

As this was a new method they had to communicate it across the section and clearing diagrams were created for this situation. The visualization was diagrams that were developed by different groups with varying degrees of complexity and clarity. While the new 45 deg clearing method was not adopted, the idea of using clearing diagrams was adopted, along with the need to standardize those diagrams. As a result standard clearing diagrams for all clearing situations is now being developed for training and inclusion in the CEnvPPs.

4.9.2 ESS Identification and Flagging Systems

ESS such as water crossings are often protected by an established buffer area. For a water crossing, a 30 meter buffer is created from the high water mark. Within that buffer only tall trees are removed leaving as much of the original herbaceous and shrub undisturbed as possible. This buffer is communicated to heavy equipment operators as a boundary where often special harvesting equipment can be used. The establishment and communication of this buffer is marked by bright flagging tape tied to existing vegetation. In the first year of construction there was no particular flagging plan created that was universal across the project. This caused issues as there were other things being indicated by flagging tape, such as tower location and other survey markers. Working through these issues was done through a process of trial and error.

4.9.2.1 Flagging Color

By process of elimination, green was assigned to represent environmental demarcation. However green flags were found to be very hard to see amongst the natural environment. Colors were being used for other purposes which could cause confusion; some colors couldn't be used because some operators reported to be color blind.

"In the first year all different colors of flagging were used, by process of elimination green was used for Env, but very hard to see. There wasn't enough ordered and difficult to see, often construction would grab some of it by accident because it was in the trailer but because of the confusion the flagging quickly lost meaning. This year different stuff was used, striped with hatching, easier to see and distinguish, I kept the box at my place so nobody had access and dolled it out as necessary" EI-91(2015)

“Have found that using pink or other bright color with striped hatching was easier to see and distinguish from flag hung for other uses. It was made clear to all that this was solely for environmental purposes and stored separately from other flagging and was only doled out as necessary. EI-93 (2016)

“Consistent use of signage and flagging tape results in less confusion and improved EPP field implementation. Hatched flagging for environmental issues works well as hatching is an unnatural pattern that tends to stand out in natural backgrounds. Signs and flagging tape with reflective strips have a higher cost but would be useful for future projects”. EI-102(2016)

With color demarcation being established, other challenges were discovered such as how the flagging was placed and seen. Environmental Inspectors worked through flagging issues, developing different solutions to problems they were experiencing. With tall heavy equipment the flagging could be hard to see. A solution for this was at the beginning of the ESS, they “bent down tall trees (8ft) and leave long ribbons of tape at the top so that the dozer operator could see them better blowing in the wind. Dozer blades are tall and if you put them at chest height the operators have a hard time seeing it. Environmental Inspectors would put heavier flagging near the centerline and spread it out after towards the ROW edge.” EI-94(2015)

4.9.3 Signage for Access trails and identifying ESS

There were some on site changes that took place to improve identification of ESS as well as communicating the type of clearing that was required there. Large 4ft tall signs were made for the projects and were used to mark the buffer zones of rivers. However these could not be used in any other location. In addition to flagging, smaller 30 cm signs were made to identify the start of an ESS and what type of clearing should take place there. Additional information was added to signage in the field to aid the people utilizing them.

When the question was asked what changes took place in the field or was anything done differently to overcome any challenges big or small, interviewees replied:

“The chloroplast signs helped, that was new for this year, started using them last year. They would say general or selective, low disturbance, no machine zone, grassland or what the site was and would put timber salvage (no bulldozing), wildlife area, EI would put these up so people knew why it was different. The flagging can be overwhelming because you get overlapping buffers and survey tape etc and you get ribbon everywhere. You want to create a bit of a barrier, and the 6ft signs that don't even fit in the back of an ATV. They didn't properly address the issue, only really fit for high importance water crossings. It was also difficult to handle them and to roll them in 4 ft snow.” EI-100(2015)

“One thing we did do signage wise that was new from last year is that we labeled all of our access points, you must have seen the orange signs, there was two signs made for each access trail, one for the line and one for the road. By labeling and identifying the distance back to camp, made the information better. Less paper next year, lesson learnt, people asked for way too many books to be printed.” EI-99(2015)

“Properly identifying ESS locations and applicable buffers in the field is an incredibly important part of successful implementation. Smaller sized signs indicating the type of ESS &/or ESS ID # provide some reference to which EPP mitigation measures are applicable.” EI-101(2016)

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5.1 INTRODUCTION

This chapter will revisit the original research questions which will frame discussion points of the information produced by the study. The purpose of the first research question was to establish what was required to carry out a successful application of Adaptive Management (AM). With that precedence established, the interactions and implementation of the Environmental Protection Program at Manitoba Hydro's Transmission Planning and Design Division was evaluated. The product of that evaluation is the identification of where the principles of AM exist within the functions of the Environmental Protection Program but also where they may be lacking. With this information gathered, the remaining question is answered: Would the program benefit from further investment in the AM approach?

This study has found that most of the basic elements of AM exist in the majority of long term monitoring activities that the EPP carries out. That is that they require advanced planning, collaboration, justification, budget allocation, long term institutional support, follow-up activities and reflection on the information collected. While the term AM does appear in the EPP documentation there isn't a detailed explanation of how and when AM activities take place. If the EPP does subscribe to the use of AM it needs to be documented as such to demonstrate that the concept is well understood. This is an assertion made by one of AM's major principles: "The careful, honest, and public articulation of what it means to undertake AM must go beyond the rhetorical assertion; words and concepts need to mean something." (Allen and Stankey 2009, pg 343). The basic steps required to implement an AM program already resemble those activities taking place in the EPP especially the biophysical monitoring initiatives.

Should an AM framework be adopted the current activities of the EPP would lend themselves to a straightforward transition into an AM approach and then could be defended as such.

5.2 *Research Questions*

5.2.1 Research question one (RQ1) - What is required to adopt an AM Approach?

The literature review section itself served as a response to this initial question. It provides detailed steps and processes that are needed should an institution adopt an AM approach. There are variations on the steps but the basic cycle of AM is to Plan, Do, Evaluate and Learn and Adjust where necessary (Jones 2009). Three basic types of experimentation that can be used to carry out AM are Active, Passive and Trial and Error. One of the common issues encountered by institutions attempting to adopt AM is an insufficient understanding of the amount of effort and investment into its principles that is required. These circumstances can lead to the misuse or misapplication of AM, which may result in the potential failure to realize the benefit of the approach. Despite its intuitive steps, people attempting AM find there are hurdles in its application that may need to be resolved. Some of the noteworthy issues are:

- Participants trusting in the value of the approach;
- The individual roles and responsibilities of people and the drive to fulfill them;
- The high cost of experimentation;
- Risk aversion in management; and
- Institutional barriers to AM such as the ability or willingness to embrace change.

Fortunately, there are a host of factors that are identified as having a positive influence on the success of AM activities.

Allan and Stankey (2009 pg 22) provide a list of factors which includes:

- The presence of a 'champion' for the activity;
- The effective coordination bodies and processes ;
- The previous history of management or dispute between parties; and
- Other external factors drawing attention from, or to, the problem situation.

The information collected in my findings chapter was separated into topics specific to AM which were: Communication, Past Influences, Basic AM Steps (Plan, Do, Evaluate/Learn, Adjust), and Experimentation (Active, Passive and Trial and Error). In my discussion I have further analyzed these topics including the evidence or lack of evidence for (Principles for AM best practices) and (The Key Characteristics of AM) which I have shown below:

Recognizing the large variations found within definitions, Diduck *et al* 2012 sees more value in identifying key characteristics which they consider being fundamental and universal to the concept of AM. With the absence of a robust definition to use in the interpretation of the EPP, this assessment will also look for evidence of the key characteristics that Diduck *et al* 2012 describe.

The characteristics are identified as:

- **AM- is iterative, meaning decisions are reviewed and assessed on a regular basis;** (Diduck *et al* 2012 pg 4)

Annual Monitoring Programs are designed to evaluate the effectiveness of mitigation as well as identifying areas needing rehabilitation where damage has occurred (eg rutting of the ROW surface). The CEnvPP documents undergo an annual update where amendments and changes are made to increase accuracy or effectiveness.

- **AM- includes ongoing experimentation, which involves treating human interventions in natural systems as “experimental probes”;** (Diduck *et al* 2012 pg 4)

There are examples of experimentation taking place to improve mitigation measures in comparing clearing methods (Sec [4.6.1](#)) and the effect different clearing prescriptions has on caribou movements, new experiments on how clearing is done, effectively micromanaging the process to get the desired effect of intentionally creating a specific habitat type for golden-winged warbler (Sec [4.6.3](#))

- **AM- Focuses on system monitoring, involving observing and evaluating changes in the environment caused by the ongoing experimentation; and,** (Diduck *et al* 2012 pg 4)

Monitoring by discipline specialists takes place at different stages of a development; pre-license surveys establish a baseline of information about ecosystems and habitats. Annual monitoring continues in established locations so that the potential impacts of construction activities can be evaluated during the construction period. Commitments are made to continuing monitoring well after construction activities have ceased to verify predicted impacts or gather results from ongoing studies. During construction compliance monitoring takes place to ensure mitigation measures are being utilized correctly and are providing adequate environmental protection. Should a mitigation measure be deemed ineffective or insufficient due to unforeseen circumstances, such an instance would be relayed back to the Environmental Protection Management team for further direction (Sec.4.3.8- EI-53).

- **AM- emphasizes feedback and learning as a way to minimize “known unknowns” and “unknown unknowns”** (Diduck *et al* 2012 pg 4)

While the activities of the monitoring program for the EPP are the best way for the EPP to fulfill the goal of minimizing “known unknowns” and “unknown unknowns”, there must be more emphasis placed on the feedback and learning of the program. While there are good examples of well designed monitoring programs for Biophysical monitoring, such as caribou response to different clearing types, there aren't good examples of current introspective questions that have been asked about the program itself. This is an area where the program could benefit from an AM cycle to follow the challenges the program's participants identify, such as communication.

5.2.2 Research question two (RQ2)- Within the Transmission Environmental Protection Program (EPP) what are the applications of Adaptive Management principles used towards the management goal of environmental protection?

Information from the literature review and an analysis of gathered information and interviews reveal to what extent the EPP exhibits AM principles and areas that may be lacking. The AM process has an identified cycle with process steps, descriptions of which are found in the literature review. However, there are also underlying principles that are important to successful AM. Six principles or guidelines have been identified by Diduck et al 2012, Allan and Stankey 2009 as AEM best practices. The following definitions of these six principles will be used as an evaluation tool to determine to what extent the EPP applies these principles and where it doesn't. The following was adapted from (Allan and Stankey 2009, pp.341-346):

1. *Understanding context is crucial* – “Understanding context means having a clear sense of the history and dynamics of any given situation, so the person or organization undertaking the task of articulation is required to think deeply and clearly about the situation in which they will be acting.” (Allan and Stankey 2009, pg 342)

There is extensive community engagement throughout the preparation of an EIS and Environmental Protection documents. The information gathered at this stage provides the information needed to understand the importance the area holds to the people living in it and using it and how it can best be protected. The history, knowledge and feedback of local peoples have directly influenced the development of the EPP documents and the information they present. Ongoing involvement of the communities during construction takes place in the form of

annual EnvPP presentations and updates that are offered for interested communities. There are also instances of ongoing engagement with the communities during the construction period. An example of this type of interaction are the those that took place in the Kettle Hills (Cowen) Blueberry Patch ([Sec 4.8.1](#)) where additional concerns were addressed by the TLCC department to the satisfaction of the surrounding communities.

Through the First Nation and Metis Engagement Process (FNMEP) Manitoba Hydro continues to involve First Nation and Metis in transmission project follow up and monitoring activities. ([Sec 4.7.3](#)) The positions of Environmental Monitor and Community Liaison are continually evolving to improve the involvement of community members with the aim of increasing the benefit for each party. These positions have helped to keep information flowing between Manitoba Hydro and the surrounding communities. By being directly involved they were able to dispel inaccuracies between what the community was hearing and what was happening on site during construction and clearing. The tracking of community concerns or issues as they develop in the weekly progress meetings is an example of how that information flows through the construction groups to find resolution. ([Sec 4.8.2](#))

However, there is recognition that some of the information being provided by the communities isn't being utilized as effectively as hoped.

"We are definitely underutilizing whatever information that they have given us so far, we aren't using it to its fullest ability and some of it is just the way it is collected and the nature of the job. The involvement does provide very good feedback to the community members and what they saw and what we did about it. The downside to BPIII was the sheer number of people that wanted to be involved and that represented logistical challenges to allow the communities meaningful involvement."(LEA SEAO)

[\(Sec 4.7.3.2 LEA SEAO, pg 157\)](#)

Through review of the environmental monitor reports there were suggestions in the reports that weren't evident in annual construction season reports produced by the Environmental Inspectors; this is an area that could be improved upon by incorporating a section dedicated to Environmental Monitors Input. While the majority of information that is being provided by the Environmental Monitors is ecosystem related they also provide information on issues that need attention. Specific instances that they bring to the Environmental Inspectors attention, such as "clearing snow ridges from a snowmobile route to prevent accidents". While other suggestions are process related, such as "Better signage to indicate animal habitat areas" ([Sec 4.7.3.2 pg 160](#)) the information they provide identifies areas of concern in an area as well as provides good suggestions for improvement. These issues may have already have been addressed through other means, but an AM process would help to ensure that these comments were further evaluated.

2. Understanding adaptive approaches – “The careful, honest, and public articulation of what it means to undertake AM must go beyond the rhetorical assertion; words and concepts need to mean something. AM needs to be seen as something more than “making it up as we go”, or “business as usual,” or the way we’ve always managed. Simply put, it isn’t; it is a significant departure from past practice and it will require new and specific policies, skills, and resources to succeed. Policy makers and practitioners must have explicit discussions of what AM means, and what it doesn’t, before directing its use or embarking on a project.” (Allen and Stankey 2009, pg 343)

Based on the interview responses of the Environmental Implementation team employees, they all have a reasonable sense of the concept of AM. In other words, the meaning of AM isn’t a completely foreign concept to them. The Environmental Management team has a better understanding of AM but it is still evolving. This is evident in the AM implementation differences found in the Bipole III EnvPP documentation and what was later found in the MMTP EIS documentation. ([Sec 4.2.3](#)) There appears to be more recognition of AM practices in the MMTP document which indicates a better understanding of the AM approach and what is required to apply it.

The term AM is used throughout the Bipole III environmental protection documents and monitoring plans but these are rather vague in their description. More details about the steps being taken by people to use using AM are necessary to demonstrate and understand what is required to use the approach. If there is truly an investment into AM it should be described in the EIS when sent to regulators to provide the developed framework that is to be followed. As it

stands now, its use is largely something that is used in response to unpredictability (LEA SEAO) ([Sec 4.2.2](#)) and admittedly used in a reactionary sense in the field (TLCC SEAO) ([Sec 4.2.1](#)). This perception isn't an uncommon claim under AM but AM is not just "managing for adaptation" (Rist *et al* 2012 pg 10). Without a sufficient understanding of the AM concept too much emphasis or attention is given to the "adaptive" portion of AM, which can skew people's perceptions.

3. Purposeful and deliberate – "Effective AM begins with the framing of good questions." [...] "good question framing helps direct subsequent undertakings, guides the monitoring and evaluation processes, and emphasizes the social and political nature of the adaptive process. AM must be anchored in a process that focuses on clarifying and framing the underlying problem in a way that ensures that subsequent management actions are relevant and useful." (Allen and Stankey 2009, pg 343)

This is done well in some of the long-term research that is taking place and is best described as an Active Adaptive Management approach. These long term questions were often driven by license conditions and particular concerns of the regulators, Sustainable Development's Wildlife Branch and the Regional Directors. The caribou crossing mitigation ([Sec 4.6.1](#)) was a prime example where these particular stakeholders were interested in knowing "what is the long term relationship between transmission corridors and caribou" (LEA BA). These are long term questions that have an implicit value as basic research (trying to build on existing knowledge, but provides information that isn't useful immediately).

What would have a greater impact would be to apply the principles of AM towards identifying and improving short term problems or questions. These applications are more likely to take the form of Passive Adaptive Management. The closest examples to Passive Adaptive Management would be the evolution of the Environmental Monitor and Community Liaison Program ([Sec 4.7.3.](#)). Specific questions could be posed each season to help improve the program, such as “What can we do to improve the training of the programs’ participants and Environmental Inspectors, so that we can increase the programs’ benefits”. Specific and deliberate questions posed to Manitoba Hydro staff, brainstorming the underlying problem and providing some of the solutions to put into effect would be examples of improvement.

Manitoba Hydro employs three full-time “Bipole III Construction Community Liaisons” who work with surrounding communities, fielding any concerns and bring any issues forward to Manitoba Hydro staff to provide resolution. Biweekly conference calls take place amongst Manitoba Hydro staff that are actively working with First Nations, Northern Affairs Communities and the Manitoba Metis Federation. The purpose of the call is to have a round table discussion on any scrutiny Manitoba Hydro has received; key concerns or issues have been brought to their attention in the week prior. These individuals also worked closely with the people employed through the Environmental Monitors and Community Liaison Program. They have commented on the value of the program and the positive impact it has for the individuals involved and area dedicated to looking for ways to increase the benefit of the program.

4. Careful documentation – “Good documentation is transparent and open to scrutiny; it is designed to encourage thoughtful and constructive debate. Good documentation is necessary to facilitate examination and analysis of data, and for sharing the lessons and new knowledge with other practitioners, including those of the future.” (Allen and Stankey 2009, pg 344)

Daily reporting- Done by the Environmental Inspectors; this is to track daily environmental events of importance or infractions when discovered. The reporting also demonstrates the due diligence of Manitoba Hydro on site, by serving as a record of areas inspected. Environmental Monitors who work alongside the Environmental Inspectors submit daily reports as well indicating what construction activities took place, what Environmental Activities they undertook and any suggestions for improvement. They gather other wildlife monitoring information as well, providing wildlife track records and pictures on site. ([Sec 4.7.3.2](#))

Weekly Reporting- There has been advances in the documentation of information during construction. Identified in the interview with the TLCC SEAO, the Wuskwatim Transmission Project had some issues with documentation of contractor meetings which caused some contract issues. A product of that were weekly meetings and minutes to record what had transpired and are now an excellent source of information.

Weekly reports to Sustainable Development- This was done in one particular section and was later adopted by other regional offices of Sustainable Development as a means to keep abreast of activities when site visits were not possible for conservation officers. This opened lines of communication and trust building. ([Sec 4.3.2.1](#))

EPIMS- The Environmental Protection Information Management System allows for a central location for this information to exist and be easily accessed by all project personnel. While it is still not in the public domain, this enables consultants, for example, to access project information for analysis in preparation of upcoming fieldwork for annual monitoring purposes. [\(Sec 4.3.6\)](#)

Annual End of Season Reporting- This is a request made to all Environmental Inspectors, to prepare a report that touches on all of the major subject areas. The intent is to identify what worked and what didn't work and provide suggestions for improvement in the next season. [\(Sec 4.3.8\)](#). With an abundance of information being collected, monitored and processed, AM objectives for the next season could easily be identified. Through using the AM framework employees and participants would have a better understanding of how the information they provide is being used. Seeing the importance of that information and how it is used to effect change may improve the initial documentation of those inputs.

5. Designed to promote learning that translates into action – “Organizations that undertake AM must acknowledge early on that it is a hard, time-consuming, expensive undertaking, requiring an ongoing investment and commitment to complete successfully.” (Allen and Stankey 2009, pg 344)

The annual monitoring that is in place for the project is the best example of dedication to evaluation over the long term, where there is a commitment to the expense and the time required to have reasonable confidence in the findings. Long-term studies of caribou movements are an excellent example of this commitment. [\(Sec 4.6.1\)](#). This has been the best example of where the EPP has set a plan in place to follow the same steps required for Active AM. There was

consultation with the Regional Wildlife Branch and collaboration with the province and consultants on study design and implementation. Monitoring is carried out from pre-construction to post construction for a period of three years. The collaring program and trail camera deployments are very costly to maintain. In the end large amounts of data will be analyzed by the same groups of people. From that determination there will be insight into the requirements for caribou mitigation best practices.

These undertakings however are not done under the pretenses of AM but rather a monitoring program. Undertaking purposeful and deliberate AM to increase the effectiveness of the EPP would be described as such, with a particular commitment as well as determined objectives and a clear framework or defined steps. Information received through the CEC process did shed some light on the topic of AM. This interaction challenged Manitoba Hydro to employ an Active approach to its activities rather than the Passive approach that had been a much more common example, as described by the LEA SEAO ([Sec 4.2.2 pg 81](#))

6. Supporting the “right” people – “the choice of suitable participants is critical, with organizational leaders ensuring that practitioners have the latitude, organizational support and resources to undertake their work.” (Diduck *et al* 2012 paraphrasing Allen and Stankey 2009, pg 345)

Regarding environmental protection, the most important position in the field on the construction sites are the Environmental Inspectors. They have been given the responsibility of overseeing construction activities through an environmental protection perspective. They are representing the promises made to the public and the regulators throughout the process of obtaining a license. They are also responsible for understanding the implications infractions or non-conformance can have with regard to Provincial Acts and Regulations. In some cases they are also the ones who are in contact with First Nations and Metis communities, landowners and other members of the surrounding communities when there are public issues with the project. This position would be considered the “right” people to provide support to ensure they have the resources and the backing to conduct their work.

It was evident from the interviews that there was at times a lack of support. In the first two years of construction many of the Environmental Inspectors were “learning the ropes” and gaining confidence in their roles. This period of on the job training for many individuals is the period where the much needed support would have been most crucial.

As found below, there are a number of ways that they felt unsupported in their roles:

1) In the first year many of the Environmental Inspectors weren't invited to weekly progress meetings [\(Sec 4.3.2\)](#).

Solution: This issue has been addressed after the first construction season. Environmental Inspectors are now included; this should include efforts for allocating time for them to be sure they can make the meetings (importance over other duties).

2) Having difficulties with compliance from the contractors and effectively conveying the messages of environmental protection to them [\(Sec 4.3.2\)](#).

Solution: In follow up meetings and interviews with Environmental Inspectors, this is an ongoing challenge with contractors and the personnel that work for them. Some of the suggestions proposed the interview [\(Sec 4.3.2.2\)](#) could be tried as a means to improve the presentation and retention of materials.

3) Being unsure how to engage the contractor. As they understood it at the time, they were not supposed to direct or correct contractors directly but rather follow through a chain of command [\(4.3.2.3\)](#)

Solution: This is an example of the break that exists in the feedback mechanism of the Environmental Inspectors reporting back to create a dialogue on the problem, the proposed solution and carrying out the suggested solutions.

4) Not having regular communication between sections in which to learn from each other or share experiences and ideas as well as inconsistencies between sections causing confusion [\(4.3.3\)](#)

Solution: Recognizing that every section is unique, with unique challenges and solutions, each section is not going to be operating identically. With the potential for personnel movement between sections, communication of these differences is necessary to prevent confusion of practices. What is being tried in one section may not be replicated anywhere else on the project. This was the case with the trial of a 45 degree clearing method vs. a 90 degree, done in one section but nowhere else [\(Sec 4.9.1\)](#).

5) Their core supporters and confidants of Environmental Protection are located at the Winnipeg office and the feeling of “...being on your own out there...” EI-28(2014). Instances when they were “feeling challenged and needing advice or feedback to help make a judgment call on a situation or interpreting the CEnvPP mitigation measures.” [\(Sec 4.3.5.1\)](#)

Due to the locations and differences in work schedule and even work week can make it difficult for the Environmental Inspectors to get solutions or advice in a timely manner. With the addition of another environmental position for Transmission Line Civil Construction department working with the SEAO, there will be another contact for support when needed. [\(Sec 4.3.5.2\)](#) New initiatives for communication strategies that bring Licensing and Environmental Assessment office staff out on a semi-regular basis to the field will provide increased support. These field visits will help explain some of the rationale and content of the environmental protection documents, which will provide additional support for field staff and Environmental Inspectors. [\(Sec 4.3.9.2\)](#)

5.2.3 Research question three (RQ3)- Would an increased investment in an Adaptive Management approach increase the efficacy of the EPP with respect to Manitoba Hydro's mandate of environmental protection?

Is the application of AM a suitable management approach for the EPP to satisfy Manitoba Hydro's mandate of environmental protection? While it wasn't within the scope of this thesis paper to evaluate the efficacy of the EPP, the EPP has been effective in remaining compliant with license conditions, Acts and Regulations during the Bipole III project construction to date. The main focus of this study was to evaluate the response to issues rather than the issues themselves. If an AM approach was adopted wholeheartedly into the EPP as a strategy, the overarching goal would be to increase Environmental Protection. By using AM as a strategy to achieve that goal, objectives could be identified, such as increasing communication between groups, soliciting feedback, documentation of the AM process and its steps and milestones.

While AM in its purest form is designed for resource management, it lends itself to applications of treatments such as how to best harvest timber from a forest with multiple goals of maintaining multiple land uses, increasing productivity and increasing production. That type of application lends itself well to modeling ahead of time, then implementation and evaluation and redesign of that original model. It is that application of AM that is typically evaluated for effectiveness in application of the concept. The circumstances in which Manitoba Hydro would apply the AM approach don't fit these scenarios as cleanly.

However the steps and actions taken in the AM cycle would work very well as a framework for improving the program. It would create scheduled purposeful meetings to tackle common goals and foster communication and a shared understanding. It would ensure Manitoba Hydro employees were looking at issues and problems objectively as the process requires objectives to

be created. Contributors such as the Environmental Inspectors would show how the issues they bring up are heard, documented and acted upon. This would boost their feelings of inclusion in the process and could translate into searching for solutions to provide and to become more participatory.

5.2.4 Missed Opportunities

There were several instances or scenarios where some pre-planning and application of an AM experimental approach and documentation would have translated into an increased understanding of cause and effect. Areas where Trial and Error were used, such as in the application of a flagging plan ([Sec 4.9.2.1](#)) could have increased the learning potential of that activity if a more Passive AM approach had been adopted. The same could be said for applications of Passive AM; with some additional planning and experimental design, these activities could have taken on a more scientific approach. Taking the mitigation measures used for GHA 19A for instance, using new mitigation techniques the possibility exists to evaluate the line of sight before and after the clearing and construction has taken place. By taking an experimental approach results are much more robust and could contribute to a currently understood best practice.

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6.1 INTRODUCTION

The objective of this master's thesis was to evaluate the use of Adaptive Management (AM) during the implementation of an Environmental Protection Program used by Manitoba Hydro during the construction of a major transmission line. With those requirements established through an extensive review of the literature, the current Environmental Protection Program for Manitoba Hydro's Bipole III Transmission Project was evaluated. Employees who interact within the EPP were interviewed and pertinent documents were reviewed to determine if AM was in fact being utilized as claimed. While there was an understanding of the concept there were only a few examples of Passive AM attributes being used to improve the EPP. Some examples that could be identified as Trial and Error did exist, but according to the literature review, it is up for debate if Trial and Error is even a form of AM. There were strong examples of Active AM found in the design and implementation of the monitoring components of the program but these examples were not applied to learn new ways to improve the EPP but rather to learn the effectiveness of specific mitigations. Communication was identified as a major hurdle that would need to improve if any serious applications of the AM approach were to take place between the different groups that work together during construction.

As identified, many of the activities already taking place in the EPP resembled the steps of AM, such as the annual feedback mechanism between Environmental Inspectors and TLCC's SEAO. If a full adoption of AM were to be attempted to improve the program, the program activities must recognize and document each of the steps identified by the cycle found in the literature review. This would also require a shift of the focus from improving mitigation measures, to purposefully learning how the Environmental Protection Program could improve. The first step in the shift to a focus on learning is identifying what would improve the efficacy of the program. Through this study "communication" is identified as a substantial issue and how to improve it would be a good

purposeful and deliberate question to ask. Improvements to communication and the adoption of AM could open up the possibility of discovering other impediments to the program. Seeking them out and finding solutions supports efforts of continual improvement of the Environmental Protection Program.

6.2 CONCLUSIONS

6.2.1 Communication-

One of the major findings of this study was the identified issues surrounding communication. Inefficiencies were identified in all of the major areas of the program. Communication issues were found between field personnel, between contractors and field staff, between the field and the home office, and also between departments at the home office. With collaboration being one of the fundamental requirements of AM these areas would need to see improvement before any serious full application of AM is to take place.

*“As long as an atmosphere of trust and open communication exists, AM can provide the framework for the decision-making and experimental aspects of these approaches. Failures in collaboration can limit and impede the ability to conduct AM experiments”
(Porzecanski et al., 2012)*

Although communication issues were identified during this study, further discussion into these issues identified that there had been efforts towards a resolution. Changes to protocol for Environmental Inspectors being active participants and contributors to the weekly progress meetings is an example of an issue identified and resolved. Additional support for environmental office staff for TLCC was also identified as being necessary; with that position filled, additional support should be available to field staff. This study documented some of these resolutions that are now underway; it also provided noteworthy suggestions that could be acted upon and

evaluated. For example, requests from the field to conduct regular scheduled conference calls and new communication strategies for delivery and support of the EnvPPs are suggested. This thesis makes the assertion that AM could be a suitable platform for working towards solutions to any of the problems or questions that arise from a drive to improve the EPP. If a concerted effort toward using AM is to take place, “improvements in communication between LEA and TLCC” should be the first objective towards the goal of improved Environmental Protection.

6.2.2 Past Influences

The Past Influences section provides a retrospective view of where the program was and how information can affect change. Through the findings of the Shad Valley evaluation a plan was made and steps had been taken to fill the gaps or accommodate the deficiencies the Shad Valley students had identified. This case study was a suggestion made by LEA’s SEO in response to the CEC inquiries ([Sec 4.2.2](#)) wanting to evaluate our understanding and use of AM. It is important to recognize the implications of these efforts. It provides evidence that the EPP and its participants are willing to affect change when the benefit is evident. To have management and staff that are willing to change is important to the AM approach (Schreiber *et al* 2004 pg 180)

6.2.3 Active Adaptive Management

The current EPP monitoring activities of caribou movements ([Sec 4.6.1](#)) and Bird Diverter ([Sec 4.6.4](#)) methods both possess the qualities of an active AM pursuit in their design. Those activities were part of the follow up and monitoring activities for Bipole III. Rooted firmly in scientific design and pursuit, many were performing long term evaluations under different conditions, with the aim of arriving at a theory of “best practice”. Because the steps followed in AM are inherent

to the actions of the established monitoring and follow up program strengthening these activities may be the key to increasing effectiveness. Adopting an AM approach to these questions would provide additional documentation and structure to the decisions that are made, and with that added transparency.

6.2.4 Passive Adaptive Management

Many of the activities described in this study that were categorized into Passive AM could be elevated to a higher level of experimentation to increase the robustness of their findings. Such as with the zig zag clearing method for GHA 19A ([Sec 4.7.2](#)), the information gathered here has the potential to be useful to Manitoba Hydro as it hasn't been attempted before. However, had an experimental design been applied initially, an Active AM approach would have had the potential to yield some significant results that could be used by other utilities, possibly informing best practice. This particular prescription of a meandering centerline approach has been suggested by consultants in the past but wasn't done as it was considered to be difficult to obtain and maintain effectively. Had an Active AM approach been taken to this method initially, the results could have been more robust and defensible as a method that did or did not work compared to the level of investment.

6.2.5 Trial and Error Approach

The applications of Trial and Error methodology used for flagging ESS could have benefited from being elevated to a passive approach where more of a focus on learning would have taken place. It was evident that little initial planning had gone into a flagging strategy, as several options would have been discussed ahead of time and a plan would have been established. If learning was an objective of a flagging plan, a departmental standard could have been developed based on the results of a Passive AM approach. This approach would have established a standardized “best practice” until it was later found to be insufficient to deal with a new situation.

6.3 RECOMMENDATIONS

To help frame the recommendations, they have been categorized under the stages of Adaptive Management in which they would likely take place. The following activities would fulfill some of the requirements of AM; others will bolster existing practices to fulfill stages of an AM framework for managing the Environmental Protection Program.

Planning Stage of Adaptive Management -

Recommendation: Identify a ‘champion’ from each of the major groups involved in the AM process

The presence of a ‘champion’ from each of the major group would be identified who is responsible for adhering the group to following the format of AM steps though objectives set towards established goals (Allan and Stankey 2009, pg 22) As described in the literature, a champion needs to be identified to maintain the use of the AM concept, to make sure

documentation happens and that meetings are organized and Action items and concerns are discussed. The communication meetings that have already been established between the LEA and TLCC departments could adopt the AM approach but with the major change being how conversations, decisions and results are tracked and documented. These crucial meetings do happen but are not consistent and not framed in that way. Communication was revealed as a major concern for the program in this study. For AM to be implemented and effective in the EPP, communication needs to be in place first and should be established as the first goal of the new approach.

Recommendation: Request guidance on the use AM from the Provincial regulator

AM is a term that is often misused and misunderstood and this has been demonstrated by the literature review. As it is a term that is used by the regulator in the description of requirements, it would be beneficial to establish a common definition of the term. Requesting a description or definition of what the Provincial Government considers to be AM or a guidance document suggesting good practices would help in the development of an AM approach within the Environmental Protection Program. Currently no such guidance document as to how to properly employ it could be found [\(Sec 2.3.3, Pg 29\)](#). With a better understanding of the regulators' perception of AM, the documents produced by the program could provide additional detail in the necessary areas and what the "appropriate responses" would be for incoming monitoring results [\(Sec 4.2.2 Pg 82\)](#).

Recommendation: Recognize and identify uncertainty and incorporate learning to overcome it during the planning stage using experimentation

As identified in the literature review, recognizing and coming to terms with uncertainty at the planning stage is an important step to the learning process. To varying degrees every project has a certain level of uncertainty, described in [Sec 2.3.1 \(Pg.24\)](#) as a “sea of uncertainty (e.g. social, institutional, regulatory, economic, ecological, and biophysical)”. Through identifying what is uncertain about a project or mitigation measures helps to form the goals and objectives and what is hoped to be learned through experimentation.

Trial and Error Experimentation- Prevent Trial and Error management for some of the smaller yet important details of implementation. With planning done with the intent to learn what works best in the field, planning to learn elevates trial and error management to that of a passive approach, such as with flagging color or signage as discussed in [Sec 4.9.2](#). In this case it would mean establishing dedicated colors to communicate delineations in the field to evaluate what works and what doesn't with alternatives discussed ahead of time.

Active Adaptive Management Experimentation- There are initiatives that lend themselves well to Active AM experimentation. The recommendation is that objectives be identified with success indicators named ahead of time at the planning stage. This would mean introducing a comparison between two or more treatments with the goal of establishing a preferred method. There were a number of current planned treatments where this is possible. The Golden-winged Warbler (GWW) Habitat design is looking at using different precision methods of vegetation clearing. This presents a good opportunity to set up an active AM experiment and take the steps of planning

etc from the beginning. It is experimental because it will set out unique objectives for the project and expand involvement to other staff and bring in new forestry expertise. Indicators of success would be the results of the prescriptive clearing methods themselves and the vegetation structure that remained. By comparing these treatments to the usual clearing method and monitoring it over the long term, the differences could be evaluated. Based on monitoring results and with practicality and economic feasibility in mind these treatments may be beneficial and be considered during future planning exercises. [\(4.3.9.4 pg 94\)](#)

Moose Sensitive Area GHA19A, could receive some experimental treatments to learn as much as possible about a number of new mitigation measures that are being tried. Bird diverter placement, type and coverage all have the potential to establish controls and trials to determine which combination had the most success at preventing bird mortalities due to wire collisions.

Passive Adaptive Management Experimentation- There have been a number of places where activities and initiatives have closely resembled Passive AM, such as the Community Monitoring and Environmental Positions have evolved to solve issues and increase effectiveness, when the process or plan needed to change. Communication issues at different levels and between different groups were continually discussed at great length in this thesis. Due to the importance of good communication when using AM to tackle the complexities of the EPP, there is a necessity to resolve some of these communication issues. Passive AM would be a good fit for addressing an over arching issue such as communication. By looking at each area (provided by the examples found in this thesis) such as communication in the field, field to office and interdepartmental communication goals and objectives issues are easily identified by where breakdowns occurred. Planning could be around an agreed action or management plan such as having biweekly

meetings or a new communication strategy. Success in these areas could be determined by indicators such as a decrease in recognized breakdowns or in agreement as a group that things are improving and actions have brought the group closer to identified goals or objectives. An example of this would be the conference calls that the Environmental Inspectors wanted to have as an opportunity to field questions and to have a forum for discussing issues. An indicator of success could be determined by the group of Environmental Inspectors, if they felt heard, had a better sense of connection, and experienced less frustration over unanswered questions or issues.

Recommendation: Increase the involvement level of First Nations, Metis and Local communities in mitigation measure development

As identified in the literature review stakeholder involvement in the planning stage is very important “Stakeholder involvement early on in the process is crucial at the planning stages as incorporating different opinions and perspectives is necessary for properly identifying the potential pitfalls of decisions.” [\(Sec 2.5.1.1 Pg 33\)](#). The recommendations to improve stakeholder involvement in planning relate to three specific groups of people.

The Community Monitors and Liaisons Program [\(Sec 4.7.3\)](#) has continued to look for ways to improve training and community involvement. Through several projects the program has undergone an evolution, seeking to gain the most benefit for the individual and the community through the experience. Through Passive AM it has adjusted to meet the unique challenges that each project presents.

Local communities and First Nations are involved throughout the development of an Environmental Impact Assessment through engagement activities. During this process identification of sensitive areas take place and are present during project activities but would benefit from involvement in mitigation development and modification. One instance where this had taken place was The Kettle Hills (Cowen) Blueberry Patch sites [\(Sec 4.8.1\)](#) where members of the construction department (TLCC) met with the communities in advance and were able to define the areas of concern and closely manage them within the large area originally delineated. Discussions and consultations with the communities took place over methods and the equipment to be used which reassured the community of the blueberry plants' protection.

Another example where a community had a clear preference of methods was in the C2 Section on the Bipole III project where the clearing contract was directly negotiated with Treaty 2 First Nations who did not want timber burned in their area. The contractor in the joint venture had clearing expertise using mostly large powerful drum mulchers to complete the vegetation clearing work. The clearing done in an adjacent section was done with a shear blade. The differences between these areas were evident where the two clearing types butted up against each other. Communities may have preference in how clearing takes place, favoring one result over another. Manitoba Hydro has plans to compare these two clearing techniques at this site for its effect on the natural regeneration of vegetation. By involving the surrounding communities in the planning stage, the input of community preference results could factor into what is considered an indication of success for one method over another.

Recommendation: Shift perception during the planning of a project to consider internal departments at Manitoba Hydro as stakeholders in the project

It is important to recognize other departments involved in the construction of a transmission line outside of their contribution to the project by thinking holistically and involving them as stakeholders in the project instead. By LEA approaching other departments as stakeholders in the process would allow them additional opportunity to contribute to plans and decisions. Doing so gives recognition to the impact these decisions of process and mitigation measures can have on other departments.

A good example of where this has already been mutually beneficial was where LEA became more involved in the tendering process for contracts and contract development with Transmission Line Civil Construction ([Sec 4.3.9.4 pg 129](#)). With LEA being a common thread throughout several separate contract developments, consistency was fostered in contract documents for the environmental sections across the project. This purposeful involvement between departments would be beneficial in other ways. Typically LEA would develop the mitigation measures and TLCC would review them before they went for approval with the regulator. The TLCC SEAO felt that this often didn't allow enough time for a thorough review. Considering the needs of that department to be involved earlier and more often as a stakeholder and involving them earlier in the development may increase the efficiency of the planning stage of AM.

Recommendation: Direct Environmental Inspector involvement in CEnvPP and mitigation measure development and refinements.

Historically LEA had developed Environmental Protection Materials which would be provided to construction to implement. Responsibility and control were largely relinquished with respect to implementation, providing support or direction when required or requested. This creates the

potential for misunderstanding or misinterpretation of mitigation measures. The Environmental Inspectors often found the mitigation measures difficult to interpret or enforce. The bulk of current mitigation measures were created in preparation of the Bipole III project, prior to the creation of the Environmental Inspector positions. Modifications or refinement to mitigation measures should involve the input of the Environmental Inspectors. Doing so would promote a better understanding of the purpose behind those protection measures. This level of participation would foster a deeper understanding of the mitigation measures for the Environmental Inspectors. This knowledge would better equip them to make suggestions for improvement during the Evaluation and Learning stages of AM when a prescription isn't as successful as first thought ([Sec 2.5.3.3](#)).

Doing Stage of Adaptive Management -

Recommendation: Explore new ways to communicate and provide additional support to field staff

It is recommended to establish a new communication strategy that isn't as heavily reliant on the CEVnPP documents to translate the importance of licence requirements, acts and regulations as well as commitments to local communities during the licensing of a project. With a structured approach LEA would target the end users of its products to better understand its needs. LEA, as authors of the information, would go directly to their audience to deliver that information. By using more in the field contact by LEA personnel, the importance of environmental protection can be delivered directly to temporary staff and contractors. Communicating and stressing the importance of environmental protection was considered both challenging and frustrating for the

Environmental Inspectors and this additional support could contribute to the effectiveness of their position which is the implementation of mitigation measures.

Recommendation: Establish a regular conference call between field staff and office staff (both LEA and TLCC).

These calls would serve as a forum to discuss CEnvPP documents and provide clarification on mitigation intent. Topics also covered would be the use of EPIMS or the discussion of any issues encountered and how to troubleshoot them. Doing so would provide additional support, but would also help introduce more participation when decisions need to be made in the field. By having more people involved in the decision making process a more structured form of AM is introduced. Due to the difficulties encountered with communication while in the field these conference calls would be a means of touching base, confirming a new course of action and clarification. Environmental Inspectors have described instances where a large conference call took place early in the construction process and suggested that it has value and should be reinstated and practiced regularly.

Recommendation: Have LEA staff directly involved in Environmental Protection, doing inspections and field work as temporary relief when the EIs are on time off.

This concept has proven to be successful on the Northwest Winnipeg Gas Project. LEA had written the Environmental Assessment, the CEnvPP and had provided environmental support on site. It was a relationship that worked well. LEA advised the crews of where they were risking infractions and the crews brought potential issues to us to resolve. Doing so provided LEA staff with direct exposure to the challenges of the work on site and alternatively the knowledge of

Environmental Protection measures and Regulatory background was available on site to project managers to help resolve and communicate issues.

Evaluation Stage of Adaptive Management

Recommendation: Have Environmental Inspectors participate in discipline specialist annual monitoring activities.

Annual Biophysical monitoring activities take place to evaluate how successful mitigation measures were during the previous construction season. Discipline specialists survey environmentally sensitive sites and evaluate their condition. For example, Aquatics specialists will evaluate each stream crossing for debris on the banks or in the water, as well as evaluate the amount of vegetative buffer that was retained. There have been opportunities in the past when Environmental Inspectors from the construction zone being surveyed went along for the assessment. This allowed the EIs the opportunity to understand what takes place and how evaluations are done during a survey. This also provides valuable feedback for the EIs, as they are able to see the results of their work, and what effects are left on the landscape in the spring after the thaw. This feedback is important for them to understand the direct result the protection provided during the winter and the effect on the terrain. Conversely the discipline specialist benefit from having someone with them that can provide firsthand accounts of the activities that took place on site and give some context to what they are seeing, making for a more objective report. In some cases the specialist would have been involved in the development of mitigation measures at the beginning of the project, so this is an opportunity for valuable information feedback.

Recommendation: Have the TLCC Environmental Specialist perform regular site visits to sections on the BPIII project and other ongoing transmission projects.

As revealed through interviews different sections of BPIII had different challenges, with crews handling them in unique and in some cases very effective ways. Prior to that position being filled Environmental Inspectors speculated that this person would travel among projects and between sections, making evaluations, potentially sharing and improving processes and communicating them to the people working in the field. The position had the potential to improve how things could be done by sharing ideas and information. By seeing several different sections at once the person in this position could see things in a holistic way. With that different perspective they would be in a better position to make an assessment of what was most effective. That information could be brought back, discussed, refined and then disseminated among the sections which allowed effective evaluation and learning to take place.

The TLCC Environmental Specialist could establish standard visits and feedback sessions, so they are expected and anticipated by EIs. Empowering the EIs at this evaluation stage would reaffirm the feedback loop and show them that their opinions had value. Knowing they have a voice when they aren't happy with a process, they can speak out about it during a feedback session. Interviews established that there is an annual feedback mechanism in place but this wasn't considered sufficient for resolving issues during construction when issues are taking place. A quote by one of the EIs addresses the importance of this:

“Regular communications and discussions both in the office and in the field on environmental practices should occur as much as is practical as it provides a forum to explain the rationale for decisions and an opportunity for others to provide feedback and make suggestions on how to improve.” EI-34(2016)

Recommendation: Introduce a long term AM goals towards improving the Environmental Protection Program itself.

The biweekly meetings have been effective at establishing better communication between the departments. Issues common to both are discussed, tasks assigned, action items decided and agreements are made as to how to best proceed towards a resolution. These items are tracked and followed up at each meeting; new items are added as required. This situation lends itself well to shift to larger issues that aren't easily tackled in one meeting and where AM could help. It was identified in the interviews by the TLCC SEAO that TLCC does have feedback mechanisms to communicate back and close the loop on learning, but that LEA isn't always brought in on that learning process. Through Passive AM a goal of better communication could be agreed upon (a theme in the findings of this thesis) because group suggestions would be made as to how to improve communication. Upon agreement a course of action would be documented and the group would continue to check in on progress.

Learning Stage of Adaptive Management -

Recommendation: Documentation of management decisions at every stage of AM

As part of good AM, documenting management decisions that are made, what happened and why things needed to change increases corporate knowledge retention and transparency in the process. Document amendments are reviewed by the regulator and if they have issues with any changes, then they let us know. Version changes are documented at the beginning of the

document and released to the public on the Manitoba Hydro website. Additional information could be added to explain what circumstances occurred or the reason why changes were made.

Recommendation: Utilize the existing EPIMS Infrastructure for documentation and coordination of AM

EPIMS has the reputation of “generally working well and serving its intended goal of being an organized central repository of up to date project information.” (EI-67, 2016). As such this would be a good centralized location to track and warehouse AM documentation and products.

Recommendation: Have a third party evaluation of increased efforts of AM in the EPP

After recommendations have been adopted, have a third party re-evaluate the use of AM in the EPP to report on improvements. Once there has been a concerted effort to follow AM guidelines and enough time has gone by to allow changes to show an effect, have another evaluation done, as was performed by the SHAD Valley students. This evaluation would help to gauge and to understand how successful Manitoba Hydro was towards those objectives, followed by further recommendations for improvement.

Adjustment Stage of Adaptive Management

Recommendation: Increase communication between the field and office when adjustments need to take place in the field during construction

Adjustments are an expected part of the process. A great deal of effort is required to fulfill the stages of AM. The adjustment stage is an important one and during a short construction season this is incredibly difficult given very tight time constraints. With increased communication, it is

expected that the decision making process could be openly discussed and decided upon, with good documentation as to the circumstances and why that course of action was chosen. Doing so allows for the process of reflection to take place in the future by other or new participants in the program and learning can take place collectively and productively. The drawback to increased involvement from a large number of participants is the tendency to bog down the process to the point where it is inefficient and decisions aren't made or aren't made in a sufficient amount of time. During the interviews the distinction was made between the time available to plan and implement Active AM and the lack of time to make decisions in the field. When a mitigation measure isn't working decisions are needed right immediately. Depending on the size of a project more involvement may be possible (smaller projects less people to confer with). Larger projects such as Bipole III could expedite the process by having only a few representatives from the departments concerned to be privy to these discussions. These representatives may also meet ahead of time to discuss what areas of uncertainty exist such as unseasonable weather or other constraints. Doing so might produce contingency plans or alternative mitigation measures that are deemed acceptable should they be needed.

Recommendations: Analyze the information that is being entered into the Environmental Protection Information Management System (EPIMS) looking for reoccurring issues with implementation efficacy. EPIMS has the ability to produce reports on the information that is entered through daily and weekly reports [\(Sec 4.3.6\)](#). Quality information going into reports can be pulled into a database allowing the information to be analyzed from many different aspects. A process is in place internally in TLCC which uses spill reports to look for trends as a causal analysis. For example if, they have found a correlation to spill reports involving equipment

hydraulic lines getting cracked and leaking during extremely cold weather. Similar analysis could be done on a monthly basis with the information that is coming in from the environmental inspectors. May be able to identify trends and identify issues implementing a particular mitigation measure and look for a root cause for trouble. This could be that the mitigation was poorly misunderstood by the contractor or the Environmental Inspector or that the mitigation measure itself isn't feasible and an alternative needs to be discussed.

In recognizing that problem exists, resources can be put into preventing these issues or necessary adjustments can be made in a number of different ways. By being open and honest (Principle #2) about what we know and don't know or what we need to improve on is a step towards a solution. It has been said that "having a problem and acting on it is understandable, but knowing there is a problem and not acting on it is unforgivable" (LEA SEAO, 2015).

6.3.1 Future Research Directions

If a clear commitment to using the AM approach is made to improve the EPP, the same evaluation process that was taken in this study should take place again in the future. This reflection is important to maintain the principles identified for successful AM, but also to verify that the program is receiving benefit from this introspection. It is unnecessary or undesirable to strive for AM if what is being managed isn't best served by that management style.

There are different areas of the program with different initiatives eg Construction activities vs Monitoring activities. These activities happen in very different ways and with different objectives; it would also be pertinent to identify what type of AM experimentation should be applied for each of the activities taking place in the program. As research into improving the practice of AM, the literature should be periodically visited to stay current with suggestions from peer review or from other industries and institutions that are currently utilizing AM.

6.3.2 Concluding comments

The Environmental Protection Program has worked effectively to maintain an excellent record of environmental protection in the construction of transmission projects. Dedicated employees who are working with or under the program are invested in the roles and responsibilities of their positions and as a result they want to see the program succeed in its mandate. The dedication of these employees is evident in each of the interviews that took place; being conscientious they offered not only the issues with the program but also well thought out suggestions for solutions. Employees interested in finding solutions, instead of passing problems along as something someone else is required to deal with, are a good base for an effective AM program. A new approach could be adopted to have regular AM meetings to check on the status and health of the EPP issues so misunderstandings can be clarified earlier before they cause larger complications. By encouraging regular meetings between the Environmental Protection Management and Implementation teams (Figure 2) participants would feel more empowered and supported, knowing they had a voice. By increasing the amount of discussion and opening dialogue in a systematic way to tackle some of the issues the program is facing, AM can be beneficial to the effectiveness of the EPP in that regard. Through Manitoba Hydro being open and honest about its attempts at employing AM would be defensible should evidence of the approach be requested by the regulators on future projects. Although there is debate found in the literature review as to how well AM works at solving complex resource problems and issues, the merit of AM is not in disputed here. At the present time from the results of this study AM has the most value in providing a framework to employ a structured cyclical approach to increasing the effectiveness of the Environmental Protection Program.

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8.1 Participant Consent Form



220 Sinnot Building
70A Dysart Road
University of Manitoba,
Winnipeg, MB R3T 2N2
Phone (204) 474-9451
Fax (204) 474-7699
Email
environment_geography@umanitoba

Study Title: Exploring the use of AM in an Environmental Protection Program to Improve Mitigation Performance during Manitoba Hydro Projects

Principal Investigator:

Kris Watts, University of Manitoba, Department of Environment and Geography.

XXX-XXXX . kwatts@XXXXXX

Co-Investigator:

Dr. Richard Baydack, University of Manitoba Professor and Chair, Environmental Science and Studies. 204-474-6776

Rick.Baydack@umanitoba.ca

Sponsor: Manitoba Hydro

This is a consent form, a copy of which I can leave with you for your records and reference; this

is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or Information not included here, you should feel free to ask.

Please take the time to read this carefully.

Project Description:

The purpose of this research is to evaluate the use of AM* for effective implementation of an Environmental Protection Plan (EnvPP) used in the construction of Manitoba Hydro's Bipole III Transmission Project.

AM-Is a continual process by which the results of policies, practices or processes are monitored, learning from those outcomes are used to then improve/modify those same policies or processes, hoping to achieve better results*

My research has taken a two phase approach. The aim of the first phase is to interview project personnel and gain a better appreciation for how the environmental protection program operates and functions. Through semi-formal or informal interviews I hope to identify how well the program functions with regard to the goal of environmental protection. In the second phase I hope to determine how Manitoba Hydro responds to issues that arise and if that involves AM techniques. On average the interviews should last approximately 30 min to an hour and individuals may be approached with questions several times throughout the construction period of the Bipole III project. With help from Manitoba Hydro staff and contractors I hope to identify where the program uses AM or where that management technique could be used to improve the program itself.

Questions

Example questions are available anytime for review if interested. At anytime during my research, notes that I have taken are available to the person from whom that information was derived. This will give participants the opportunity to review responses that I have recorded and clarify any misunderstandings.

Data Handling

Information will be used from a variety of sources, Daily, Weekly and Monthly Reports, information being fed into EPIMS, e-mail correspondence between employees and myself as well as information gathered from personal interviews. This information will all be kept for the duration of the construction project, into the monitoring phase and has the potential to be kept into the foreseeable future (perpetuity). Personal interviews are one instance where anonymity will be enforced and the coding system used to link people to their comments will be destroyed at completion and submission of the thesis, and never made available internally or externally to Manitoba Hydro.

Risks and Benefits of Participation

Potential risks of participation would be confusion between questions that I will ask regarding my research topic and those questions asked out of the responsibility of my position as there as there may be considerable overlap. This fact may cause some confusion for people who decline to be a part of the research as I may still ask similar questions for Manitoba Hydro purposes

only. To alleviate confusion for those who decline participation in the research, another member of my department (Licensing and Environmental Assessment) will ask any of the questions that bear a resemblance to my thesis. The other potential concern for participants may be anonymity in some cases there are only three or four people that hold a particular position. To counter this problem, the information will only be analyzed and the results discussed in such a way that I can ensure that people cannot be individually identified and connected to their responses. Anonymity is also easier to secure for those positions that involve movement of employees between different construction sections of the project.

Potential benefits of participation would be the ability to help improve the efficiency of the process of environmental protection. Participation in this study would serve as an additional opportunity or avenue for employees to effect change or have suggestions heard and respected.

Consent

This research is unique in the sense that during collection of information I will be fulfilling two roles, one as a Manitoba Hydro employee in the position of Environmental Protection Officer and secondly as a researcher for the University of Manitoba. Consenting to this is completely voluntary and should you decline you can do so without any negative consequences whatsoever. Consent will mean that the questions I ask may be used to contribute to information used in my thesis research for the University of Manitoba.

Should consent be declined, any subsequent questions thereafter will be based on the

professional responsibility of my position with Manitoba Hydro only. In that capacity I will respect complete privacy and confidentiality in accordance with Manitoba Hydro's policy of "Intellectual Property and Confidentiality (P83B)". If I were to violate that policy and use that information outside the corporation I would be putting my own employment at serious risk, something I take very seriously.

Steps will be taken to help reassure individuals that they are free to decline participation in research without jeopardizing their position as a Manitoba Hydro employee:

The first step is that none of the participants report directly to myself or any member of the Licensing and Environmental Assessment Department, and as such have no influence or authority over potential participants and their standing within the department they work under.

The second step is that should an individual decline to participate in research questions any further questions deemed necessary to assess Environmental Protection or topics related to that of AM will be asked by another member of the Licensing and Environmental Assessment Department. As I won't be involved in the questioning, those individuals can be reassured that the information will not be used for research purposes. In this capacity information collected shall remain internally within Manitoba Hydro. By declining consent for research participation, none of the information you provide will be recorded as part of the thesis research and will not be part of a public report produced for the University of Manitoba.

Confidentiality:

I will be on site several times throughout construction. Depending on the circumstances and a participant's willingness to discuss the topic, I may ask a few or several questions. I would like participants to be assured that in either case (with consent for research or not) that our conversations will be kept completely confidential. Any statements made during an interview that are later used in any report will be attributed to an anonymous source. I will not record names with any notes that I take, but rather use assigned letter combinations (a code).

Recording information this way will prevent anyone else from linking comments from a conversation to an interviewee (coding is for my reflection only). Summary references may be made about certain positions but never names, such as "In interviews construction supervisors commented that updated site information was slow in making it to the field". No identifying details will be used in summary statements of positions and references to site specifics will be used so that those working in that area cannot be traced back to any participant's statements.

Signed Consent:

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

Withdrawal:

You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. As part of the consent process you can choose to end your involvement in the study at any time. Should new information be presented or the research design change at all, I will require you to re-affirm consent, at which time you may also choose to withdraw from the study. Should you decide to withdraw at any time for any reason, please inform me and I will no longer ask questions related to this topic of research.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the “Joint-Faculty Research Ethics Board”. If you have any concerns or complaints about this project you may contact any of the above-named persons or the

Human Ethics Secretariat at 474-7122, or e-mail margaret_bowman@umanitoba.ca. A copy of this

consent form has been given to you to keep for your records and reference.

Participant’s Signature

Date

Researcher and/or Delegate’s Signature

Date

Email or surface mail address to which a summary of findings and written reports (at your option) should be sent:

Interview Audio Recording Consent

For this study I wish to take an audio recording of interviews to aid in the accurate transcription of conversation. Neither your name nor any other identifying information will be associated with the audio or audio recording or the transcript. Only I will be able to listen to the recordings. If being recorded I will always inform you of when the recording has started and stopped.

Once the recording has been transcribed and you have verified the accuracy of the recording, that file will be deleted. Should you not want the interview to be recorded you may still participate in the research without any repercussions whatsoever.

By signing this portion of the form, you are providing consent to this recording protocol.

Signature: _____

Date: _____

8.2 Research Ethics Board Approval Certificate



Research Ethics and Compliance
Office of the Vice-President (Research and International)

Human Ethics
208-194 Dafoe Road
Winnipeg, MB
Canada R3T 2N2
Phone +204-474-7122
Fax +204-269-7173

APPROVAL CERTIFICATE

May 21, 2014

Manitoba Hydro

TO: Kristopher Ryan Watts
Principal Investigator (Advisor R. Baydack)

FROM: Susan Frohlick, Chair
Joint-Faculty Research Ethics Board (JFREB)

Re: Protocol #J2014:017
"Exploring the use of Adaptive Management in an Environmental Protection Program to Improve Mitigation Performance during Manitoba Hydro Projects"

Please be advised that your above-referenced protocol has received human ethics approval by the **Joint-Faculty Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement (2). **This approval is valid for one year only.**

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Please note:

- If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: <http://umanitoba.ca/research/ors/mrt-faq.html#pr0>)
- if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.

The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans*.

The Research Ethics Board requests a final report for your study (available at: http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html) in order to be in compliance with Tri-Council Guidelines.

8.3 Research Ethics Board Renewal Approval Certificate



Human Ethics
208-194 Dafoe Road
Winnipeg, MB
Canada R3T 2N2
Phone +204-474-7122
Fax +204-269-7173

Research Ethics and Compliance
Office of the Vice-President (Research and International)

RENEWAL APPROVAL

April 6, 2016

Manitoba Hydro
(Advisor – R. Baydack)

TO: Kristopher Ryan Watts
Principal Investigator

FROM: Lorna Guse, Chair
Joint-Faculty Research Ethics Board (JFREB)

Re: Protocol #J2014:017
"Exploring the Use of Adaptive Management in An
Environmental Protection Program to Improve Mitigation
Performance during Manitoba Hydro Projects"

Please be advised that your above-referenced protocol has received approval for renewal by the Joint-Faculty Research Ethics Board. **This approval is valid for only year and will expire May 3, 2017.**

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Coordinator in advance of implementation of such changes.

umanitoba.ca/research