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4.0 ENVIRONMENTAL ASSESSMENT APPROACH

4.1 PURPOSE AND BACKGROUND

The purpose of this chapter is to describe the approach, direction and methods used for the assessment process for the Project. This includes a description of the Site Selection and Environmental Assessment process (Section 4.2), as well as descriptions of the approach used to assess cumulative effects (Section 4.3), and the proposed environmental monitoring and protection measures (Section 4.4).

As described in Chapter 1 (Introduction) Manitoba Hydro submitted a draft scoping document to Manitoba Conservation in December of 2009 as part of an *Environment Act* Licence Proposal for the proposed Project as part of the environmental assessment process. Review by the regulatory authorities assisted Manitoba Hydro in finalizing the scoping document and it was approved by Manitoba Conservation in July 2010 (the Scoping Document). The scoping document serves as a guide to the environmental assessment and, for the most part, is directly reflected in the structure and content of the EIS.

4.2 SITE SELECTION AND ENVIRONMENTAL ASSESSMENT PROCESS

4.2.1 Objectives and Process Overview

The environmental assessment process for the Project is consistent with provincial and federal environmental assessment legislation, guidelines and procedures, as well as best practices.

Manitoba Hydro uses a Site Selection and Environmental Assessment (SSEA) process to conduct assessments of its transmission facilities. The overarching objective in the conventional SSEA approach for transmission facilities is to provide impact avoidance and management opportunities at every stage in the process, from pre-licensing through post-construction.

The following is a summary of how this objective is addressed through the process:

- Assist in the planning and design of the Project, including how it will be constructed and operated, by early integration of potential environmental and socioeconomic issues.
- Provide a description of the proposed Project facilities to potentially affected First Nations and other Aboriginal communities, other communities generally, land and resource users, interest groups, resource managers, and the public at large.
- Identify and evaluate alternative routes for the HVdc transmission line and other transmission lines associated with the Project, and preferred sites for development of the converter stations and related ancillary project components based on community/public input, local and Aboriginal Traditional Knowledge, socio-economic, biophysical, technical (engineering), and cost considerations.
- Select preferred routes and sites that, where feasible, minimize potential adverse effects and enhance/optimize opportunities.
- Provide sufficient information about the existing environment so that environmental effects not avoided by route/site selection can be identified and mitigated, and follow-up requirements can be defined in a technically, economically and environmentally sound manner that addresses input from consultations as much as feasible.
- Prepare an Environmental Impact Statement (EIS) that documents the results of the SSEA study, answers questions raised by the public and government during the study and integrates Aboriginal Traditional Knowledge and local knowledge so that there is sufficient information in the EIS for public/regulatory review and decision-making by regulators.
- The SSEA process for the Project followed the general outline illustrated in Figure 4.2-1. It involves a phased approach using increasing levels of study area refinement leading to the selection of a preferred route and other Project component sites that balanced physical, biological, socio-economic, technical (engineering) and cost perspectives with input from ongoing environmental assessment consultation with a variety of stakeholders in route and site selection for the proposed Project. This general approach is consistent with the sustainable development principles guiding Manitoba Hydro, and with Manitoba Hydro's policies on Sustainable Development (Chapter 10).

The SSEA process involves a series of steps as illustrated in Figure 4.2-1.

Figure 4.2-1 illustrates the SSEA process for the Bipole III Project through to completion and submission of the EIS. An additional iteration of the consultation process may be undertaken with respect to finalization of specific routing decisions. Further iterations may occur in the event that regulatory review and licensing of the Project results in recommended modifications to its development, and will also occur during the course of easement negotiations with land owners respecting final detailed routing and tower placement for the HVdc transmission line.

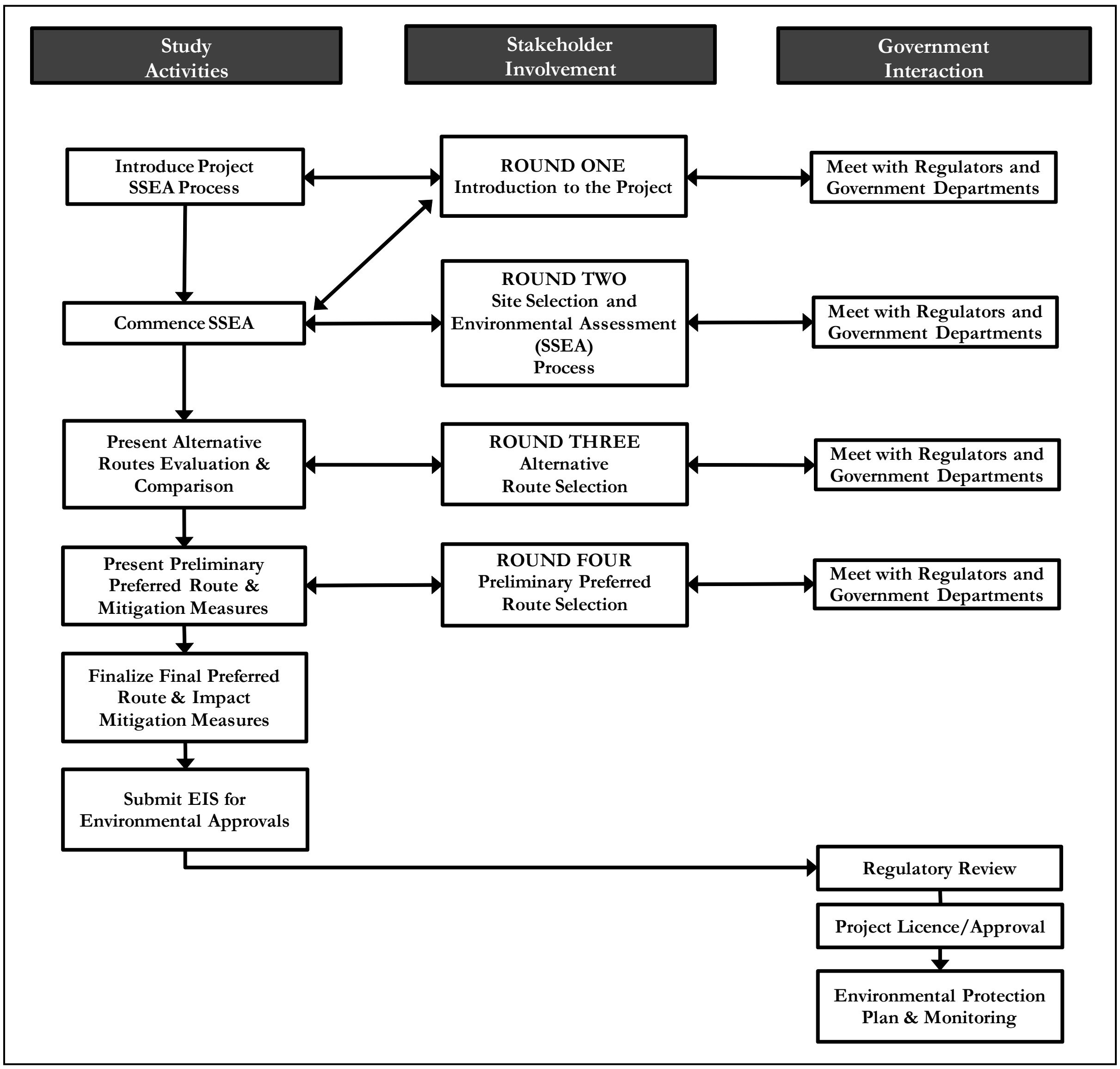

Figure 4.2-1: Site Selection and Environmental Assessment (SSEA) Process

As shown in Figure 4.2-1, there were several iterations and ongoing feedback/revisiting of the various tasks involved in the process. The primary tasks undertaken in support of this process consisted of the following:

- Scoping of Project description and Project phases;
- Study area delineation and characterization;
- Consultation;
- Route and site selection;
- Selection of valued environmental components;
- Data gathering (biophysical and socioeconomic);
- Identification and assessment of environmental effects;
- Development of mitigation measures; and
- Significance evaluation.

As indicated previously, descriptions of the approach used to assess cumulative effects and the proposed environmental monitoring and protection measures are described in subsequent sections of this chapter. The balance of this section describes the other aspects of the SSEA process in the above list.

4.2.2 Scoping of Project Description and Project Phases

The assessment approach has been structured to address the expected construction and operation effects for the various distinct phases of the Project. These include site preparation and construction, operation and maintenance, and decommissioning.

Decommissioning activities consist mainly of post construction site remediation/ rehabilitation/ clean-up. At this time, there is no timetable for ultimate decommissioning of the Project. If project components were to be decommissioned, the earliest timeframe would be approximately 50 years from now. For this amount of time into the future it is not feasible to provide meaningful assessment of the likely decommissioning plans or their effects. If at a later date it is determined that the facilities would no longer be required, Manitoba Hydro will adhere to the legislation and regulations in place at that time, reviewing decommissioning plans with regulatory authorities.

A conceptual project description was developed early on in the process and used to gather feedback on issues of concern regarding configuration and/or location, gathered through the consultation or field data gathering processes (described in later tasks below). This input assisted in refining the design of the Project, including selection of aspects such as tower type and specific placement to minimize potential effects. Project description details can be found in Chapter 3.

4.2.3 Study Area Delineation and Characterization

The SSEA process for the Project involved a phased approach, which used increasing levels of study area refinement leading to the selection of a balanced choice for a preferred route and related Project component sites.

4.2.3.1 Project Study Area

The SSEA study for the Project began with the definition of a general regional study area (the Project Study Area) that reflected the basic functional requirements of the Project HVdc transmission line and converter stations (see Chapter 3), and was sufficiently broad and representative to allow identification of several alternative routes and sites (see Chapter 1, Map 1-1). Study areas for the ac transmission line and converter station components were generally contained within the larger HVdc transmission line study area, with site selections driven more directly by considerations of technical feasibility.

The relatively large study area allowed an appropriate range of planning choices for consideration based on the collection of environmental information about its physical and biological characteristics (including vegetation, wildlife and aquatic resources), as well as socio-economic and land use characteristics (including locations of communities, conservation areas, economic land uses [e.g., agriculture], archaeological and heritage resources). Study area characterization, although broadly focused on all aspects of the environment, was guided by prior SSEA project experience through which Manitoba Hydro has established an understanding of the environmental issues and concerns associated with the development of transmission facilities.

In order to describe the various Project components and their spatial and environmental context, several spatial scales of study area were developed. The Project Study Area defines the broadest area used to provide spatial context and comparison to the Project components (with allowance for some socio-economic topics that require a larger regional context such northern Manitoba).

Following delineation of the Project Study Area, environmental information about its physical and biological characteristics such as atmosphere, soils and terrain, vegetation, wildlife and aquatic species/habitat, and socio-economic characteristics such as the locations of communities, heritage resources, etc. were assembled from existing information in order to develop an understanding of the area. This information (i..e., the environmental setting) characterizes the existing conditions in the Project Study Area. Some of this information is quantitative (e.g., concentrations of metals in organisms), while other information is qualitative, illustrating social and cultural conditions or general landscape features. Due to the spatial scope of the Project Study Area, the majority of research at this phase was done by remote sensing or "desktop" studies (maps, literature studies, etc.). Study area characterization, although broadly focused on all aspects of the environment, was guided by prior SSEA experience through which Manitoba Hydro has established an understanding of the environmental issues and concerns associated with development of transmission facilities, as well as from the EACP, Aboriginal Traditional Knowledge (ATK) and Key Person Interviews (KPIs) respecting possible environmental issues—constituting both constraints and opportunities.

Environmental/socioeconomic issues were examined in the context of technical (engineering) constraints such as, where feasible, minimizing routing through major waterbodies, extensive areas of deep peat and widespread permafrost areas, or minimizing the line length, maximizing separation from the existing Bipole I and II HVdc transmission lines, and minimizing the use of heavy angle structures.

Appropriate limits on the data collection were established to meet the needs of subsequent analysis for Project assessment and to identify any requirements for monitoring programs that would be established. In circumstances where data collection was not possible, professional judgment was used to make determinations.

In addition to the baseline information that exists in documents and databases for the selected assessment areas, field studies, data collection, and information from knowledgeable and local people through the EACP and the KPIs were used to supplement the process. Aboriginal Traditional Knowledge was an important input for planning, assessment and implementation purposes.

For site selection purposes, the Project Study Area or assessment area limits are related to the full range of potential biophysical, socio-economic and technical siting features/constraints associated with each particular Project component. The resultant study areas encompass a wide range of technically viable alternative locations and, at the same time, were considered to offer sufficient scope for identification and comparative assessment of alternatives which might involve different biophysical or socio-economic effects. The relatively large study areas facilitated an appropriate level of assessment of the nature and spatial scope of the environmental effects associated with each of the Project components and provided a high level of comfort in the ability to select the best locations, from the combined biophysical, socio-economic, and technical perspectives.

4.2.3.2 Local Study Area & Project Footprint

As the SSEA process proceeded, progressively more detailed characterization is required as specific route alterntiaves are examined. The Local Study Area is used to describe the 4.8 km (three-mile) wide band centred on the alternative routes for the Project HVdc transmission line (i.e., 1.5 miles on either side of the centreline of the right of way) and the area immediately surrounding the Project components, including the ac collector transmission line rights-of-way, the converter stations and ground electrodes, and the electrode lines between the stations and the electrodes. The right-of-way is used to describe the Project Footprint for the transmission lines and electrode lines. The Project Footprint is also used to describe the physical space occupied by the Keewatinoow and Riel converter stations and ground electrodes, and associated Project components (e.g., the Keewatinoow construction camp and construction power station).

4.2.4 Consultation

Stakeholder consultation is an integral part of Manitoba Hydro's SSEA process. Manitoba Hydro developed an Environmental Assessment Consultation Program (EACP) to guide the approach to consultation for the Project. A description of this process is found in Chapter 5. The overall purpose of the EACP is to provide the public, and particularly those who may be potentially affected by the Project, with meaningful opportunities to receive information on, and provide their input into, the SSEA for the project.

Four rounds of public consultation were held for the Project (see Figure 4.2-1). Rounds 1 and 2 focused on providing an introduction to the Project, and identifying potential features/constraints, and opportunities to assist in identifying alternative routes for the Bipole III HVdc transmission line. Round 3 activities focused on presenting a comparison of the alternative routes for the HVdc transmission line, and receiving input on these alternatives to assist in identifying a preliminary preferred route for the line. Round 4 provided an opportunity to review the alternative route evaluation findings, and the preliminary preferred route, and to provide input on potential effects and mitigation measures for the route. The EACP consultation on the HV dc transmission line is supplemented by corresponding discussion, particularly with those who may be potentially affected, respecting siting of the Keewatinoow and Riel converter stations and their ancillary components (see Chapter 5 and Chapter 7).

From the outset of the Project planning process, Manitoba Hydro identified meaningful engagement with Aboriginal communities and incorporation of Aboriginal perspectives, including ATK, as important components of Project planning and the SSEA process. To recognize and address the unique rights and interests of Aboriginal communities, potentially affected publics in the Project Study Area were divided into Aboriginal and non-Aboriginal groupings. The EACPs for both were carried out separately, but coordinated over the same time frames, which allowed consultation activities to recognize the diversity and unique nature of various stakeholders from both a cultural and physical geographic perspective.

A variety of consultation activities including meetings, and open housew were used throughout the various rounds of consultation. As indicated, the EACP, including activities and outcomes, are described in more detail in Chapter 5.

4.2.5 Route and Site Selection

Through study area characterization, the locations of sensitive physical, biological, socio-economic and cultural features (potential impact areas), technical (engineering) and cost considerations, as well as routing opportunities (e.g., existing transmission line rights-of-way, other linear rights-of-way) were identified. The alternative routes and sites selected avoided sensitivities where possible, and sought to minimize potential effects where avoidance was not possible or practical. Routing and siting opportunities were utilized where possible in identification and evaluation of alternative routes and sites. In the context of station facilities and associated components (e.g., converter station and ground electrode sites), environmental considerations were considered in the context of overall technical (engineering) and cost requirements.

Data from existing published sources were supplemented by field reconnaissance and by incorporation of feedback from the EACP activity including ATK workshops and studies, local input and KPIs. A detailed discussion of the approach taken and the results of the route and site selection processes are outlined in Chapter 7.

4.2.6 Selection of Valued Environmental Components

As the initial desktop studies and rounds of consultation proceeded, those emergent issues and concerns that appeared to have any potential to interact with the Project were identified. These potential environmental interactions issues were used to help scope the routing and siting process and to avoid environmental sensitivities wherever feasible (as discussed in Chapter 7). Theses same issues were also used to help scope the environmental assessment process required for the final preferred route and siting of Project components.

In accordance with the Scoping Document, the environmental assessment of the Project's expected effects was structured by broad biophysical (e.g., atmosphere, soils, aquatic, terrestrial, mammals, birds, etc.) and socio-economic (e.g, land use, resource use, economy, infrastructure and services, heritage resources, etc.) environmental components.

As the SSEA moved in an iterative manner towards selection of a preferred final route for the HVdc transmission line and final sites for other Project components, specific biophysical and socio-economic environmental components that could potentially still be impacted by the Project were identified as important or valued by members of the proponent's technical team and/or by the public, by ATK studies, and by other elements of the SSEA process. The indentified Valued Environmental Components (VECs) facilitated assessment of the interactions between the Project components and specific valued components of the environment.

The following list explains the relationship between the broadest environmental components (biophysical and socio-economic), their subcomponents, and how the VECs (shown in parentheses) are organized for the assessments described in Chapter 8:

- Biophysical Environmental Components
    - Terrain and Soils (soil productivity, stable terrain)
    - Air Quality and Climate
    - Groundwater (aquifer productivity, groundwater quality)
    - Aquatics (surface water, fish habitat)

- Terrestrial ecosystems and vegetation (plant species and communities of conservation concern, grasslands/prairie areas, plant species)
- Mammals and habitat
  - Ungulates – (Coastal and barren ground caribou, boreal caribou, moose, elk)
  - Furbearers – (American marten, beaver, wolverine)
- Birds and habitat
  - Waterfowl and waterbirds (mallard, sandhill crane, yellow rail)
  - Colonial waterbirds (great blue heron, least bittern)
  - Birds of prey (bald eagle, ferruginous hawk, burrowing owl, short-eared owl)
  - Upland game birds (sharp-tailed grouse, ruffed grouse)
  - Woodpeckers (pileated woodpecker, red-headed woodpecker)
  - Songbirds and other birds (olive-sided flycatcher, loggerhead shrike, Sprague's pipit, golden-winged warbler, Canada warbler, rusty blackbird)
- Amphibians, Reptiles
  - Amphibians (plain's spadefoot toad, wood frog, northern leopard frog)
  - Reptiles (red-sided garter snake, northern prairie skink)
- Terrestrial invertebrates:
  - Invertebrates (Dakota skipper, ottoe skipper, uncas skipper)

- Socio-economic Environmental Components:
  - Land Use
    - (Land Tenure and Residential Development)
    - (Private forestlands)
    - (Aboriginal lands) [meaning Reserve Lands, Treaty Land Entitlements])
    - (Designated Protected Areas and Protected Areas Initiative)
    - (Infrastructure)
    - (Agricultural land use/productivity)

- Resource Use
  - (Commercial Forestry)
  - (Commercial Fishing)
  - (Mining/Aggregates)
  - (Trapping)
  - (Recreation and Tourism)
  - (Domestic resource use)
- Economy
  - (Economic Opportunities)
- Services
  - (Community Services)
  - (Travel and Transportation)
- Personal, Family and Community Life
- Public Safety
- (Human Health)
- (Aesthetics)
- Culture and Heritage Resources (Culture and Heritage Resources)

4.2.7 Data Gathering

Three primary sources of information have been used to conduct the environmental assessment of the proposed Project. These are as follows:

- Existing published literature and unpublished information (biophysical and socio-economic) collected and synthesized during the study area characterization phase of the process;
- Information provided through Project-specific research activities, including field studies conducted to address known or expected gaps in the data. In some cases, additional research and monitoring activity will follow Project approval and securing of rights-of-way (e.g., detailed field reconnaissance and identification of site-specific

avoidance or mitigation measures as part of the subsequent EnvPPs prepared for the Project); and

- ATK and local knowledge provided by residents, resource harvesters and other users, and by members of First Nations and representatives from other potentially affected communities.

The following section provides an overview of the methods used to gather the various types of biophysical and socioeconomic data, as well as an overview of the consultation process.

Detailed methodologies are documented in a series of technical supporting documents developed by various technical specialists. These supporting documents include the technical specialist assessment of environmental sensitivities, identification of related potential Project effects and, finally, recommendations as to mitigation measures and conclusions as to the significance of residual effects. In order to facilitate appropriate integration and synthesis of the diverse findings of a large number of experts over a large and complex study area, the specialists had access to all relevant information over the course of the SSEA process. This facilitated adjustment and refinement of the discipline-specific analyses to reflect ongoing feedback from the EACP, ATK workshops and studies, and KPIs, as well as emergent Project design and construction detail as the preliminary engineering of the Project proceeded.

The contents of the EIS reflect review and synthesis of the specialist findings in the broader context outlined above, and provide a final overall integrated assessment of the Project. Readers of the technical supporting documents should be aware that the timing and sequence of their production may, in some cases, have resulted in minor differences in context relative to the ongoing consultation and design activity, and some slight inconsistencies in approach. These have been accounted for in the integrated EIS description of environmental effects.

4.2.7.1 Biophysical Data

After the initial study area delineation and characterization process using primarily desktop information, field studies were initiated, as required, on various biophysical components, as details on the route and site selection became available. This section summarizes the methods used to gather information on the biophysical components.

Soils and Terrain

In describing the existing geological, terrain and soil environment, major sources of information included: ecoregion physical environment summaries, geology, physiography, existing soil resource information (i.e. provincial soil resource information [detailed and reconnaissance level soil surveys] and soil landscapes of Canada), wind erosion risk index, enduring features data, Manitoba wetlands, stereo-photography acquired for the Project, and field investigation activities.

Field investigations, including aerial reconnaissance and ground truthing of select portions of the Local Study Area, were conducted to supplement existing soil resource information limitations at Project component sites and select sensitive soil and terrain features (e.g. unique soil/terrain features within Stephens Lake ASI and highly erodible soils in the agricultural portions of the study area).

Air Quality and Climate

The SSEA examined potential effects of cliamtge on the Project and potential long-term effects of the Project on climate.

Impacts to infrastructure have been identified as a key issue in both rural and urban areas. For utilities like Manitoba Hydro, planning for system reliability is a significant and continuing concern, with the potential for climate change adversely affecting reliability being a further consideration. It is recognized that the approach going forward involves identifying and managing associated risks, and minimizing any potential service disruptions to Manitoba Hydro customers. Transmission facilities (both lines and stations) are directly vulnerable to extreme weather events (e.g., tornadoes, high winds, ice storms, lightning, etc.) and to the potential effect of climate on the frequency and severity of such events. Transmission facilities may also be indirectly vulnerable to the potential effects of climate change on related environmental conditions (e.g., degradation of permafrost, flooding, incidence of forest fires, etc.). The effects of climate, including extreme weather events, on HVdc system reliability has been the subject of considerable research commissioned by Manitoba Hydro. For Bipole III, the effects of climate-related events on the Project were addressed through a study of risk assessment. Further discussion related to the effects of the environment on the Project is provided in Chapter 8 of the EIS.

In addition, climate change is addressed in a more global fashion to the extent possible (given the difficulties with the science and associated uncertainty) with respect to the long-term effects of the Project on climate. A Life Cycle Assessment (LCA) was used to estimate the greenhouse gas emissions (GHG) generated from the construction, land use change, operation, and decommissioning of the Project (The Pembina Institute 2011). The analysis followed the ISO 14040 life cycle standard (International Standards Organization, 2006). The results of the analysis established the life cycle GHG emissions as associated with the Project, including a summary of emissions by life cycle stage (Chapter 8, Effects Assessment). Further details on incorporating climate change considerations in the effects assessment, including the results of the LCA analysis, are provided in Chapter 8 of this EIS.

Groundwater

The approach taken to understand the current groundwater regime in the Local Study Area involved the collection, review, and synthesis of available geological and hydrological information. No field activities were conducted. The information comes from a synthesis of data collected in the area, material from a variety of literature sources, and personal communications with experts who have knowledge of the groundwater in the assessment area. To facilitate the assessment, the Local Study Area was divided (from the Riel Converter Station northwards) into sections that generally corresponded to areas with similar hydrogeology and groundwater use.

Bedrock aquifer information and maps for the entire preferred route, maps showing the occurrence of aquifers in the overburden along the route to just north of The Pas, and maps of flowing wells and springs (i.e., artesian groundwater conditions) excluding the most northern area of the preferred route, were provided by Manitoba Water Stewardship. Water Stewardship also provided a database of licensed wells within the study area.

Additional information sources included outcomes of the ATK workshops and public consultation process in relation to the groundwater environment. This information was analyzed for direct and indirect groundwater references and implications. These were compared with information from the literature, maps and other sources of information to complete an examination of the area that could potentially be affected by the Project.

It is noted that the large scale resolution of the Project Study Area means that some small aquifers may not have been represented and assessed. Where possible, supplemental information for detailed evaluations (e.g., of Environmentally Sensitive Sites) was obtained. Despite this effort, however, there may still be some unidentified small aquifers in the Local Study Area or Project Footprint (e.g., in areas where groundwater is not presently relied upon), which will be addressed, if/where necessary, during pre-construction activities.

Aquatics

Fish habitat is defined by a variety of biophysical parameters, including hydrology, channel and flow characteristics, substrate, cover, water and sediment quality, aquatic macrophytes and periphyton, and benthic invertebrate communities. Benthic invertebrate communities represent a large and diverse food base for higher trophic levels such as fish populations and are also of indirect importance to fish populations through ecological importance to the overall structure and function of aquatic environments. Water quality parameters key to defining fish habitat characteristics include temperature, dissolved oxygen (DO), total suspended solids (TSS), turbidity and pH. To provide a description of the existing aquatic environment, specifically the biophysical parameters of fish habitat, an assessment of fish habitat was conducted for each water course occurring within the Project area. Fish habitat quality was assessed for each water course within the Local Study Area using aerial photographs, aerial video, Google Earth imagery, existing published and unpublished information, and field studies.

Terrestrial Ecosystems and Vegetation

The Land Cover Classification Enhanced for Bipole (LCCEB) was the primary data source used in the assessment of vegetation (and other terrestrial components) for the preferred route and other Project components. Additional data sources included Forest Resource Inventory (FRI) (Manitoba Conservation). These data were examined in a Geographical Information System (GIS to identify vegetation types and determine ecologically important areas, locations for species of concern and calculations of vegetation cover types existing in the Local Study Area, transmission line rights-of-way, and footprints for other Project components. To identify previously known locations for species and terrestrial communities of conservation concern, a GIS analysis of existing plant location data, was conducted in the Local Study Area.

Spatial information from LCCEB and FRI vegetation cover types was overlaid on 1:50,000 orthoimagery. Interpretation of orthoimagery and aerial reconnaissance was used for the selection of field assessment sites. The native vegetation survey consisted of establishing temporary sample plots on sites with relatively homogeneous vegetation.

Data collected from the botanical field assessments were recorded. To describe the vegetation communities more succinctly all plots were classified into community types based on their plant species composition and abundances. Where vegetation community types are listed, naming was based on their structure and species dominance.

The search for species of conservation concern initially involved the review of a comprehensive plant list that was compiled by Manitoba Conservation for the Project Study Area as well as review of the department's online database for species listed in the province by ecoregion. Species of conservation concern included plants and communities that have special designation by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), species listed under the federal Species at Risk Act (SARA) and Manitoba Endangered Species Act (MESA), or those that are very rare to uncommon throughout their range in Manitoba, listed by the Manitoba Conservation Data Centre (MCDC). Prior to field surveys, interpretation of aerial photography assisted in identifying areas with high potential for species of concern and areas with high diversity of species, as locations to investigate. Surveys were conducted using patterned and meander searches. Patterned searches involved walking roughly parallel transects in a search unit, while meander searches involved walking randomly through a site.

Mammals and Habitat

Assessment of mammal community composition and of the abundance and distribution of individual species within the Project Study Area was conducted using a variety of methods. These included radio-collaring of wolves and caribou, aerial transect surveys, and total counts, including both animal observation and track records, data from provincial government archives and files, historical documentation in the public record, published records in books, technical reports and the peer reviewed literature, traditional and local knowledge, direct field observations and ground transects, and photographic records obtained from both portable digital photography and fixed trail camera records. Broad habitat composition and availability were projected using various digital habitat sources including Forest Resource Inventory (FRI) and the Land Cover Classification Enhanced for Bipole (LCCEB) that incorporated fire history, soil and terrain data and cumulative land use activities. These data provided a basis for assessing species distribution and abundance within the Project Study Area.

Particular attention was given to boreal woodland caribou due to their status and sensitivity to resource development. Within the Project Study Area, there are a number of collaborative monitoring and research initiatives that were undertaken prior to the Project SSEA. The resultant data have been made available to Manitoba Hydro for the SSEA and are of high utility in understanding the historical context of boreal woodland caribou distribution relative to current knowledge.

As part of a larger province-wide strategic effort, Manitoba Hydro has developed a draft internal corporate strategy that directs research and monitoring activities to address issues on the potential effects of transmission development on boreal woodland caribou. The main elements of the strategy are based on an identification and evaluation of potential threats to boreal caribou conservation. The approach undertaken was based on Environment Canada's threat assessment process used in recovery planning for species at risk. The Manitoba Hydro boreal woodland caribou threat assessment was the result of an external expert workshop, which provided an objective assessment of the various potential effects associated with the construction and operation of transmission lines on boreal woodland. The draft strategy that flowed from this threat assessment provided a critical path for targeted monitoring and research activities aimed at mitigating the potential impacts of transmission line construction and operation.

The main elements of this strategy focused on the planning and routing of transmission lines to avoid calving and calf-rearing areas, core winter use areas, and/or other potential critical habitat. The routing of major transmission lines (including those in the Bipole III Project) includes emphasis on pre-project monitoring of specific caribou ranges to identify "critical habitat". This provides opportunities to mitigate impacts through selecting a preferred route that avoids critical habitat and sensitive areas. Specific issues addressed in this strategy include loss of forage (both direct and functional loss due to sensory disturbance), range fragmentation, increased predation, northward encroachment of white-tailed deer, and increased mortality (hunting).

The results of the SSEA process resulted in the selection of the preferred route from a number of alternative routes. Both historical and newly acquired data derived from the Project's specific caribou monitoring initiatives were used in the integrated evaluation and selection of a preferred route. This process resulted in a preferred route that avoided the majority of core winter areas and important calving and calf-rearing habitats for boreal caribou ranges found across the Project Study Area. The preferred route was the preferred alternative for reducing overall fragmentation across the larger landscape; following, where possible, the existing linear development and disturbed areas, thus mitigating and reducing much of the potential impact.

Birds and Habitat

Bird studies began with desktop exercises, including a review of peer-reviewed literature, other reports, discussions with government and non-government organizations, and field surveys. These were used to describe the existing environment and to conduct an effects assessment for bird species. The highest level of field sampling effort occurred in the Project Footprint and in the Local Study Area along the transmission line route. A moderate sample effort was undertaken in habitats adjacent to the Local Study Area. Bird habitat associations and habitat modeling were generated using the LCCEB.

A number of bird surveys were conducted in the Project Study Area, including owl surveys, raptor migration surveys, colonial waterbird surveys, water staging reconnaissance surveys, and breeding bird surveys. Nocturnal owl surveys were conducted using roadside point counts, to assess the migratory timing, range, and presence of owl species near the Local Study Area. Spring raptor migration surveys were conducted centred on watercourses with adjacent ridge topography. Colonial waterbird breeding sites were sampled by helicopter survey and included colonies previously identified by Manitoba Conservation and Ducks Unlimited Canada, as well as large lakes, ponds and rivers in or near the Local Study Area. A waterfowl staging survey was conducted by helicopter in or near the Local Study Area, focusing on areas where suitable habitat and high densities were reported. Breeding bird point count surveys were conducted with a focus on neotropical migrants (i.e., those that winter in tropical climates and breed within the temperate, boreal, or arctic regions of North America) and for species at risk.

Statistical analyses were conducted to summarize how habitat and geographic location affect species diversity, species occurrences based on habitat availability, and the degree of similarity between bird species based on available habitat information and the selection of specific habitats by bird species. Models were developed to identify the location of high quality habitat in the Local Study Area for each VEC.

Amphibians and Reptiles

Effects of the Project on amphibians and reptiles were assessed on the basis of information obtained from published literature, government online databases, field studies, and habitat models.

A review of information on amphibian and reptile species biology, spatial and temporal distributions and habitat preferences was made from literature and various government resources. The review identified and described species with distribution ranges overlapping the Project Study Area. Select amphibian and reptile species were identified as Valued Environmental Components (or VECs) in order to better assess potential impacts of the Project.

Habitat models were developed for VEC species in order to aid in the identification of possible sensitive areas within the Local Study Area. These models were made using information on distribution range and habitat requirements and were used to select field sample sites, as well as predict habitat availability within the Project Footprint. Field work consisted of two rounds of anuran call surveys during peak breeding activity periods, northern prairie skink surveys using coverboards at selected sandy-soil habitat, and visual encounter surveys at selected suitable garter snake hibernacula habitat. Additionally, incidental observations were recorded from other disciplines during the course of their field studies on an opportunistic basis, and local knowledge was obtained at survey sites where available. ATK interviews were also used in further identifying sensitive areas within the Local Study Area.

Terrestrial Invertebrates

Habitat models were developed for selected VEC species in order to aid in the identification of possible sensitive areas within the Local Study Area. These models were based on information respecting distribution range and habitat requirements, and were used to aid in the selection of field sample sites, as well as predicting habitat availability within the Project Footprint. Field investigations included sweep-net surveys and visual encounter surveys. Incidental observations were also recorded during the course of amphibian and reptile studies as well as obtained from other disciplines on an opportunistic basis.

4.2.7.2 Socio-economic Data

Land Use

General

Review of land use included land tenure and residential development, private forestlands, Aboriginal lands (meaning Reserve Lands and Treaty Land Entitlements), designated Protected Areas and Protected Areas Initiative (PAI), infrastructure (aerodromes, communications facilities, rail, pipelines, roads, drains, culverts) and agricultural land use/productivity. Additional information is provided for designated protected areas and PAI, Aboriginal Lands, and agricultural land/use productivity below. Private forestlands are discussed under commercial forestry.

Based on prior experience with Site Selection and Environmental Assessment (SSEA) studies for similar transmission projects, SSEA-related issues for land use typically cover a spectrum of concerns. Typical environmental effects associated with transmission line development are generally well understood. Some will relate specifically to potential project effects. Others will reflect perception of potential land use conflicts and related effects on the enjoyment or value of property. Related concerns may vary regionally in relation to such factors as geographic context and property tenure, as well as existing and prospective land and resource use patterns.

The land use data collection process involved contact with a variety of local and provincial government agencies, as well as institutional and private organizations, and searches of both published and unpublished reports and land use data sets. In some instances, original data were collected through land use field survey to update, verify and expand the land use data (e.g., rural residential areas). Aerial photographs, property ownership maps and other land use maps prepared by various sources were also used to verify the land use data. Through study area characterization, the locations of sensitive land use features (potential impact areas) which suggest either constraints or potential routing opportunities (e.g., existing transmission line rights-of-way) were identified. The regional constraint and opportunity data were digitally mapped on a set of Geographic Information System (GIS) and National Topographic System (NTS) base maps at a 1:250,000 scale. Additional issues identified during the course of SSEA research were added and mapped in the GIS database. ATK and KPIs, as well as input during the EACP were also used to update or verify the land use data as required.

Designated Protected Areas/ Protected Areas Initiative and Aboriginal Lands

Research relating to the Designated Protected Areas and Protected Areas Initiative (PAI)[1] included areas in the Project Study Area that are either currently permanently protected by legislation or under consideration for protection under the PAI. In terms of Aboriginal lands[2], Reserve Lands and lands identified for potential transfer or purchase under the TLE process were considered.

For Designated Protected Areas/PAI and Aboriginal lands, which are considered VECs, fieldwork was conducted along with interviews of staff of the Province of Manitoba, and searches of government data bases. The descriptions of the VECs were based on public information and published materials. Additional information was obtained through the Bipole III ATK workshops and studies were also considered and incorporated into the effects assessment. For designated protected areas, studies included either a designated protected area under legislation such as a park, park reserve, ecological reserve, WMA,

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[1] Designated Protected Areas are areas already protected. The PAI includes lands under consideration for protection.

[2] Aboriginal Lands refer to Reserves Lands or lands identified for potential transfer or purchase under Treaty Land Entitlement process.

forest reserve, and community pastures, whereas PAIs considered lands under consideration for future protection such as Areas of Special Interest (ASIs).

The evaluation of VECs for Designated Protected Areas/PAI and Aboriginal Lands was based on potential interaction with the Project Footprint for the Bipole III HVdc transmission line and within the 4.8 km (3.0 mile) Local Study Area. In addition, soils and terrain characteristics of enduring features for selected ASIs under consideration in the PAI which fell within the Project Footprint for the Bipole III preferred route were evaluated through current satellite imagery and field studies undertaken as part of the soils and terrain work (described under biophysical data gathering). Where potential effects were identified, mitigation measures were identified to avoid or minimize adverse effects. Potential residual environmental effects after mitigation were identified, as well as options for follow-up monitoring of environmental effects.

Agricultural Land Use/Productivity

The agricultural component of the Project research involved identifying the types of agricultural use and prioritizing them to assist in the selection of the preferred route for the Bipole III HVdc transmission line. As part of the process, the production potential of the soils in the Project Study Area were mapped and intensive agricultural uses were identified. The major agricultural features/issues, which assisted in the identification/comparison of alternative routes and were incorporated in order to select the best balanced choice of a preferred route, were agricultural land use (i.e., farm yards, livestock facilities, irrigation, row cropping, intensive crop production, tame and native hay and pasture land, and shelterbelts), impact on agricultural operations, and impact on intensive field activities including irrigation. As part of the process, agricultural land use, productivity and irrigation maps were produced, and houses, barns and large sheds within 270 m of the alternative routes for the Bipole III HVdc transmission line were identified. Data were obtained through field studies, aerial photography, and Google Earth imagery.

When the alternative route selection process began, a comprehensive study of the routing area east of the Riel site to PTH 12, south to Steinbach, west to Carman and on to Holland and PTH 34 was conducted. Thirty-four categories of routing issues/constraints were identified, including occupied farm yards, grain farms, livestock farms, rural residential housing, Hutterite colonies, pivot irrigation, abandoned yards, etc. The completion of this task allowed the selection of various alternative routes from Riel Converter Station site east and south around Winnipeg and west to the Assiniboine River and Holland. Once selected, the alternative routes were ground-truthed. Routes in the remainder of agricultural Manitoba were developed using past knowledge of the areas, aerial photography and Google Earth imagery. Farms and housing sites were identified and routes selected were ground-truthed. Between the Riel Converter Station site and Mafeking, agriculture is the primary land use. There is also some agricultural use in the vicinity of The Pas. Since the Bipole III HVdc transmission line must cross these lands, it was necessary to identify categorize the agricultural use and prioritize the categories in relation to the importance of their avoidance in selection of the best balanced choice of preferred route. The following are the general guidelines for routing transmission lines through agricultural lands: route on or adjacent to the road allowance; follow linear features where possible; route along the half mile to avoid farm yards, livestock barns, irrigation pivots and other higher priority obstacles; avoid in-field placement in cultivated lands under annual crop production. Route placement parallel to the section-township-range survey system is preferred to diagonal placement from an agricultural perspective.

Resource Use

Resource use studies were undertaken on commercial forestry, commercial fishing mining/aggregates, wild rice harvesting, trapping, recreation and tourism, and domestic resource use. Information on mining/aggregates, wild rice harvesting, trapping and recreation/tourism was gathered as part of the land use research as described above. Commercial forestry, commercial fishing and domestic resource use are described below.

Commercial Forestry

The provincial forest resource inventory data were compiled for the Project Study Area within the Commercial Forest Zone and updated to reflect current conditions (2010), including forest fire history, timber harvesting and forest renewal activities on Crown lands. Deforestation/afforestation activities on private lands, within the Project area footprint, were updated using supplemental imagery. Geo-referenced data sets were obtained for the Bipole III Transmission Project from Manitoba Conservation, forestry companies, Manitoba Agriculture, Food and Rural Initiatives, Manitoba Forestry Association and through the ATK data collection process. These data sets represented reforestation and afforestation initiatives, ATK forest value areas, forestry research and monitoring sites, managed woodlots and shelterbelts on private land. The Land Cover Classification Enhanced for Bipole (LCCEB) was used to describe and assess Project effects in the northern portions of the study area that fall within the Non-commercial Forest Zone.

The effects of the Project were quantified for the commercial forestry VEC. Manitoba Conservations' Forest Damage Appraisal and Valuation guide was used to estimate compensation for productive forestland loss, dues on standing timber affected and effects on forest management investments. Environmentally sensitive sites that may be at risk of being damaged during the construction, operation and maintenance phases of the project have been identified and mitigation measures prescribed.

Commercial Fishing

The assessment of commercial and recreational fishing within the Project Study Area was based upon existing information on resource use within water bodies in the Project Study Area. A literature and existing data review were conducted to provide information on existing commercial and recreational fishing conditions in the Study Area. This included a review of commercial fishing quotas and bait fishing licenses from Manitoba Water Stewardship Fisheries Branch. The Manitoba Fisheries Inventory and Habitat Classification System (FIHCS) was reviewed for water bodies identified as supporting commercial and recreational fisheries. The data sources focused on larger water bodies with fish populations capable of supporting significant commercial and recreational fisheries.

Domestic Resource Use

Information on domestic resource use, which includes hunting, fishing and gathering, was collected from a variety of sources including published and unpublished literature. This included information for the Project Study Area compiled from an analysis of the ATK studies (Project workshops and self-directed) through the Bipole III ATK process, Key Person Interviews (KPIs) and the EACP for the Project. Trapping was addressed separately as a component of Resource Use as noted above.

The various sources also provided information on the potential effects from the Project specifically, as well as other potential effects identified through other similar projects. Information on domestic resource use was compiled and mapped in terms of polygons (areas where domestic resource use activities occur) and lines (trails, etc. used to access the resource) which intersected the Local Study Area for the Bipole III line. As domestic resource use activities are related to resources such as wildlife, fish and plants, study team specialists that undertook studies for these disciplines looked at the potential effects from their perspectives although the effects assessment is summarized under domestic resource use.

Economy

The collection of economic baseline data for incorporated communities (RMs, LGDs, cities, towns and villages), Northern Affairs Communities (NACs) and First Nation Communities for the Project Study Area is discussed as part of the data collection under Personal, Family and Community Life.

In addition, an economic impact report was prepared for the Project which involved assessing the economic impacts of the construction and operations of the Project in terms of direct expenditures that would be made, and secondary impacts that would be expected from the direct expenditures. The economic modelling framework used for estimating these economic impacts is the Manitoba Bureau of Statistics' Input-Output model. The model is based on statistical information about the flow of goods and services among various sectors of Manitoba's economy. This allowed one to trace the demands placed on one industry, resulting from increased activity in another. Hence, the model provided estimates of direct, indirect, and induced impacts of the Project on the economy of Manitoba and Canada. In determining the economic impact, there were two major purchasing categories considered: local purchases and non-local purchases, the latter of which would represent a loss to the local economy.

Services

The collection of data in terms of community services is discussed as part of the data collection under Personal, Family and Community Life.

In order to assess the transportation and travel impacts associated with the Project, an understanding of existing conditions and base data was required. This included obtaining the most recent traffic data on the provincial network, reviewing historical collision data on the roads most likely to be affected by the project, reviewing existing roadway constraints such as truck weight limitations and critical bridge dimensions, and highlighting any infrastructure improvements that are currently underway or identified on the transportation network. Identifying all existing roadway, air and railway infrastructure likely to be impact by the additional demand was also a key component of understanding the study area and the scale of the Project. This information was used to highlight any existing constraints on infrastructure and services and to understand the level of capacity that is currently available to cater for the additional movement of workers and / or material.

The next was to estimate the traffic and travel demand likely to be generated by the Project. The estimates were derived by using workforce and material quantity estimates, along with the likely method of transporting the required materials and the origin of the materials. By using this information and road weight restrictions for the provincial road network, anticipated truck and rail car (for the heavier electrical items) volumes for the duration of the Project were estimated. The anticipated workforce traffic volumes were estimated by adopting travel patterns and characteristics relevant to each Project component and considered possible worker origin, place of residence, mode choice, duration of stay, and trip purpose.

With reference to existing transportation infrastructure and services, with particular consideration to the available capacity and safety of the network, the likely impact of the additional travel and traffic demand generated by the Project was assessed. From this assessment, recommendations for mitigating its impact on the operation, safety and efficiency of the transportation network were made.

Personal, Family and Community Life

Socio-economic baseline data including statistical data on population and demographics, dwellings, education, labour force, income, and industry and occupations, were collected for incorporated communities (RMs, LGDs, cities, towns and villages), NACs and First Nation Communities in the Project Study Area. Census information was obtained from Statistics Canada's 2006 Canadian Census of Population. Information was obtained for each incorporated community, NAC and First Nation in the Project Study Area. This information was combined in the following categories: RMs/LGDs; towns, villages and cities, excluding the City of Winnipeg; the City of Winnipeg; NACs; and First Nations. In addition, data were combined to provide information on the Project Study Area as a whole. As well, data from the Province of Manitoba were collected for comparison purposes.

The socio-economic baseline data included information on population, dwellings and demographics. In addition, data on the economy (labour force, income, industrial and occupational data, as well as educational level) were collected. Information relating to community services and local infrastructure including hospitals, hotels, and community services was obtained from Government of Manitoba departmental websites for the Project Study Area.

Specific location data derived using PCensus-Canada for ArcView Software was used to generate age-sex distributions for communities near the Final Preferred Route which did not have detailed population data available through Statistics Canada's website and community profiles on cds. PCensus-Canada provided detailed analysis at the Designated Place level, which was not available from Statistics Canada for some First

Nation and NACs within the Project Study Area. As defined by Statistics Canada, a designated place is normally a small community or settlement that does not meet its criteria to be a census subdivision.

Statistics Canada community data have multiple reporting levels (Census Divisions, Census Metropolitan Areas, Health Regions, and Census Subdivisions). Census Sub-Divisions were used to determine baseline information regarding the Project Study Area and the communities in the Project Study Area.

More detailed information for communities in the vicinity of the Final Preferred Route was gathered from KPIs with community representatives, ATK workshops and studies, and community-produced online resources (i.e., RM or Town websites). In addition to community profile baseline data collected from Statistics Canada, the information was also used to generate population projections for communities near the Final Preferred Route.

4.2.7.3 Culture and Heritage

Assessment of culture and heritage within the Project Study Area was conducted using a variety of anthropological and archaeological data collection methods. The cultural assessment was conducted partially through the ATK workshop studies where standard anthropological techniques of interviewing and memory mapping were applied; and content analysis of the results of the interview process using Ethnography. Particular attention was paid to nine cultural indicators based on universal values established by United Nations Education Scientific and Cultural Organization (UNESCO). Standard categories of traditional knowledge were used as a framework for sorting the results of the indicators. Literature review, archival research, existing anthropological and traditional knowledge studies also contributed to the background knowledge. In addition to the above, reports of the self-directed studies conducted by six First Nations and the Manitoba Metis Federation were used where possible to add to the interpretation of culture.

The heritage assessment also used a number of methods. The Manitoba Inventory of Archaeological and Heritage Sites were initially accessed; registered site locations were plotted using GIS. A literature review of published and unpublished archaeological and heritage reports was undertaken and data cross-referenced with the provincial site inventory. In addition, a process of triangulation based on the oral history, archival records (including geological, soils, journals, diaries, maps, etc.) and archaeological records was used to identify gaps in the existing knowledge base. A predictive model of potential site locations was developed for the north and south components of the Project Study Area with The Pas representing the division between the two models. Where lands were accessible, archaeological field investigations, conducted as part of the Heritage Resources Impact Assessment (HRIA) process, identified archaeological sites. Content analysis of the ATK studies (Project workshops and self-directed) also indicated areas of heritage.

4.2.8 Identification and Assessment of Environmental Effects

As reviewed in Section 4.2.6, the environmental assessment of the Project's expected effects is structured by broad biophysical and socio-economic environmental components, and specific biophysical and socio-economic environmental components that could potentially be impacted by the Project are identified as VEC's to facilitate assessment of the interactions between the Project components and specific valued components of the environment.

Various categories of environmental effects[3] are identified in the environmental assessment, including adverse and beneficial, direct[4] and indirect[5], and cumulative effects of the Project. Initially, all potential environmental effects of the Project on VECs were identified and assessed in terms of importance so that those effects requiring mitigation can be identified. Finally, the SSEA also assesses effects of the environment on the Project (see Chapter 8).

Environmental effects identification was undertaken in the context of the environmental setting and the associated base of environmental data. Identification of effects entailed a systematic approach intended to account for all of the important Project/environment interactions or overlaps identified, including indirect and cumulative effects. This process was guided by Manitoba Hydro's lengthy and successful experience in siting and

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[3] According to the Canadian Environmental Assessment Agency (1994) an environmental effect is a change in the environment caused by a project, or a change to a project caused by the environment.

[4] Direct effects are caused by a project itself (e.g., by transmission line construction activities such as land consumption, removal of vegetation, and severance of farmland). The removal of granular material from a borrow pit for use in access roads is an obvious direct effect. In this case, the land area in which the borrow site is located has been directly affected by activities associated with the project.

[5] Indirect effects (also known as secondary, tertiary and chain effects) may also be associated with a project. Examples include degradation of surface water quality by the erosion of land cleared as a result of a new right-of-way, or changes in the pattern of resource harvest activities arising from increased access opportunities along newly cleared rights-of-way.

environmental assessment of transmission facilities and was re-visited during preparation of the Scoping Document for the Project, which identified the key environmental issues/components to be considered for further assessment.

Once all the effects on VECs were identified, their characteristics were described, relative importance determined and potential magnitude estimated. The effects assessment used biophysical, socio-economic and other available data to estimate the likely characteristics and parameters of effects.

Both adverse environmental effects and potential beneficial effects were assessed on VECs. Environmental effects were expressed quantitatively to the extent possible. Where quantification was not possible, qualitative methods were used to estimate and compare effects systematically. Where insufficient data were available to support a high level of certainty in the qualitative analyses the constraints of the conclusions were so noted. To the extent possible, environmental effects are described in both qualitative and quantitative terms with the range of prediction or confidence limits identified. Quantification serves to provide an accurate description of the environmental effects and to enable the identification of meaningful residual effects. Physical environmental parameters such as atmospheric conditions, air quality, stream flow, water quality, etc. easily lend themselves to quantification. Similarly, social and economic conditions are also expressed in quantitative terms to the extent possible.

A variety of methods were used for effects identification, including where appropriate, checklists, matrices, overlay mapping and geographic information systems (GIS). Checklists were used to identify the environmental features or factors that required attention when identifying the effects of the project and related development activities. Matrices were also used, where applicable, to identify the interactions between project activities and environmental characteristics.

Environmental effects are discussed by VEC and Project component (Chapter 8). Environmental effects on each VEC are described to the extent feasible according to the following:

- Characteristics that are subject to change by the Project component activities;
- Measurable parameters/variables (i.e., changes in environmental indicators expressed in quantitative terms to the extent possible);
- Environmental effects (i.e., predicted change in the environment caused by the Project); and

- Proposed mitigation measures (i.e., measures to avoid, minimize or sometimes compensate for adverse environmental effects), residual environmental effects (i.e., resultant changes in the environment after application of mitigation measures) caused by the Project, significance evaluation of such residual effects, and cumulative effects assessment, are discussed in the following sections.

4.2.9 Identification of Mitigation Measures

As part of the SSEA process, mitigation measures were identified as an integral part of the Project design, site and alternatives routes selection and evaluation process In order to avoid, minimize or remedy adverse environmental effects. These measures were implemented as part of the process of effects management, together where feasible with any necessary adjustments to respond to unforeseen effects.

Mitigation measures for the Project derive as well from established standards and practices for transmission design and construction and from corresponding Manitoba Hydro corporate policies and procedures. Where mitigation was incorporated into the design of the Project, those measures are identified in the mitigation measures section as mitigation for specific environmental effects.

The objectives of mitigation irelated to the Project includes the following:

- Find better alternatives and ways of doing things;
- Enhance the environmental and social benefits of a proposal;
- Avoid, minimize or remedy adverse effects; and
- Confirm that residual effects are kept within acceptable levels.

Mitigation measures were applied throughout the SSEA process (including the design, route and site selection and evaluation process) and later when assessing the final routes and sites. Their application included the following:

- Effect Avoidance - This is most effective when applied at an early stage of project planning. For the Project, this was primarily achieved during the route selection and evaluation process[6], and through Project design measures.[7]
- Effect Minimization - This is usually taken during effect identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse effects. For the Project, this was an ongoing process through all phases of the planning process.
- Effect Compensation - This is usually applied to remedy unavoidable residual adverse effects. This resulted in development of landowner compensation policy and trapper compensation policy to compensate for unavoidable effects.

Mitigation measures were identified where feasible for all adverse environmental effects. Generally, mitigative measures have been identified to reduce negative effects during all phases of Project development. Where mitigation measures are incorporated in the design of the Project, those measures were also identified as mitigation for specific environmental effects. Similarly, all standard mitigation practices identified in the mitigation measures section of the EIS in relation to predicted environmental effects are identified in the Draft Environmental Protection Plans prepared separately for the Project. A detailed description of the potential impacts and mitigative measures is provided detailed in Chapter 8.

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[6] As indicated in Section 4.2.7, a considerable amount of effort has been spent in the line routing process to avoid areas/sites of concern wherever possible. Once a route is selected, there are still opportunities for adjustments in terms of specific tower locations. Subject to detailed engineering analysis, tower location (tower "spotting") has been identified as a potential mitigative measure to reduce adverse environmental effects. Location preferences identified in the course of the SSEA process (including more detailed pre-construction evaluation of the selected rights-of-way) will be included in the engineering analysis and, where technically and economically feasible, incorporated in the structure placement decision.

[7] For example, two tower types have been selected for use in the proposed Project. In northern Manitoba, and in forested and pasture areas in southern Manitoba, the line conductors will be suspended from guyed lattice steel structures (i.e., assemblies of steel structural members with connections). Guyed structure design and construction was chosen because it can be adjusted to difficult or shifting foundation conditions, and enables periodic adjustment of the guys at their anchors, to accommodate such changes. This is particularly important in the north, where permafrost may affect foundation stability, and where construction access and maintenance may be hampered by difficult soil and terrain conditions. In the more intensively developed areas of southern Manitoba, self-supporting lattice steel structures will be used to reduce the footprint and land acquisition requirement of tower foundations and to minimize potential impact on farming practice.

Based on previous project experience, Manitoba Hydro has developed a well-established set of standard mitigation measures that has been developed over time through input from engineers, contractors, environmental specialists, regulators and the general public. This EIS builds on this experience and extends to identification and commitment to an ongoing program of environmental protection during the various phases of project development. Chapter 11 provides guidance and support to Manitoba Hydro's transmission construction and line maintenance departments. It is an important reference tool and catalogue of environmental protection guidelines that supplement transmission project design, construction, maintenance and operating specifications to prevent or minimize adverse environmental effects.

Unavoidable effects that cannot otherwise be mitigated may require the implementation of compensation measures, either through replacement of lost components (e.g., planting trees and reestablishing terrestrial habitat), financial compensation to offset losses of productive land, or adverse effects agreement (as with the Impact Settlement Agreement signed by Fox Lake Cree Nation, the Province of Manitoba, and Manitoba Hydro), to deal with complex effects to an affected First Nation.

4.2.10 Residual Effects Significance Evaluation

Residual environmental effects are environmental effects remaining or predicted to remain after mitigation measures have been applied. The assessment approach for the Project describes both positive and adverse predicted residual environmental effects and evaluates their significance. A more detailed discussion on the effects on the environment as a result of the Project is included in Chapter 8.

In accordance with the EIS Scoping Document and prior experience in SSEA studies for transmission facilities, the assessment approach as summarized in Chapter 8 has considered applicable legislation, guidelines, standards and codes, risks to the environment and human health, results of scientific study and analysis, along with ATK, local knowledge and available experience in determining the significance of potential effects during all phases of the Project.

In discussing significance of environmental effects, the EIS Scoping Document specifies that "the significance of the residual environmental effects of the proposed Project will be evaluated based on best and current practices, and will use a pre-determined significance evaluation framework…" that includes eight specified factors.[8]

Accordingly, the significance approach framework adopted for the SSEA was guided by the *Canadian Environmental Assessment Agency Practioners Guide* (1994). Significance was understood to be a determination or conclusion about whether adverse environmental effects are likely to be significant taking into account the implementation of appropriate mitigation measures. Significance was evaluated for any residual effect of the Project on each biophysical and socio-economic VEC using one overall significance evaluation framework that included the following factors:

- **Direction or Nature of the Effect -** Describes the difference or trend of the effect compared with existing baseline or pre-project conditions. Direction is described as:
    - Positive - A beneficial or desirable change;
    - Negligible - No measurable change[9]; or
    - Negative - An adverse or undesirable change.
- **Magnitude -** The predicted degree of disturbance the effect has on a component of the biophysical or socio-economic environment. Magnitude is described as:
    - Small - No definable or measurable effect or below established thresholds of acceptable change;
    - Moderate - Effects that could be measured and could be determined with a well designed monitoring program or are generally below established thresholds of acceptable change; or
    - Large - Effects that are easily observable, measured and described and outside normal range of variation, or exceeds established threshold of acceptable change.
- **Geographic Extent** - The spatial boundary within which the residual environmental effect is expected to occur. Geographic extent is described as:
    - Project Site/Footprint - Low level effect confined to the area where direct effects would occur [e.g., rights-of-way or component sites];

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[8] Ecological value; societal value; nature of the effect; magnitude of the effect; geographic extent of the effect; frequency of the effect; duration of the effect; and reversibility of the effect.
[9] Negiible effects were considered in the SSEA to be equivalent to no residual effect.

- Local Study Area – Moderate level effects that extend into the area beyond the Project Footprint into local surrounding areas [including potentially affected communities within a six km wide band centred on the route and similarly in the local area around other Project components] where direct and indirect effects can occur; or
- Project Study Area – High level effects that extend into the wider regional area, including surrounding communities, where indirect or cumulative effects may occur.

- **Duration -** The length of time that the predicted residual environmental effect would last. Duration is described as:
  - Short Term - Low level effects that occur once or are limited to site preparation or construction phase of the Project [0 to 5 years]);
  - Medium - Medium level effects that extend throughout construction and operational phases of the Project, i.e., up to 50 years; or
  - Long Term - High level effects that extend greater than 50 years.
- **Frequency** - How often the predicted residual environmental effect would occur. Frequency is described as:
  - Infrequent - Low level effects that occur only once or seldom during the life of the Project (e.g., initial clearing of right of way);
  - Sporadic/Intermittent - Moderate level effects that are sporadic or intermittent, occurring only occasionally and without any predictable pattern during the life of the Project (e.g., wildlife- vehicle collisions, bird strikes with transmission lines); or
  - Regular/Continuous - High level effects that occur continuously or at regular periodic intervals during the life of the Project.
- **Reversibility** - The potential for recovery from an adverse effect. Reversibility is described as:
  - Reversible - Effect that is reversible during the life of the Project or upon Project decommissioning; or
  - Irreversible - A long-term effect that is permanent [remains indefinite as a residual effect], even after Project decommissioning.

- **Ecological Importance**[10] - Ecological context of the biophysical VEC, sensitivity to disturbance, capacity to adapt to change. Includes the rarity, uniqueness and fragility within the ecosystem, and importance to scientific studies (i.e., rare species/habitats, critical habitats, breeding areas, etc). Ecological Importance is described as:
    - Low - The VEC is not rare or unique, resilient to imposed change, or of minor ecosystem importance and limited scientific importance;
    - Moderate - The VEC has some capacity to adapt to imposed change, is moderately/seasonally fragile or is somewhat important to ecosystem functions or relationship, or scientific investigation; or
    - High - The VEC is a protected/designated species or fragile with low resilience to imposed change, very fragile ecosystem, scientifically important.
- **Societal Importance** - Societal context of the socio-economic VEC, sensitivity to disturbance, capacity to adapt to change. Includes the value that individuals/communities place on components of the affected socio-economic and biophysical environments that are necessary for economic, social and cultural well-being (i.e., designated conservation or protected areas, infrastructure or heritage resources, or other important areas, activities, infrastructure and services, and environmental components). Societal Importance is described as:
    - Low - The VEC has no formal designation and not identified through the EA consultation/ATK processes or EA regulatory guidance as important for individuals' overall wellbeing;
    - Moderate - The VEC is protected regionally/locally and has been identified through the EAPC/ TK process or EA regulatory guidance as being somewhat important to sustaining the economic, social and cultural well being of individuals; or
    - High - The VEC is protected internationally, nationally or provincially.

The assessment of environmental effects also includes consideration of uncertainty. The level of uncertainty is a condition resulting from the adequacy of scientific information.

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[10] The EIS Scoping Document included in the criteria for assessment, "Ecological Value" and "Societal Value"; in undertaking the assessment it was determined that the terms "ecological importance" and "societal importance" more accurately descripted the relevant assessment criteria and were therefore used in the EIS.

Certain effects are easily predicted with a high level of certainty while other effects are unknown until they occur. Without adequate data or information even predictable environmental effects can be uncertain in terms of timing, magnitude, etc. Sources and degrees of uncertainty for each of the biophysical and socio-economic analyses are identified where relevant and feasible in the Chapter 8 environmental effects assessment.

The assessment of significance for environmental effects typically can determine a clear overall direction of change (positive, neutral or negative/adverse) for a specific VEC, although issues can arise when a specific species or habitat has positive effects in some areas and is harmed in other areas. The assessment of significance for socio-economic effects also considers the following:

- The relevance of perceptions in affecting how people view changes;
- Differing perspectives and values among different groups of people about their community and region, as well as their individual and family circumstances; and
- The problems inherent in assessing separately effects on different aspects or components (i.e., different VECs) of people's lives that each contribute to an overall "effect" on any group of people, i.e., effects may be either positive or negative, depending on the people affected, and may be both positive and negative when different groups are affected differently or when different VECs are considered for the same group.

Although both positive and negative environmental effects of the Project are assessed, the SSEA focuses on assessing the significance of potential negative or adverse environmental effects of the Project on VECs. Potential adverse effects that are likely were initially ranked where feasible based on three of the above criteria: duration, magnitude and geographic extent of the effects. The rating of these likely adverse residual effects used the following definitions (see Figure 4.2-2):

- **Significant - High Residual Effect:** Effects are long-term (high) duration, large (high) magnitude, and extend beyond the Local Study Area into the Project Study Area (high geographic extent).
- **Potentially Significant** - **Moderate Residual Effect:** Effects which fall between "high" and "low" in this list of initial definitions, and thus are "potentially significant" and merit consideration of additional significance criteria. In essence, "moderate" effects are either:
  - Within the Project Site/Footprint Area (low in extent) and high in both magnitude (large) and duration (long term);

- Beyond the Project Site/Footprint and into the Local Study Area (moderate in extent) and either high (large) in magnitude (regardless of duration), or moderate (medium) in magnitude and high in duration (long term); or
- High in geographic extent (Project Study Region) and either moderate or high (medium or large) in magnitude (regardless of duration).

- Not Significant or Insignificant or Negligible - Low Residual Effect:
  - Small or low in magnitude (regardless of duration or geographic extent), as the effect cannot be detected;
  - Low in geographic extent (e.g., Project Site/Footprint) and not high in both magnitude (large) and duration (long-term);
  - Short-term (low) or medium-term in duration, and not high (large) in magnitude or extent (i.e., not extend beyond the Local Study Area); or
  - No definable effects at any level or insufficient to be termed a low effect, and generally indistinguishable from Project baseline conditions.

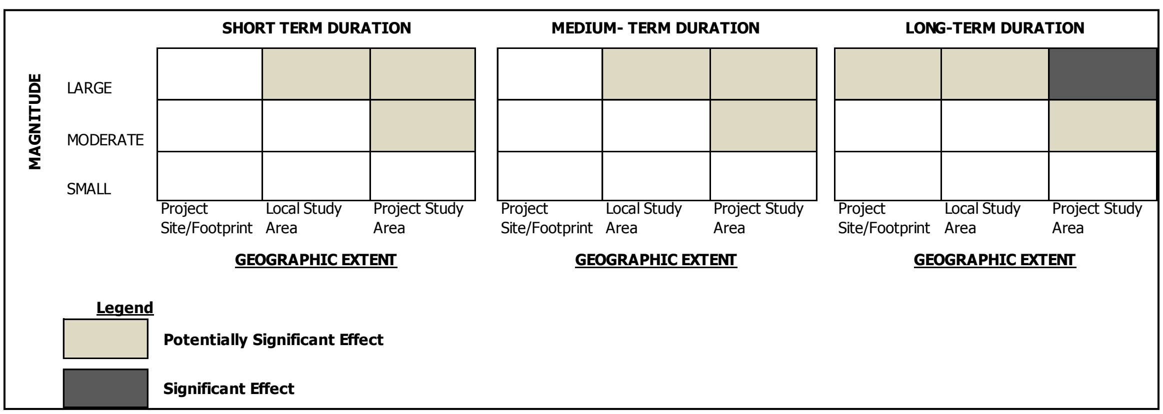

Figure 4.2-2: Potentially Significant and Significant Effects of the Project on VECs

For "potentially significant" and "significant" effects, initially ranked on the above basis, it is relevant to consider other significance criteria such as frequency, reversibility, and ecological/socio-economic importance or resilience. For example, if an environmental VEC is known to be highly resilient (i.e., adaptable and recovers well from disturbance), effects that would otherwise be considered significant could be determined as insignificant, despite magnitude and/or duration or the extent of the effects. Conversely, thresholds or guides may identify highly vulnerable environmental VECs where the loss of even a few individuals may affect the long-term status of the population. For socio-economic VECs, additional factors that may need to be considered include concurrent effects on other socio-economic VECs affecting the same group of people or others in the same community or region, effectiveness of mitigation measures and the degree to which the affected people have any control over mitigation (which may affect "vulnerability" in socio-economic terms), the extent to which the socio-economic component is affected by the Project (magnitude, frequency, reversibility of the effects), and overall confidence in the assessment after consideration of proposed mitigation measures.

In the event that significant adverse effects are predicted for residual effects on VECs, the likelihood is discussed in terms of both the probability of occurrence of the significant adverse effect and the degree of "scientific uncertainty". Based on this, a conclusion is made as to whether a significant adverse environmental effect is likely. Where relevant for adverse or negative residual effects, the potential sensitivity of the significance determination for a VEC to climate change has been considered.

Cumlative effects assessment, which has been considered throughout the SSEA from scoping to significance evaluation, is addressed in Section 4.3 below and Chapter 9. The sensitivity of significance determinations in Chapter 8 for adverse environmental effects is tested where relevant in Chapter 9 for cumulative effects related to reasonably foreseeable future projects that may not have been fully considered in the Chapter 8 assessment.

Proposed monitoring and follow up activities as reviewed in Chapter 11 address, among other matters, management plans to address issues of uncertainty, including uncertainty that affects determinations in the SSEA that adverse environmental effects are not expected to be significant.

4.3 CUMULATIVE EFFECTS ASSESSMENT

The Scoping Document (July 2010) provides that, in addition to assessing the direct and indirect environmental effects of the Project, the EIS will include an assessment of potential cumulative environmental effects, i.e., the potential for Project environmental effects to act in combination with effects of other past, present and/or reasonably foreseeable future projects.

Cumulative effects assessment is integral to the Project assessment approach and, as documented in Chapter 9, is based on the Scoping Document, Canadian Environmental Assessment Agency (CEAA) guidance (Cumulative Effects Assessment Practitioner's Guide 1999) as well as current best practices. The approach considers those adverse residual effects of the Project on VECs (as identified in the effects assessment provided in Chapter 8) that have the potential to act in concert with the effects of other past, existing or potential future projects or human activities. VECs with no residual effect or a positive residual effect from the Project, as identified in Chapter 8, are not included in the cumulative effects assessment. Further, the cumulative effect assessment only includes VEC's with an adverse effect of the Project that overlaps both temporally and spatially with the effects of other identified projects and human activities.

The full list of past, existing and future projects and human activities considered is provided in Chapter 9. The cumulative effects assessment considered expert knowledge, professional judgement, and analyses of environmental effects as required and feasible.

The effects of past and current projects and activities form an integral part of, and are incorporated into, the description of existing environment (Chapter 6). Accordingly, cumulative effects that are likely to result from the Project in combination with other past and current projects or activities have generally been assessed as part of the effects assessment in Chapter 8. Past projects are further addressed in the cumulative effects assessment in Chapter 9 only if ongoing effects from such other projects have not been adequately addressed in Chapter 8.

Future projects or human activities are included in the cumulative effects assessment as being reasonably foresseable where such projects or activities have already been approved and are being constructed or are planned to be constructed/carried out, or are in a planning and/or approvals process to be constructed/carried out. In addition, to be included, an identified project or human activity had to be currently defined in sufficient detail to allow effects to be characterized for cumulative effects assessment. The environmental effects of future projects not meeting these criteria were not considered.

4.4 ENVIRONMENTAL PROTECTION PROGRAM

The EIS describes proposed monitoring activities for the effects on the physical, biological and socio-economic environments arising from project pre-construction (i.e., site preparation), construction, operation and maintenance, and eventual decommissioning (Chapter 11). The EIS also describes the process for environmental protection and identifies mitigation measures, monitoring and other follow-up actions to be implemented through an Environmental Protection Program. Manitoba Hydro's program consists of a framework for implementing, managing, monitoring and evaluating environmental protection measures in a consistent and responsible manner with regulatory requirements, corporate commitments, best practices and public expectations.

Manitoba Hydro's Environmental Protection Program involves the development and implementation of Project-specific Environmental Protection Plans (EnvPPs). This program consists of an implementation framework that outlines how environmental protection is delivered and managed, and environmental protection plans that prescribe measures and practices to avoid and minimize adverse environmental effects. A preliminary EnvPP has been prepared for the Project as part of this EIS submission and is the main implementation tool for achieving effective implementation of mitigation measures and follow-up requirements identified in the environmental assessment.

Following receipt of the required environmental license, the required content tentatively identified in the preliminary EnvPP will be finalized taking into account supplementary provisions following from any conditions attached by the regulatory authorities to approval of the facilities. The final EnvPP will outline specific mitigative measures, including any required monitoring, to be implemented during the construction, operation and maintenance phases of the Project. The EnvPP will generally be implemented to accomplish the following goals:

- To address the terms and conditions outlined in the Environment Act License (Manitoba);
- To facilitate the mitigation of environmental effects throughout the life cycle of the Project by providing clear reporting protocols for field construction and operating personnel;
- To incorporate issues and concerns identified during the environmental assessment consultation process;
- To identify modifications to construction methods or schedules, summarize environmental sensitivities and mitigation actions;
- To provide specific information on practices to be utilized during the clearing, construction and operation and maintenance phases of the Project; and
- To monitor and where required modify clearing, construction and operation and maintenance activities to ensure that work proceeds in accordance with the EnvPP(s).

Upon final approval and completion of Project development, follow-up activities are used to verify the accuracy of the environmental assessment of a project or to determine the effectiveness of measures taken to mitigate adverse effects. The main components of environmental protection implementation and follow-up include the following:

- **Inspection** – To oversee adherence to and implementation of the terms and conditions of Project approval during Project construction and operation;
- **Effects monitoring** – To measure the environmental changes that can be attributed to Project construction and/or operation and check the effectiveness of mitigation measures;
- **Compliance monitoring** – To ensure that applicable regulatory standards and requirements are being met (e.g., for waste discharge and pollutant emissions);
- **Management** – Prepare plans to address important management issues, regulatory requirements and corporate commitments (e.g., access management, emergency response, waste management);
- **Environmental auditing** – To verify the implementation of terms and conditions, the accuracy of the predictions, the effectiveness of mitigation measures, and the compliance with regulatory requirements and standards; and
- **Updating and review** – Update and finalize the draft EnvPP to include stipulated license terms, conditions and other regulatory requirements, prepare construction phase EnvPPs and operational phase EnvPPs (one for each separate project component by phase), and to annually review and update the EnvPPs to ensure their continued effectiveness.

Further detail on Manitoba Hydro's Environmental Protection Program to be implemented for the Project is provided in Chapter 11 of this EIS and is more fully outlined in the Draft Environmental Protection Plan prepared as part of the EIS submission for regulatory review (see Chapter 11, Attachment 11-1).

4.5 REFERENCES

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