ADDITIONAL INFORMATION RELEVANT TO THE RESPONSE TO CEC RD 2 CEC-0102C:

CEC Rd 2 CEC-0102c requested a table providing total pre-development available habitat for wildlife VECs, habitat changes due to past and current projects, the Keeyask project and reasonably foreseeable future projects, and habitat remaining after considering all of these projects. Table A in the original response to CEC Rd 2 CEC-0102c provided this information for wildlife VECs in their respective Regional Study Areas (terrestrial Study Zones 5 and 4 for all but one of the VECs). The amounts of pre-development wildlife habitat were estimated using the ratio approach provided in the Information Request. Corresponding values were also provided for total terrestrial habitat with the difference being that pre-development area was a measured value.

In Information Requests CEC Rd 1 CEC-0022 and CEC Rd2 CEC-0102c, the CEC also requested that Study Zone 5 be extended eastward to encompass additional existing developments and future hydroelectric developments such as Bipole III (including the Keewatinoow Converter Station) and the proposed Conawapa Generation Project. In its responses, the Partnership explained how the effects of these projects on the VECs were already captured in the terrestrial assessments. The Partnership indicated in both responses that it believes the terrestrial study zones selected are appropriate for the effects assessment, including the cumulative effects assessment, for each VEC. This perspective has not changed and the Partnership is still confident in its assessment, as filed.

However, for information purposes and to more fully address the Information Requests from the CEC, additional work has been undertaken to provide coarse estimates for an eastern extension of Study Zone 5. This attachment to CEC Rd 2 CEC-0102c provides information on total terrestrial habitat (a supporting measure for the ecosystem diversity VEC and the overall terrestrial assessment), core area (an indicator measure for the intactness VEC) and available habitat for wildlife VECs in an eastern extension of the VEC's Regional Study Area (either for Study Zone 5 or 4, depending on the VEC). To correspond with the regional study areas for each VEC in the EIS, two variations of an eastern extension were used; one is roughly equivalent to an extension of Study Zone 5 (eastern extension A) and another that is roughly equivalent to Study Zone 4 (eastern extension B). Map 1 shows the eastern extension area boundaries.

For the total terrestrial habitat and core area indicator measures, pre-development areas and changes due to past, current and future projects in the area east of Study Zone 5 were measured using waterbody data, digital aerial photos, satellite imagery and/or available project footprint information.

For the wildlife VECs, terrestrial habitat mapping data compatible with that used for the Project assessment and consistent with the Project wildlife habitat models are not available for areas east of Study Zone 5. In order to provide the requested information, available habitat in the eastern extension was coarsely estimated using ratios comparable to that suggested by the CEC in CEC Rd 2 CEC-102c to address a similar absence of relevant data. Appendix 1 describes the methods used to complete the analysis (including the ratios and formulas used to coarsely estimate wildlife habitat areas) and provides detailed results. The following section summarizes the results of the analysis for an eastern extension of the VEC's Regional Study Area.

Summary of Results

Compared with the effects reported in the Project assessment, the additional information provided in this attachment demonstrates that, by using ratios to produce coarse habitat estimates, an eastward extension of Study Zone 5 (or Study Zone 4, depending on the VEC) would reduce adverse effects from past, current and future developments on total terrestrial habitat and core area (Table 1). This result occurs because past, current and future developments comprise a lower proportion of an eastern extension area than of Study Zone 5 or 4, leaving a greater proportion of unaffected habitat. This additional information also confirms that the Keeyask Generation Project is not expected to affect the amounts of total terrestrial habitat or core area in areas east of Study Zone 5.

The same pattern of reduced adverse effects from past, current and future projects on available wildlife habitat in an eastern extension of Study Zone 5 compared with the EIS results is also apparent for all of the wildlife VECs using the coarse estimates provided by ratios (summarized in Table 1). This pattern occurs because using simple ratios based on total terrestrial habitat causes the coarse estimates for available wildlife habitat to follow the reduced effects on total terrestrial habitat that have been measured.

The main limitation to using ratios to coarsely estimate wildlife habitat in an extension area east of Study Zone 5 is the implicit assumption that the terrestrial habitat composition of Study Zone 5 is quite similar to the eastern extension. Available coarse surface materials and soils mapping, a provincial report (Smith et. al 1998) and experience gained from conducting field studies for other projects east of Study Zone 5 indicate that the terrestrial habitat and waterbody composition of these two geographic areas are quite different. The area to the east is in a different Ecozone. As examples of the ecological differences, fen habitat for yellow rail and peatland complexes suitable for caribou calving habitat are thought to be considerably more prevalent in the eastern extension area while waterbodies large enough to provide bald eagle habitat are less prevalent. This main limitation is compounded by the fact that a ratio was also used as requested in CEC Rd 2 CEC-102c to estimate total available pre-development habitat in

the Keeyask Regional Study Area for the wildlife VECs (the limitations of this ratio-based method to extrapolate pre-development wildlife habitat were discussed in the response to CEC Rd 2 CEC-0102c).

As indicated in previous responses to Information Requests, the information provided in this attachment also shows that the Keeyask Generation Project is not expected to affect the amounts of available wildlife habitat in the area east of Study Zone 5. This conclusion reflects the estimated areas of direct and indirect effects from the Keeyask Project, which do not extend into the eastern extension area.

In conclusion, mapped changes in total terrestrial habitat and core area due to past, current and existing projects in the eastern extension areas provide a high-level indication that cumulative effects on the regional ecosystem east of Study Zone 5, including for wildlife, are relatively low, and are not expected to increase substantially with reasonably foreseeable future projects. However, while total terrestrial habitat and core area are often used as a “coarse filter” for evaluating and monitoring ecosystem and wildlife effects, a more refined and reliable analysis using detailed habitat mapping will be required in the future to provide a sufficient assessment of the specific effects of future projects when they become subject to regulatory environmental assessment. In particular, such refined analysis will be needed to account for the distinctly different habitat composition and ecological conditions in the area east of Study Zone 5 that will be directly affected by future projects located in this area.

Additionally, the information provided in this attachment for an eastern extension of Study Zone 5 to encompass additional existing developments and future hydroelectric developments such as Bipole III (including the Keewatinoow Converter Station) and the proposed Conawapa Generation Project demonstrates (with the above noted limitations) that such an extension would have the effect of reducing the terrestrial effects reported in the filing. The Partnership is confident in its assessment, as filed, and believes the terrestrial study zones selected are appropriate for the effects assessment, including the cumulative effects assessment, for each VEC.

Table 1. Percentages of Habitat Remaining in the Keeyask Regional Study Area, the Eastern Extension Only and the Combined Keeyask Regional Study Area and Eastern Extension

VEC	Indicator Measure	Study Zone/ Extension Area Used for VEC	% of Total Pre-development[1] Habitat Remaining in RSA After Past, Current, Keeyask Generation Project and Reasonably Foreseeable Future Projects		
			Regional Study Area	Eastern Extension Area Only	Regional Study Area plus Extension Area
	Source		*Column K in Table A*	*Column K in Table B*	*Column K in Table C*
Ecosystem Diversity	Total Terrestrial Habitat (ha)- Extension A	5/A	96.4	98.4	96.8
Intactness	Total core area larger than 1,000 ha as a percentage of land area - Extension A	5/A	80.7	90.0	81.7
Common Nighthawk	Habitat (ha)	4/B	75.4	96.7	86.7
Olive-sided Flycatcher	Habitat (ha)	4/B	79.8	97.0	88.9
Rusty Blackbird	Habitat (ha)	4/B	82.3	98.0	90.6
Bald Eagle	Habitat (ha)	5/A	97.5	98.1	97.6
Mallard	Habitat (ha)	4/B	92.4	94.8	93.7
Beaver	Habitat (ha)	4/B	80.0	96.4	88.7
Caribou	Winter Habitat (ha)	5/A	95.5	96.3	95.7
Caribou	Calving Habitat - Islands in Lakes (ha)	6/A	97.6	99.7	98.0
Caribou	Calving Habitat - Peatland Complexes (ha)	6/A	97.9	99.3	98.2
Caribou	Intactness (%)	6/A	92.9*	95.4	93.4
Moose	Habitat (ha)	5/A	95.4	96.8	95.7

[1] Pre-development refers to conditions prior to industrialized development, which is generally around 1950 with the exception of the rail line.

* Based on amount of habitat lost due to buffered human features only; additional loss of 28% habitat due to burns reduces availability to 65.3%.

Summary Note on the 2013 Fires

Three wildfires occurred in Study Zone 5 during this past summer. The resulting burned areas do not alter the terrestrial assessment filed by the Partnership for two reasons. First, as a component of the ecosystem-based approach to the assessment, the size and boundaries for Study Zone 5 were established so as to incorporate the ongoing occurrence of large fires. Second, the expectation when the EIS was filed was that it was inevitable that more large fires would occur in the Keeyask area at some time in the future. What was unknown was the timing – i.e., how many years into the future such fires would occur. The following provides a high-level overview of how large fires were incorporated into the assessment.

Fire is the dominant natural force that changes ecosystems in the northern Manitoba boreal forest. The species that live in the Keeyask region are used to coping with frequent large fires. When a fire occurs in one area, animals that require older vegetation (e.g., caribou) move to other areas while animals that prefer younger vegetation (e.g., moose, common nighthawk) move to the recent burns from areas that have become too old.

To support the ecosystem-based approach to the terrestrial assessment, the size and boundaries for the regional ecosystem (i.e., Study Zone 5) were determined by the area needed to maintain relatively constant proportions of the different habitat types as large fires occur over time. In other words, by the time a new area burns, other burned areas have become old enough to replace them. Basing the regional ecosystem size on fire ecology has two important implications for the terrestrial assessment. First, the Project region is large enough to support self-sustaining populations for most of the resident wildlife species as large fires occur over time. Second, even though large areas burned in the Project area this past summer, the terrestrial assessment conclusions are still valid. They have already taken into account the fact that large fires frequently occur, and fires will continue to occur in the region after the EIS submission. Since the burns affect some aspects of Project implementation (e.g., the approach to reservoir clearing) and Project effects monitoring, the Partnership commits to mapping the areas that were burned and incorporating these changes into Project construction planning and the design of the terrestrial environment monitoring program.

REFERENCES:

Smith, R.E., H. Veldhuis, G.F. Mills, R.G. Eilers, Fraser, W.R., and G.W. Lelyk. 1998. Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba: An Ecological Stratification of Manitoba's Natural Landscapes. Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada. Research Branch. Technical Bulletin 1998-9E.

Appendix 1: Detailed Information for the Study Zone Extension

This appendix details the methods used to estimate available wildlife habitat in the eastern extension and provides information for total terrestrial habitat, core area and available habitat for wildlife VECs in an eastern extension of the VEC's Regional Study Area (either for Study Zone 5 or 4, depending on the VEC).

Eastern Extension Areas

The boundary for the eastern extension suggested in the initial information request (CEC Rd 1 CEC-0022) was applied for this addendum with the exception that the eastern extremity is not as sharply narrowed so as to capture existing Conawapa geotechnical exploration activities (see Map 1).

To correspond with the overall approach of using VEC-specific regional study areas that reflect the differing requirements for providing a regional context for ecosystems and wildlife populations, two variations of the eastern extension area that roughly correspond with Study Zones 4 and 5 are used (see Map 1):

- **Extension B**: This extension variation essentially follows the boundaries suggested by the CEC information request (CEC Rd 1 CEC-0022), and is roughly equivalent to the use of Study Zone 4 as a VEC Regional Study Area. This extension variation is referred to as extension B in the tables and maps below. The total pre-development land area of extension B is approximately 216,742 ha.
- **Extension A**: This extension variation expands the area captured to be more equivalent to Study Zone 5 by advancing the northern boundary of the eastern extension further north to meet the northeast corner of Study Zone 5. This extension variation is referred to as extension A in the tables and maps below. The total pre-development land area of extension A is approximately 348,637 ha.

Area Estimation Methods

Total Terrestrial Habitat and Core Area

The methods used to determine total terrestrial habitat in the Regional Study Areas and in the eastern extension areas for the various development periods were as follows:

- Total pre-development terrestrial habitat: Equals the total size of the study area minus total pre-development waterbody area. Pre-development waterbody areas were obtained from the National Hydrography Network dataset for unflooded areas with the exception that waterbody area for Study Zone 4 was obtained from the large scale terrestrial habitat mapping for existing waterbodies, and from a combination of historical air photos and historical Project information for the

flooded areas. Total terrestrial habitat area equals total land area in the pre-development period;

- Losses due to past and current projects: Equals pre-development total terrestrial habitat area from the previous calculation minus total permanent human infrastructure area. Past and current project footprints generally obtained from air photos or satellite imagery (photo-interpreted form large scale air photos for Study Zone 4), and from available project information for the remaining areas;
- Losses due to the Keeyask Generation Project: From Table 2-17 of the Terrestrial Environment Supporting Volume (equals permanent habitat loss plus temporary habitat alteration in the Project Footprint); and,
- Losses due to reasonably foreseeable projects: From available project information.

Map 6-30 in the Response to EIS Guidelines shows human linear features and the locations of settlements in Study Zone 5. Map 2 below shows those features in Study Zone 4 and the eastern half of Study Zone 5, as well as the human infrastructure and waterbodies used to produce total land and total terrestrial habitat areas in the eastern extensions.

Since the ratios used to coarsely estimate wildlife habitat are influenced by the size of the past, current and reasonably foreseeable future projects, Appendix 3 details the past, current and future project footprint areas used in the tables produced for this attachment, and describes the sources for the total area change.

Available Habitat for Wildlife VECs

For the wildlife VECs, the ratios used to estimate pre-development habitat and habitat affected by past, current and future projects in the eastern extension areas were comparable to those suggested by the CEC in CEC Rd 2 CEC-102c and were as follows:

- Pre-development wildlife habitat in the eastern extension area equals the ratio of total pre-development terrestrial habitat in the extension area to total pre-development terrestrial habitat in the Regional Study Area multiplied by the total amount of pre-development VEC habitat in the VEC's Regional Study Area. The version of the eastern extension area used for these calculations is the one that is roughly equivalent to the VEC's Regional Study Area (i.e., extension A for VECs that use Study Zone 5 as their Regional Study Area and extension B for VECs that use Study Zone 4 as their Regional Study Area).
- The losses of wildlife habitat due to past, current and future projects in the VEC's eastern extension area equals the ratio of total terrestrial habitat losses in the extension area to total terrestrial habitat losses in the VEC's Regional Study Area multiplied by pre-development VEC habitat in the VEC's Regional Study Area.

Appendix 2 provides the calculations and values used to determine the ratios. Since the ratio used to coarsely estimate wildlife habitat losses is based on the areas of past, current and future project footprints, Appendix 3 details the project footprints used to develop the total project footprint areas in Table A and Table B.

RESULTS for TOTAL TERRESTRIAL HABITAT and the VECs

Four tables were developed to provide total terrestrial habitat, core area and available habitat for wildlife VECs for an eastern extension of the VEC's Regional Study Area (either for Study Zone 5 or 4, depending on the VEC). The following describes what each of the four tables represents:

- **Table A**: This table is from the original response to CEC Rd 2 CEC-0102c with the addition of the core area indicator measure for the intactness VEC and a row showing total terrestrial habitat loss in the project footprints. Table A provides values for Study Zones 5 and 4 from the Partnership's EIS filing (these study zones represent the regional study areas for all of the terrestrial VECs except for caribou). In this table, total available pre-development habitat for wildlife VECs was estimated as requested in CEC Rd2 CEC-0102c by extrapolating current available habitat using the ratio approach defined in the response to CEC Rd 2 CEC-0102c (the limitations of this ratio-based extrapolation method were discussed in the response to CEC Rd 2 CEC-0102c);
- **Table B**: This table provides information similar to Table A, but for an extension east of Study Zone 5. Total terrestrial habitat and core area values for extension A and B were measured from available information. For the wildlife VECs, total pre-development habitat and habitat losses due to past, current and reasonably foreseeable future projects were coarsely estimated using ratios comparable to that suggested by the CEC in CEC Rd 2 CEC-102c (the limitations of this method are discussed below);
- **Table C**: This table provides information similar to Table A for the combined area encompassed by Study Zone 5 and the eastern extension area. That is, Table C integrates results from Table A and Table B; and,
- **Table 1**: This table (which appears above) summarizes the high-level results from Tables A through C in one place for ease of comparison.

The third column of Tables A, B and C and Table 1 shows which Study Zone or extension area was used for the VEC.

Table A and Table B provide total terrestrial habitat loss in the project footprints only since the coarse estimation ratios use this value to prorate wildlife habitat into the eastern extension areas. Table 1 of CEC Rd 1 CEC-0021 provided total terrestrial habitat loss in project footprints plus the estimated maximum potential amount of indirect habitat alteration in areas surrounding the footprints, since this was the basis for the

ecosystem diversity, wetland function and priority plant VEC assessments. For comparison purposes, the areas of existing projects in Study Zone 5 used in Table A of this attachment and Table 1 of CEC Rd 1 CEC-0021 are 37,045 ha and 42,657 ha, respectively). The primary contributor to the project footprint area reduction was the removal of estimated Kelsey flooding that was actually outside of Study Zone 5 (only 155 ha of the 5,700 ha of flooding originally included is in Study Zone 5). This area reduction was partially offset by a few missing borrow areas outside of Study Zone 4 and a number of other small areas.

It is noted that using this updated project footprint area information for past and current projects would modify the current available and pre-development total terrestrial habitat areas in Study Zone 5 since a portion of these area were estimated by proration. The EIS version of current available and pre-development total terrestrial habitat areas are used to prorate wildlife habitat to the eastern extension areas for consistency with filed information. This makes very little difference for coarsely estimated wildlife habitat areas for the eastern extension areas because the ratios of current to pre-development total terrestrial habitat are so similar with either version of the project footprint data (see Appendix 3 for details). The updated version of the project footprint areas are used to quantify cumulative losses.

Total Terrestrial Habitat

Regional Study Area Results (Table A)

The footprints of past and current developments have removed approximately 37,045 ha of terrestrial habitat in Study Zone 5. Reasonably foreseeable future projects, including Keeyask, are expected to remove an additional 8,946 ha of terrestrial habitat. The combined terrestrial habitat losses from past, current and potential future projects would reduce total terrestrial habitat to 96.4% of pre-development area.

Eastern Extension Area Only Results (Table B)

Pre-development terrestrial habitat in extension A totaled 348,637 ha (Table B). Past and current projects reduced total terrestrial habitat in by approximately 1,705 ha in extension A and by 1,584 ha in extension B. Reasonably foreseeable future projects are expected to remove an additional 3,911 ha in each extension area. Cumulatively, all of the past, current and reasonably foreseeable future projects are predicted to affect 1.6% and 2.5% of the total pre-development terrestrial habitat area in eastern extension areas A and B, respectively. The Keeyask project is not expected to measurably affect the amount or composition of terrestrial habitat in either of these eastern extension areas.

Regional Study Area and Eastern Extension Combined Results (Table C)

As demonstrated in Table C, if Study Zone 5 and eastern extension area A are combined together, past and current projects have removed approximately 38,750 ha of terrestrial habitat relative to pre-development conditions. Past and current projects have affected approximately 37,045 ha of terrestrial habitat in Study Zone 5 (Table A) and 1,559 ha in extension area A (Table B) for a combined total area of 38,750 ha (Table C). Reasonably foreseeable future projects, along with Keeyask, are expected to reduce total terrestrial habitat by an additional 8,946 ha in Study Zone 5 and 3,911 ha in the eastern extension for a total area of 12,857 ha for the combined Study Zone 5 and eastern extension. This would mean that, cumulatively, total terrestrial habitat losses with past, current and all reasonably foreseeable future projects would reduce total terrestrial habitat by approximately 3.2%, or to 96.8% of total pre-development area for the combined area encompassed by Study Zone 5 and eastern extension A. By comparison, Table A indicates that cumulative effects on total terrestrial habitat in Study Zone 5 without an eastern extension is a reduction of approximately 3.6% to 96.4% of the pre-development area.

Intactness

For the intactness VEC, core areas for the eastern extension area were obtained as the land areas left after buffering human features in the same manner as for the Study Zone 5 analysis (i.e., 200 m for transmission lines and cutlines; 500 m for all other features). While the cutline data for the eastern extension was incomplete because these features have not been fully mapped for this area, including the missing cutlines is not expected to substantially alter on the core area results since it is expected that most of the missing cutlines are in close proximity to each other or other human features (i.e., large portions of the individual cutline buffers will be overlapping). Additionally, the additional buffered area of any missing isolated cutlines would have to be very large to reduce core area from its current high level to a moderate level (i.e., from 90% to 65:; more than 3,000 ha of additional buffered area needed to reduce core area by 1%). Also, the reported total core area percentage is for core areas larger than 1,000 ha. The EIS also reports total core area percentage for core areas larger than 200 ha, which is considered a suitable minimum size for most wildlife species.

Map 3 below shows existing core areas in both eastern extension areas and in the eastern half of Study Zone 5.

Table B indicates that, in the eastern extension areas, past and current projects have reduced total core area in core areas larger than 1,000 ha to 92% of land area in extension area A. Reasonably foreseeable future projects are expected to further reduce core area to 90% of land area. The Keeyask Project is not expected to measurably affect core area in the eastern extension areas.

As demonstrated in Table C, if Study Zone 5 and extension area A are combined together, total core area in core areas larger than 1,000 ha is cumulatively reduced by past, current and reasonably foreseeable projects to approximately 82% of land area. Past and current projects have cumulatively reduced total core area in core areas larger than 1,000 ha to approximately 83% of land area in Study Zone 5 (Table A) and to 92% of land area in extension area A (Table B) for a total reduction to approximately 85% of land area in the combined Study Zone 5 and extension area A (Table C). Reasonably foreseeable future projects, along with Keeyask, are expected to reduce total core area in core areas larger than 1,000 ha to approximately 81% of land area in Study Zone 5 and to 90% of land area in extension area A for a total reduction to 82% for the combined Study Zone 5 and eastern extension. By comparison, Table A without an eastern extension indicates that after considering the combined effects of past, current and reasonably foreseeable future projects, total core area in core areas larger than 1,000 ha is approximately 81% of the pre-development area.

Wildlife VECs

As noted above, the amount of available habitat for wildlife VECs within the eastern extension area was derived using ratios comparable to that suggested by the CEC in CEC Rd 2 CEC-102c (see above for details).

As was the case for total terrestrial habitat and core area, Table A provides available habitat values for the VEC's Regional Study Area, Table B provides corresponding values for the equivalent eastern extension area and Table C presents the results obtained when the eastern extension area is combined with the Keeyask Regional Study Area (either Study Zone 5 and extension A or Study Zone 4 and extension B, depending on the wildlife VEC).

Table 1 presents the percentages of total wildlife habitat remaining after past, current and reasonably foreseeable future projects for the VEC's Regional Study Area, the equivalent eastern extension and the combined area included in the VEC's Regional Study Area and eastern extension.

Bald eagle and common nighthawk demonstrate the range of differences in available habitat arising from the application of the formulas (Table 1). Remaining bald eagle habitat increases from 97.5% in the Keeyask Regional Study Area to 97.6% in the combined Regional Study Area and eastern extension while the corresponding values for common nighthawk increase from 75.4% to 86.7%. The larger differences occur for wildlife VECs that use Study Zone 4 as their Regional Study Area because projects comprise a higher proportion of the smaller study area and because the cumulative project footprint is smaller in the extension area.

As noted in the Summary section at the beginning of this attachment, Table 1 demonstrates that the same pattern of differences is observed for all of the wildlife VECs when the percentage of area remaining in the eastern extension (Table B) or the combined area (Table C) is compared with the corresponding percentage for the Regional Study Areas (Table A). That is, the available habitat remaining in the eastern extension alone is always a higher percentage of pre-development habitat than reported for the Regional Study Area, as are the corresponding percentages for the combined Regional Study Area and eastern extension. This pattern results because the same two ratios determine the wildlife habitat areas for each VEC that uses the same Regional Study Area.

As noted in the introduction, the main limitation to using ratios to coarsely estimate wildlife habitat in an extension area east of Study Zone 5 is the implicit assumption that the terrestrial habitat composition of Study Zone 5 is quite similar to the area to the east, which is not the case.

Bald eagle provides a good example of the limitations of using ratios to estimate available habitat. Bald eagle nest in treed riparian habitats adjacent to large rivers and lakes. The amount of available riparian or shoreline habitat for bald eagles has actually increased, not decreased since pre-development. This increase is attributed to hydroelectric projects and creation of reservoirs which expand shoreline through flooding (see original response to CEC RD 2 CEC-0102c). Prorating current bald eagle habitat in Study Zone 5 to estimate the amount of pre-development habitat in the eastern extension therefore gives inaccurate results in Tables B and C. Additionally, waterbodies large enough to provide bald eagle habitat are less prevalent in the eastern extension area which means less suitable shoreline for bald eagles and proportionately less bald eagle habitat.

Table A. Habitat and Intactness Amounts for the Keeyask Regional Study Areas (Study Zone 5 or 4) – DATA FROM ORIGINAL RESPONSE TO CEC RD 2 CEC-0102c

VEC	Indicator Measure	Study Zone Used for VEC RSA	Current Available for VEC	Current Total Terrestrial Habitat (ha)	Proportion for Extrapolation	Total Terrestrial Habitat Pre-development Habitat in RSA (ha)	Total Available Pre-development VEC Habitat in Regional Study Area (ha)	Change Due to:			Total Habitat Change from Past, Current & Potential Future Projects (ha)	% of Total Available Pre-development VEC Habitat in RSA Remaining
								Past & Current Projects	Keeyask	Potential Future Projects*		
	Column	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***	***K***
	Calculation	*n/a*	*n/a*	*n/a*	*B/C*	*n/a*	*D*E*	*n/a*	*n/a*	*n/a*	*G+H+I*	*(F+J)/F*100*
Ecosystem Diversity	Total Terrestrial Habitat Loss in Project Footprints (ha)[1]	5	n/a	1,227,250	n/a	1,269,907	n/a	-37,045	-6,823	-2,123	-45,991	96.4%
Ecosystem Diversity	Total Terrestrial Habitat Loss in Project Footprints and Estimated Maximum Potential Indirect Alteration in Surrounding Areas (ha)[2]	5	n/a	1,227,250	n/a	1,269,907	n/a	-56,836	-9,416	-4,865	-71,117	94.4%
Intactness	Total core area larger than 1,000 ha as a percentage of land area	5	n/a	n/a	n/a	n/a	99.0%	-16.5%	-0.7%	-1.1%	-18.3%	80.7%
Common Nighthawk	Habitat (ha)	4	19,172	162,487	0.12	192,134	22,670	-3,498	-1,926	-143	-5,586	75.4%
Olive-sided Flycatcher	Habitat (ha)	4	9,513	162,487	0.06	192,134	11,249	-1,736	-470	-63	-2,276	79.8%
Rusty Blackbird	Habitat (ha)	4	39,358	162,487	0.24	192,134	46,539	-7,181	-921	-141	-8,248	82.3%
Bald Eagle	Habitat (ha)	5	34,354	1,227,250	0.03	1,269,907	35,548	-1,194	380	-69	-883	97.5%
Mallard	Habitat (ha)[3]	4	68,860	216,741	0.32	221,509	70,375	-1,515	-2,958	-902	-5,375	92.4%
Beaver	Habitat (ha)	4	20,656	163,879	0.13	192,134	24,217	-3,561	-1,102	-177	-4,840	80.0%
Caribou	Winter habitat (ha)[4]	6	850,307	1,228,642	0.69	1,269,907	878,865	-28,558	-6,686	-4,119	-39,363	95.5%
Caribou	Calving Habitat - Islands in Lakes (ha)	6	14,271	2,691,509	0.01	2,733,459	14,493	-222	-132	0	-354	97.6%
Caribou	Calving Habitat - Peatland Complexes (ha)[5]	6	189,969	2,071,295	0.09	2,114,636	193,944	-3,975	-69	-92	-4,136	97.9%
Caribou	Intactness (percentage of region area)[6]	6	2,015,340	3,050,226	NA	3,050,226	3,050,226	-193,214	-7,389	-16,153	-216,756	92.9%**
Moose	Habitat (ha)	5	1,228,505	1,228,642	1.00	1,269,907	1,269,765	-41,260	-12,116	-4,948	-58,324	95.4%

[1] Wildlife habitat extrapolation formulas are based on terrestrial habitat losses in project footprint areas only. See next table row for areas included in the response to CEC-0021. Note that current area is less than the pre-development area minus change due to past and current projects because these values originally included a component that prorated areas to Study Zone 5. The EIS values are used to maintain consistency with filed information. The ratio of current to pre-development areas is so similar in both versions of current and pre-development total terrestrial habitat that there is no noticeable difference in the habitat areas extrapolated to the extension areas (see Appendix 3 for details).

[2] These are the areas included in the response to CEC-0021. Wildlife habitat extrapolation formulas are based on terrestrial habitat losses in project footprint areas only.

[3] Mallard habitat includes both terrestrial and aquatic components

[4] Caribou winter habitat calculations based on coarse habitat types information available for Study Zone 5 only.

[5] For Caribou Regional Study Zone 6, mapping of peatland calving complexes is limited to 69% coverage in this Study Zone, including terrestrial habitat and water. Percentage of available habitat in Study Zone 6 expected to be higher because the human footprint occupies a smaller proportion of the expanded area than it does in Study Zone 5.

[6] Calculated intactness estimates based on entire range of Study Zone 6 including burned areas and lakes (i.e., total terrestrial habitat plus portions of waterbodies without emergent vegetation).

* Reported area is incremental to Keeyask Project. ** Based on amount of habitat lost due to buffered human features only; additional loss of 28% habitat due to burns reduces availability to 65.3%.

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Table B. Habitat and Intactness Amounts for the Eastern Extension Areas Only

VEC	Indicator Measure	Extension Area Used for VEC	Total Terrestrial Habitat Pre-development in VEC Regional Study Area (ha)	Total Terrestrial Habitat Pre-development Habitat in VEC Extension Area (ha)	Proportion for Extrapolation	VEC Available Pre-development Habitat in Regional Study Area (ha)	VEC Available Pre-development Habitat in Extension Area (ha)	Change Due to:			Total Habitat Change from Past, Current & Potential Future Projects (ha)	% of Total Available Pre-development VEC Habitat in RSA Remaining
								Past & Current Projects	Keeyask	Potential Future Projects		
	Column	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***	***K***
	Calculation	*n/a*	*1,269,907 for VECs that use extension A and 192,134 for VECs that use extension B*	*Column E - first area for extension A and second area for extension B*	*C/B*	*Column F in Table A for wildlife VECs*	*D*E for wildlife VECs*	*C * Ratio A or D for wildlife VECs[1]*	*n/a*	*C * Ratio C or F for wildlife VECs[1]*	*G+H+I*	*(F+J)/F*100*
Ecosystem Diversity	Total Terrestrial Habitat Loss (ha)- Extension A	A	n/a	n/a	n/a	n/a	348,637	-1,705	0	-3,911	-5,616	98.4%
Ecosystem Diversity	Total Terrestrial Habitat Loss (ha)- Extension B	n/a	n/a	n/a	n/a	n/a	216,742	-1,584	0	-3,911	-5,495	97.5%
Intactness	Total core area larger than 1,000 ha as a percentage of land area - Extension A	A	n/a	n/a	n/a	n/a	99.9%	-8.3%	0.0%	-1.6%	-9.9%	90.0%
Common Nighthawk	Habitat (ha)	B	192,134	216,742	1.13	22,670	25,574	-193	0	-638	-831	96.7%
Olive-sided Flycatcher	Habitat (ha)	B	192,134	216,742	1.13	11,249	12,689	-96	0	-281	-377	97.0%
Rusty Blackbird	Habitat (ha)	B	192,134	216,742	1.13	46,539	52,500	-396	0	-630	-1,026	98.0%
Bald Eagle	Habitat (ha)	A	1,269,907	348,637	0.27	35,548	9,759	-55	0	-127	-182	98.1%
Mallard	Habitat (ha)	B	192,134	216,742	1.13	70,375	79,388	-84	0	-4,027	-4,111	94.8%
Beaver	Habitat (ha)	B	192,134	216,742	1.13	24,217	27,319	-197	0	-790	-987	96.4%
Caribou	Winter habitat (ha)[2]	A	1,269,907	348,637	0.27	878,865	241,281	-1,314	0	-7,588	-8,902	96.3%
Caribou	Calving Habitat - Islands in Lakes (ha)	A	1,269,907	348,637	0.27	14,493	3,979	-10	0	0	-10	99.7%
Caribou	Calving Habitat - Peatland Complexes (ha)	A	1,269,907	348,637	0.27	193,944	53,245	-183	0	-169	-352	99.3%
Caribou	Intactness (%)	A	1,269,907	348,637	0.27	3,050,226	837,400	-8,893	0	-29,757	-38,650	95.4%
Moose	Habitat (ha)	A	1,269,907	348,637	0.27	1,269,765	348,598	-1,899	0	-9,115	-11,014	96.8%

[1] See Appendix 2 for ratios and calculations used to derive the ratios.

[2] Overstates the habitat loss because it is based on the Study Zone 5 equivalent (Table A uses Study Zone 5) whereas Study Zone 6 is the caribou Regional Study Area, and human disturbance is negligible beyond Study Zone 5. Study Zone 5 used for the Table A calculations due to lack of suitable data for Study Zone 6.

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402 **Table C. Habitat and Intactness amounts for the combined Keeyask Regional Study Area and the Eastern Extension**

VEC	Indicator Measure	Study Zone Used for VEC RSA	Total Available Pre-development Habitat in Regional Study Area (ha)	Change Due to:			Total Habitat Change from Past, Current & Potential Future Projects (ha)	% of Total Available Pre-development VEC Habitat in RSA Remaining
				Past & Current Projects	Keeyask	Potential Future Projects		
	Column	***A***	***F***	***G***	***H***	***I***	***J***	***K***
	Calculation	*n/a*	*Column F in Table A + Column F in Table B for Wildlife VECs*	*Column G in Table A + Column G in Table B*	*Column H in Table A + Column H in Table B*	*Column I in Table A + Column I in Table B*	*G+H+I*	*(F+J)/F*100*
Ecosystem Diversity	Total Terrestrial Habitat (ha)- Extension A	5/A	1,618,544	-38,750	-6,823	-6,034	-51,607	96.8%
Intactness	Total core area larger than 1,000 ha as a percentage of land area - Extension A	5/A	99.2%	-14.7%	-2.3%	-1.2%	-18.1%	81.7%
Common Nighthawk	Habitat (ha)	4/B	48,244	-3,691	-1,926	-781	-6,398	86.7%
Olive-sided Flycatcher	Habitat (ha)	4/B	23,938	-1,832	-470	-344	-2,646	88.9%
Rusty Blackbird	Habitat (ha)	4/B	99,039	-7,577	-921	-771	-9,269	90.6%
Bald Eagle	Habitat (ha)	5/A	45,307	-1,249	380	-196	-1,065	97.6%
Mallard	Habitat (ha)	4/B	149,763	-1,599	-2,958	-4,929	-9,486	93.7%
Beaver	Habitat (ha)	4/B	51,536	-3,758	-1,102	-967	-5,827	88.7%
Caribou	Winter Habitat (ha)	5/A	1,120,146	-29,872	-6,686	-11,707	-48,265	95.7%
Caribou	Calving Habitat - Islands in Lakes (ha)	6/A	18,472	-232	-132	0	-364	98.0%
Caribou	Calving Habitat - Peatland Complexes (ha)	6/A	247,189	-4,158	-69	-261	-4,488	98.2%
Caribou	Intactness (%)	6/A	3,887,626	-202,107	-7,389	-45,910	-255,406	93.4%
Moose	Habitat (ha)	5/A	1,618,363	-43,159	-12,116	-14,063	-69,338	95.7%

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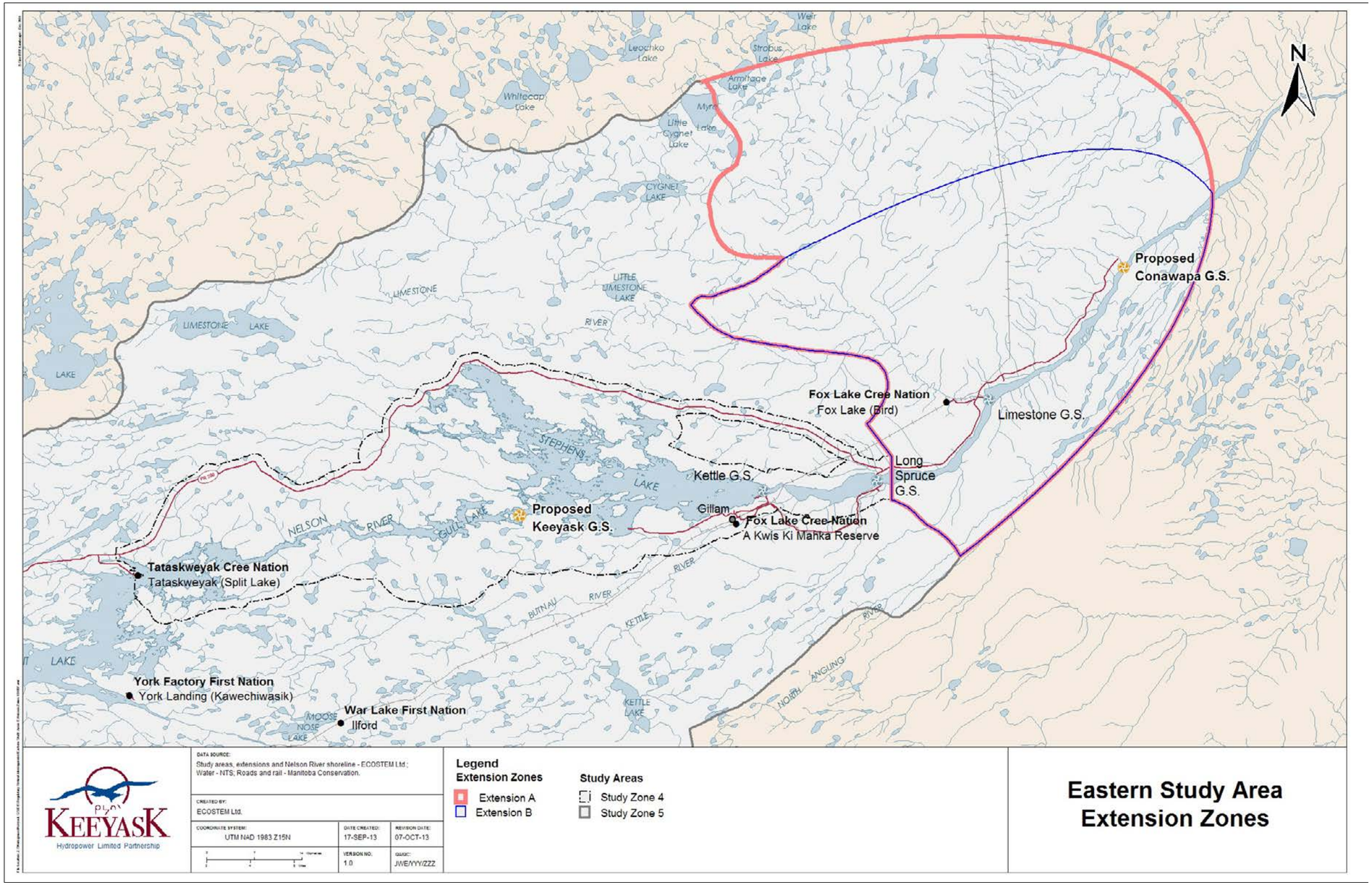

Map 1. Eastern Extension Area A and B

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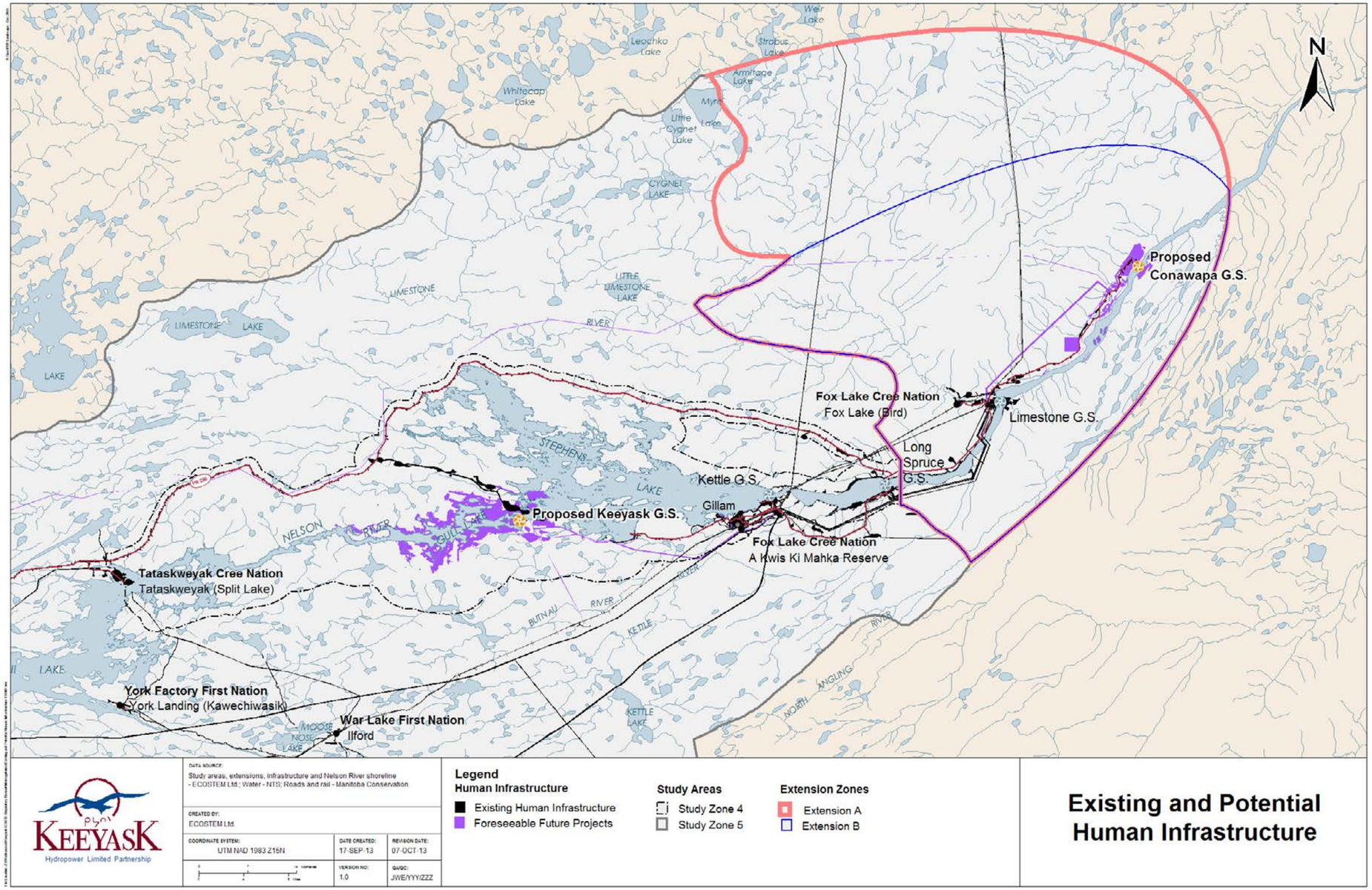

Map 2. Human Infrastructure and Waterbodies in the Eastern half of Study Zone 5 and in the Eastern Extension Areas

Note: Footprints for future projects are based on available information and may change as plans become more refined and based on actual construction practices.

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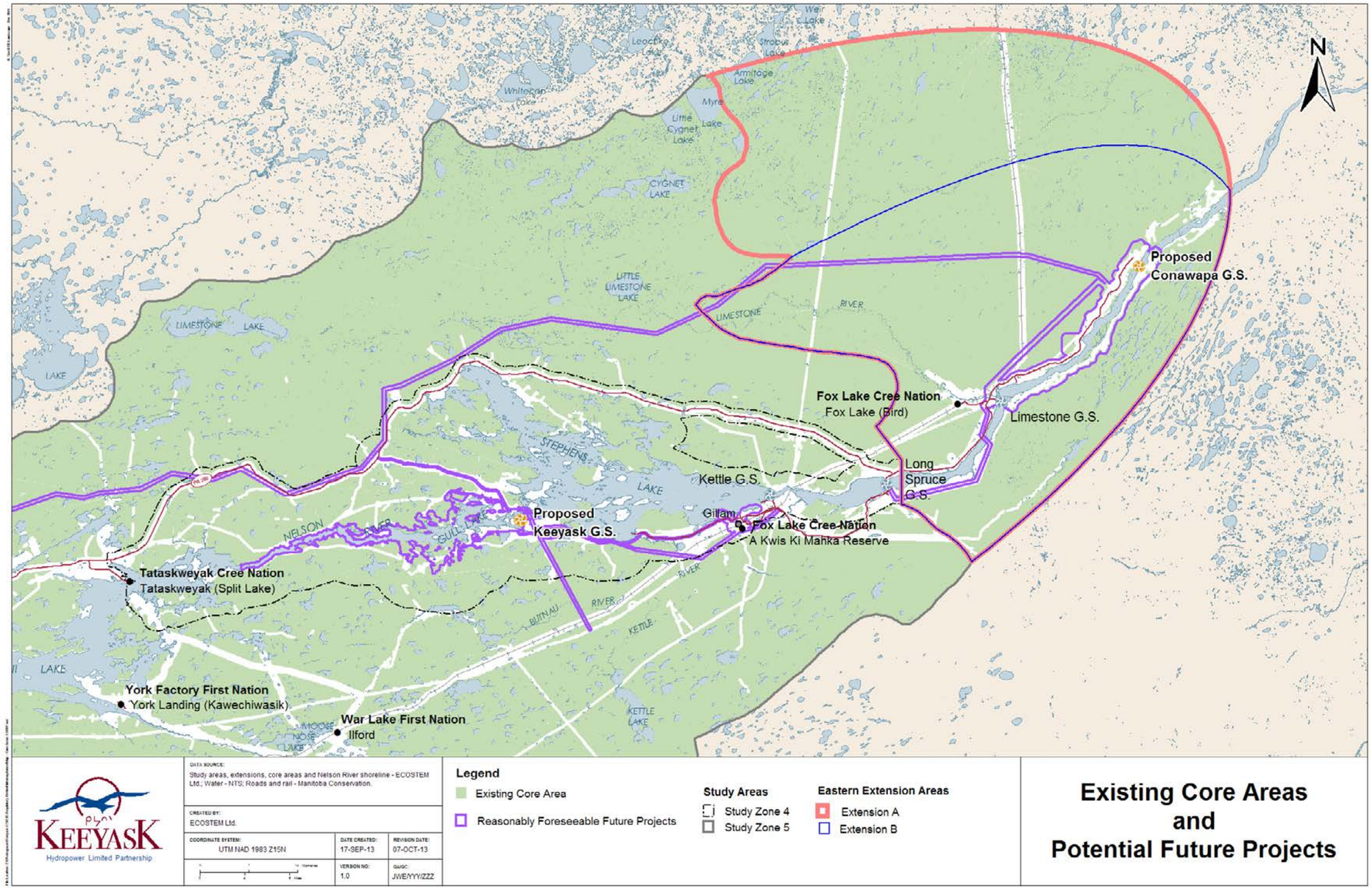

Map 3. Core Area in the Eastern Half of Study Zone 5 and in the Eastern Extension Areas

Note: Footprints for future projects are based on available information and may change as plans become more refined and based on actual construction practices.

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Appendix 2: Ratio Calculations

This appendix provides the calculations used to derive the ratios used to determine available wildlife VEC habitat in the relevant eastern extension area.

Table D. Percentages of Habitat Remaining in the Keeyask Regional Study Area, the Eastern Extension Only and the Combined Keeyask Regional Study Area and Eastern Extension

	Source		
	Past and current	**Keeyask**	**Future Projects**
VECs that use Study Zone 5 as their Regional Study Area			
Total terrestrial habitat loss (ha) in Study Zone 5	37,045	6,823	2,123
Total terrestrial habitat loss (ha)in Extension Area A	1,705	0	3,911
Ratio applied to VEC's pre-development habitat area in Study Zone 5	0.05	0.00	1.84
VECs that use Study Zone 4 as their Regional Study Area			
Total terrestrial habitat loss (ha) in Study Zone 4	28,705	6,823	876
Total terrestrial habitat loss (ha) in Extension Area B (ha)	1,584	0	3,911
Ratio applied to VEC's pre-development habitat area in Study Zone 4	0.06	0.00	4.46

Appendix 3: Land Areas for Past, Current and Reasonably Foreseeable Future Projects

Since the ratio used to coarsely estimate wildlife habitat losses is based on the areas of project footprints, this appendix provides the past, current and reasonably foreseeable future project footprint areas that were used to develop the total project footprint areas in Table A and Table B. Table E provides these areas for Study Zones 4 and 5 while provides the areas for eastern extensions A and B. Map 2 shows all of the features that have been included for the eastern extension area, for Study Zone 4 and for the eastern half of Study Zone 5.

The areas for some project features provided in Table E and Table F differ from those reported in the EIS or responses to Information Requests. There are several potential valid reasons for differing areas being provided by alternative sources, some of which were described in responses to Information Requests that asked for clarification as to why reported areas for the same feature were not identical in all sources (e.g., CEC Rd 2 CEC-0102b). The primary reasons for differing areas being provided by alternative sources are:

- The "study area" is different and the feature extends outside of the study area (e.g., use of Split Lake RMA versus Study Zone 5);
- The reported value may be total footprint area, total land area, total terrestrial habitat or total native terrestrial habitat;
- Some footprints overlap each other (e.g., flooding covers a borrow area; transmission line right-of-way crosses a road). The area that would be double-counted where features cross over each other may or may not be removed; and/or,
- In the case of terrestrial habitat values, the total can either be for the footprint only or for the footprint plus the estimated maximum potential amount of indirect habitat alteration surrounding the footprint.

Based on the above, the type of reported value is dependent on its context, which is a valid reason for differences between various sources.

Table E and Table F provide the footprint areas used to produce the total terrestrial habitat losses from past, current and reasonably foreseeable future projects reported in Tables A and B. In general, overlaps with other project footprints have been removed. This can produce a large reduction in area compared with values reported in other sources, particularly for future projects. Additionally, limited effort was allocated to determining where one "project" ended and another started. As examples, borrow areas along PR 280 are generally lumped with the PR 280 footprint and roads going to settlements may be typed as either road or the settlement they enter.

While some small project footprints may be missing from these tables, the overall results in Tables B, C and 1 would change little even if the time was taken to find and map missing small footprints because

their total are would need to amount to more than 1,600 ha to create a 0.1% reduction in total terrestrial habitat remaining.

As noted in the Results for Total Terrestrial Habitat Section, the total terrestrial habitat loss from past and current projects in Study Zone 5 is 37,045 ha, which is 5,612 ha lower than the 42,657 ha included in the total used in CEC-0102c. The primary contributor to the project footprint area reduction was the removal of estimated Kelsey flooding that was actually outside of Study Zone 5 (5,700 ha of flooding was actually 155 ha). This area reduction was partially offset by a few missing borrow areas outside of Study Zone 4. The updated version of the project footprint areas area was used to quantify cumulative losses.

It is noted that an implication of this updated project footprint area information for past and current projects is that current and pre-development total terrestrial habitat area in Study Zone 5 are slightly different than reported in the EIS. This occurs because a component of both of these areas in the EIS was estimated by prorating areas from Study Zone 4. Using the more refined project footprint mapping completed for this attachment produces pre-development total terrestrial habitat area of 1,262,248 ha which compares with the EIS value 1,269,907 ha. Because the amount of current available terrestrial habitat in the portion of Study Zone 5 outside of Study Zone 4 was prorated using a ratio that incorporated the existing human footprint, the refined project footprint mapping also reduces current available terrestrial habitat in Study Zone 5 to 1,225,203 ha. The EIS version of current available and pre-development total terrestrial habitat areas are used to prorate wildlife habitat to the eastern extension areas for consistency with filed information. This makes very little difference for coarsely estimated wildlife habitat areas for the eastern extension areas because the ratios of current to pre-development total terrestrial habitat are so similar with either version of the project footprint data. The pre-development area change relative to the refined values is less than 1% and the ratio of current to pre-development terrestrial habitat in the previously reported and refined values are very similar (0.966 compared with 0.971). In other words, either version would produce virtually the same wildlife VEC habitat areas in the eastern extension areas using the estimation ratios defined in Appendix 2.

478 **Table E. Land Areas for Past, Current and Reasonably Foreseeable Future Projects in Study Zones 4**
479 **and 5**

Project/ Feature Type	Feature	Total Area (ha)*		
		Study Zone 4	Study Zone 5 Area Outside of Study Zone 4	Study Zone 5
Existing				
Road	PR 280	1,071	1,070	2,141
	Butnau Road	83		83
	Winter road	15	240	255
	Other	77	522	599
Railway		72	340	412
Settlement	Gillam, Split Lake, York, War Lake	305	439	745
	Thompson		2,169	2,169
Kelsey	Generating Station		159	159
	Flooding[1]		155	155
Kettle	Generating Station	341	1	342
	Flooding	23,800		23,800
Limestone	Flooding	17		17
Long Spruce	Generating Station	225		225
	Flooding	1,429		1,429
Keeyask Infrastructure Project		794		794
Transmission	BP I and II - Radisson to Dorsey	15	919	934
	Henday to Radisson - DC	36	21	57
	Kelsey - multiple lines converging		15	15
	Kelsey to Mystery Lake		246	246
	Kelsey to Oxford House		151	151
	Kelsey to Radisson	28	841	869
	Kelsey to Split Lake		269	269
	Kettle to Limestone	21	29	51
	Kettle to Thompson (INCO)		335	335
	Long Spruce to Henday	18	0	18
	Long Spruce to Radisson	112	16	127
	Mystery Lake to Laurie River		73	73
	Radisson to Churchill	14	53	67
	Radisson to Kelsey	38	47	85
	Other	47	20	67
Other	Borrow areas, ditches, clearings, abandoned roads	175	232	407
Total Existing Before Overlaps Removed		**28,734**	**8,366**	**37,100**
Total Existing After Overlaps Removed				**37,045**
Total Land Area		*192,134*	*1,077,773*	*1,269,907*
Existing Projects as a Percentage of Total Land Area		*15.0%*	*0.8%*	*2.9%*

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Project/ Feature Type	Feature	Total Area (ha)*		
		Study Zone 4	Study Zone 5 Area Outside of Study Zone 4	Study Zone 5
Future[2]				
Settlement	Gillam Redevelopment	142		142
Bipole III	Right-of-way	248	1,140	1,388
Keeyask Transmission	Construction Power	63	51	114
Keeyask Transmission	Outlet Power	448	88	536
Keeyask Generation Project[3]		6,823		6,823
Total Future After Overlaps Removed		7,725	1,278	8,946
Total Land Area		*192,134*	*1,077,773*	*1,269,907*
Future Projects as a Percentage of Total Land Area		*4.0%*	*0.1%*	*0.7%*
Existing and Future Projects as a Percentage of Total Land Area		*19.0%*	*0.9%*	*3.6%*

* Area will often be different from other sources because it is land area only and/or the overlaps with other footprints have been removed (see text for explanation and additional factors).

[1] Used 5,700 ha for Study Zone 5 in the EIS. Was estimated by roughly prorating from Split Lake PPER. Subsequent mapping of the flooded area has reduced the flooding footprint by 5,545 ha to 155 ha.

[2] Footprints for future projects are based on available information and may change as plans become more refined and based on actual construction practices.

[3] Lower total area than Project description because flooded surface water and existing human footprints (622 ha) are not included. The EIS also includes an additional 2,592 ha for estimated maximum potential indirect terrestrial habitat alteration in areas surrounding the project footprint for a total of 9,416 ha of terrestrial habitat affected after 30 years of operation.

Table F. Land Areas for Past, Current and Reasonably Foreseeable Future Projects in Extension Areas A and B

Project/ Feature Type	Feature	Total Area (ha)*		
		Extension B	Extension A Area Outside of Extension B	Extension A
Existing				
Road	PR 290	39		39
Railway	Abandoned Rail Line to Port Nelson (decommissioned)[1]	0		0
	Amery Train Station[2]	0		0
	Hudson Bay Railway	103	36	139
Settlement	Bird - Community and airstrip	77		77
Other	Communication Tower[3]	0.1		0.1
Conawapa	Access Road	71		71
	Borrow and Cleared Areas	99		99
Henday	Converter Station	24		24
	Henday to Radisson - 500 kV DC	67		67
	Long Spruce to Henday - 230 kV AC Collector lines	197		197
Limestone	Borrow and Cleared Areas	339		339
	Generating Station	227		227
	Sundance Camp	37		37
	Flooding	193		193
Transmission	Ground Electrode	46		46
	Kettle to Limestone - KN 36 - 138 kV AC	30		30
	Limestone To Henday	12		12
	Radisson to Churchill - RC60 - 138 kV AC	47	85	132
	Spare Nelson River Crossing - 500 kV DC	30		30
Total Existing Before Overlaps Removed		**1,638**	**121**	**1,759**
Total Existing After Overlaps Removed				**1,705**
Total Land Area		*215,161*	*124,488*	*339,649*
Existing Projects as a Percentage of Total Land Area		*0.7%*	*0.1%*	*0.5%*
Future[4]				
Bipole III	Construction Power Station	2		2
	Keewatinoow Converter Station[5]	37		37
	Keewatinoow Ground Electrode Site	406		406
	Limestone Stores Area	0.3		0.3
	Main Construction Camp	27		27
	MH & Contractor Work Areas	21		21
	Potential Borrow Areas	230		230

Project/ Feature Type	Feature	Total Area (ha)*		
		Extension B	Extension A Area Outside of Extension B	Extension A
	Potential Material Placement Areas	143		143
	Cleared Right-of-Way	323		323
	Start-Up Camp	18		18
	Keewatinoow AC Collector Lines	820		820
	Keewatinoow Ground Electrode Line	52		52
Conawapa	All components	1,759		1,759
	Generation Outlet Transmission RoW[6]	170		170
Total Future Before Overlaps Removed		4,008	0	4,008
Total Future After Overlaps Removed				3,911
Total Land Area		*215,161*	*124,488*	*339,649*
Future Projects as a Percentage of Total Land Area		*2.0%*	*0.0%*	*1.2%*
Existing and Future Projects as a Percentage of Total Land Area		*2.7%*	*0.1%*	*1.8%*

* Area will often be different from other sources because it is land area only and/or overlaps with other footprints have been removed (see text for additional factors).

[1] Decommissioned.

[2] Station stop. Train stops if flagged down.

[3] Adjacent to Hudson Bay rail line.

[4] Footprints for future projects are based on available information and may change as plans become more refined and based on actual construction practices.

[5] Footprint was revised after EIS was filed as per document filed with Manitoba Conservation.

[6] Location of the GOT lines has not been determined (i.e., the map shows an approximate study area where they are likely to be located), but for the purposes of the analysis the study team has assumed a 240 m cleared ROW somewhere in this general vicinity.

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