

Keeyask Infrastructure Project Terrestrial and Aquatic Monitoring Plan

Plants, Habitat and Ecosystems Monitoring Annual Report 2013-2014



KEYYASK INFRASTRUCTURE PROJECT

TERRESTRIAL AND AQUATIC MONITORING PLAN

**Terrestrial Plant, Habitat, and Ecosystem Monitoring:
Annual Report 2013 - 2014**

Report for

MANITOBA CONSERVATION AND WATER STEWARDSHIP

Prepared on Behalf the
Keeyask Hydropower Limited Partnership

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EXECUTIVE SUMMARY

The Keeyask Hydropower Limited Partnership is constructing the Keeyask Infrastructure Project (the Project or KIP). The Project is located approximately 40 km southwest of Gillam, extending between Provincial Road (PR) 280 and Gull Rapids on the Nelson River (Map 1-1). The Project includes a start-up camp and associated infrastructure, a 25 km all weather access road and the first phase of a main camp.

As part of the KIP licensing conditions (Environment Act Licence No. 2952R), the Keeyask Hydropower Limited Partnership is conducting terrestrial effects monitoring during the KIP construction. This annual report covers the period from April 1, 2013 to March 31, 2014.

Terrestrial habitat, ecosystem and plant monitoring for the KIP conducted during 2013 included clearing and physical disturbance mapping, rare plant surveys, invasive plant surveys and fire extent reconnaissance surveys.

Clearing and physical disturbance studies were conducted to compare the actual with the planned extent of KIP clearing and physical disturbance. The areas covered by these studies reflected alterations to the licensed Project Footprint approved by Manitoba Conservation and Water Stewardship to address the unanticipated shortage of suitable construction materials and to include the addition of wells for the main camp and start-up camp.

Clearing and physical disturbance studies showed that construction activities have been contained within the planned KIP Footprint with the exception of several small extensions of planned borrow areas totalling 4.3 ha. The magnitude of effects on the terrestrial habitat included in this small additional area is within that which was assessed in the KIP EA Report.

Pre-clearing rare plant surveys were conducted to verify that S1 or S2 species were not present in the planned borrow areas. As was the case for EIS studies, no S1 or S2 species were observed in any of the surveyed areas.

Invasive plant surveys were also conducted to determine whether Project activities were resulting in a spread of invasive species, and whether any control or eradication measures were needed. Four invasive species were observed in a couple of locations in the start-up camp area during 2013 monitoring surveys. While no invasive species were found in any of the other construction zones, borrow areas or along the access road, it is noted that the extent of ground surveys to date have been limited by safety concerns, so any immature or sparsely distributed invasive plants would likely be undetected. It is recommended that the small number of invasive plants growing in the start-up camp be removed, in order to prevent further spread of these species within the camp area.

Several large wildfires swept through the Local Study Area during the summer of 2013. The fires were not Project related, but they burned areas within the Project Footprint at multiple locations. Areas burned during 2013 wildfires were surveyed in order to determine the general extent and nature of the burns. Satellite imagery of the burns will be collected in 2014. Data obtained from satellite imagery, ground surveys and aerial surveys will be used to plan ground and aerial surveys for 2015 to determine whether KIP substantially influenced the behavior of these wildfires.

Terrestrial plant, habitat, and ecosystem monitoring results to March 2014 were consistent with EA Report predictions regarding actual KIP footprint clearing, effects on S1 and S2 plant species and the extent to which construction could spread invasive and/or non-native plants. No modifications to monitoring programs, mitigation measures or EnvPP guidelines are recommended at this time. Terrestrial plant, habitat, and ecosystem monitoring will continue in 2014.

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STUDY TEAM

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1.0 INTRODUCTION

The Keeyask Hydropower Limited Partnership is constructing the Keeyask Infrastructure Project (the Project or KIP). The Project is located approximately 40 km southwest of Gillam, extending between Provincial Road (PR) 280 and Gull Rapids on the Nelson River (Map 1-1). The Project includes a start-up camp and associated infrastructure, a 25 km all weather access road and the first phase of a main camp.

The start-up camp is located near the intersection of PR 280 and the access road, while the first phase of the main camp is located at the end of the access road on the north side of Gull Rapids. The predicted environmental effects of the KIP were described in the KIP Environmental Assessment Report (KHLP 2009; the EA Report). KIP was expected to affect terrestrial ecosystems through the direct and indirect effects of vegetation clearing, overburden excavation, road use and camp operation.

Construction of KIP began in January 2012 and was still ongoing in March 2014. Construction activities during this 2013 – 2014 reporting period included: clearing trees, stripping, grubbing, stockpiling materials, burning slash, excavating overburden for use in roads and camp areas, setting up the start-up camp, blasting, road construction, installation of culverts, installation of the Looking Back Creek bridge, construction of a security gate and setting up the first phase of the main camp.

Monitoring for the effects of KIP on terrestrial plants, habitats and selected broad ecosystem topics addresses two types of considerations: implementation compliance and unanticipated events. The purpose of implementation compliance monitoring is to document the actual extent of the KIP-related clearing and physical disturbance as well as implementation of mitigation measures. Unanticipated event monitoring focuses on potential low likelihood events or conditions that could substantially alter effects predictions such as accidentally starting wildfires, finding provincially rare plant species or the substantial spreading of invasive and/or non-native plants.

The KIP Footprint used for the terrestrial monitoring program has undergone a number of alterations since 2009, all of which were approved by Manitoba Conservation and Water Stewardship – for more details on how the KIP Footprint changed from 2009 to 2013, see the KIP Terrestrial Plants, Habitat, and Ecosystems 2012 – 2013 Annual Report (KHLP 2013). In July 2013, the KHLP requested another alteration to the KIP Footprint. In order to avoid clearing impacts on breeding birds, 31 ha of additional area was added to the KIP Footprint. This area was cleared in the winter of 2014.

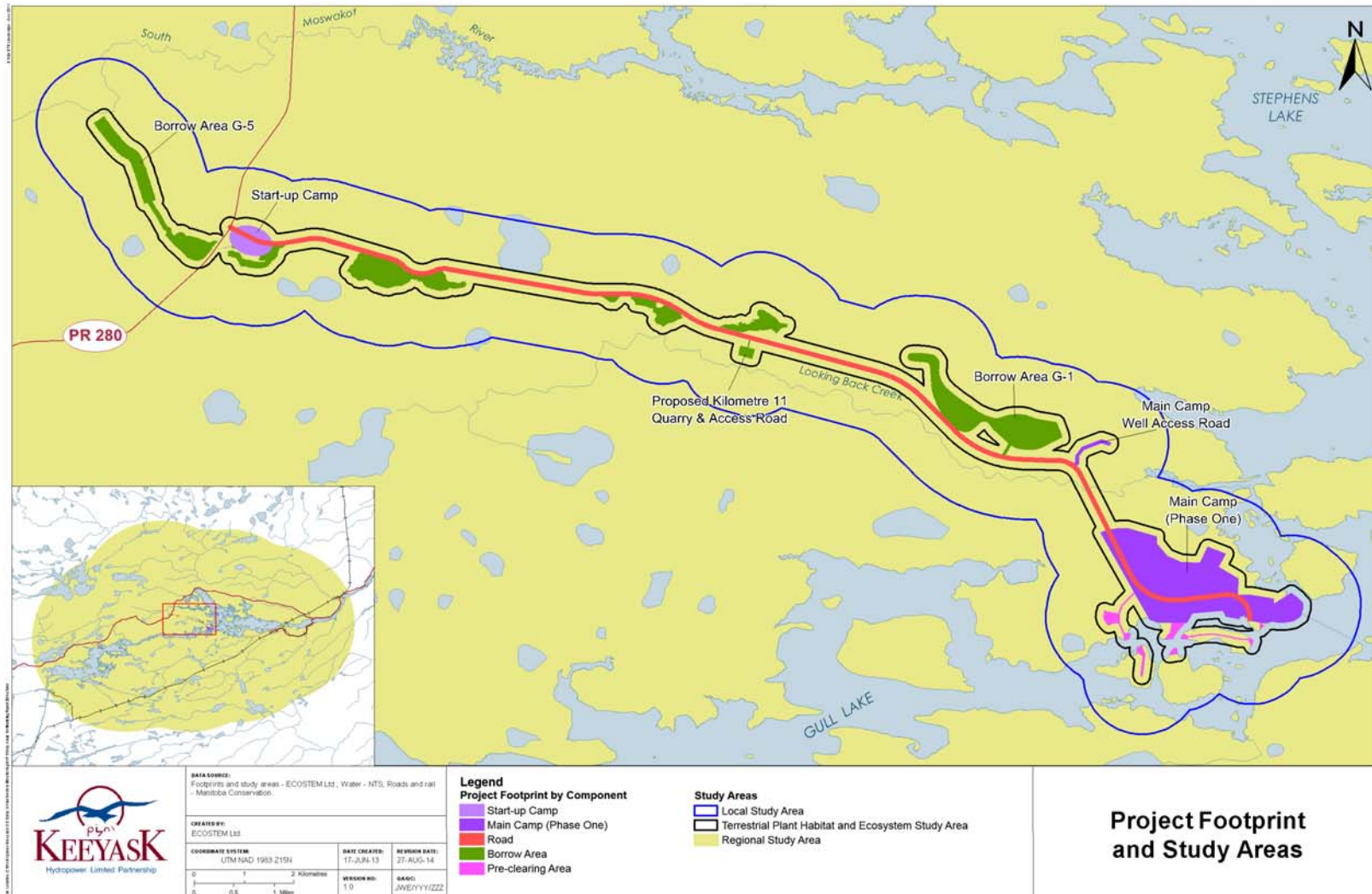
All of the alterations to the licensed KIP Footprint are located within areas assumed to be affected by the Keeyask Generation Project cumulative effects assessment (KHLP 2012), and that assessment concluded that significant effects on terrestrial ecosystems, habitat and plants are not expected based on the mitigation measures outlined in the Keeyask Generation Project in effects assessment and the KIP EA Report (KHLP 2009). On this basis, and in combination with the environmentally sensitive sites review completed prior to approval of the KIP license alterations, significant KIP effects on terrestrial habitat, ecosystems and plants are not anticipated.

Map 1-1 shows the updated planned KIP Footprint and the revised study areas used for the terrestrial environment monitoring program in 2013, based on the licensed KIP Footprint as of August 2013. As was the case for the KIP EA Report, a 150 m buffer of the planned KIP Footprint defined the maximum expected potential extent of indirect KIP effects on terrestrial habitat and plants (i.e., the Terrestrial Plant, Habitat and Ecosystem Study Area). This 150 m buffer also ensured that the monitoring area would detect any KIP related clearing and physical disturbance located outside of the planned KIP Footprint. As was the case for the KIP EA Report, the Local Study Area used for all terrestrial habitat, plant and ecosystem monitoring studies (Map 1-1) was a 1,150 m buffer of the planned KIP Footprint, which also provided for potential KIP effects on intactness and the fire regime.

This report describes the terrestrial habitat, plant, intactness and fire regime monitoring conducted from April 1, 2013 to March 31, 2014. The report is organized into the following

main sections: introduction (this section), methods, results and conclusions. Each section after this one is organized by the following studies:

- Construction clearing and disturbance;
- S1 and S2 plant species;
- Introduction and spread of invasive and non-native plants; and,
- Fire regime effects.



Map 1-1: Planned KIP Footprint and Terrestrial Plant, Habitat, and Ecosystem Study Area, as of spring 2014.

2.0 METHODS

2.1 CONSTRUCTION CLEARING AND DISTURBANCE

2.1.1 Rationale

Potential KIP effects on terrestrial ecosystems include a reduction in the total number of habitat types, changes in the proportions of the habitat types, reductions in the areas of certain types of habitats, and a risk that the natural fire regime will be altered (KHLP 2009). Construction clearing and physical disturbance monitoring is being used as a keystone indicator for effects on terrestrial plants, habitats and overarching ecosystem topics (e.g., intactness). Terrestrial habitat is fundamental because plants and animals use habitat for survival and reproduction and habitat effects are of interest in themselves. Terrestrial habitat also serves as a proxy for effects on many broader ecosystem attributes such as ecosystem diversity, wetland function and soil quantity and quality. Terrestrial habitat monitoring provides an effective means for identifying anticipated and unexpected effects on the terrestrial environment.

2.1.2 Objectives

The objectives of clearing and disturbance monitoring are to:

- Document the actual extent of clearing and physical disturbance, which is referred to as the actual KIP Footprint; and,
- Assess whether there are substantial differences between the actual and the planned KIP Footprint.

If substantial differences between the actual and the planned KIP Footprint are detected, then objectives will also include:

- Assess whether these differences substantially change predicted KIP effects and, if they do:
 - Develop additional monitoring studies as needed; and,

- Recommend modifications to mitigation measures and the environmental protection plans (EnvPPs), where appropriate and to the extent feasible with available data.

2.1.3 Design

Remote sensing, aerial surveys, pedestrian surveys and GIS mapping are being used to map KIP related clearing and physical disturbance (i.e., KIP Footprint mapping). High resolution digital remote sensing collected at the end of construction will provide additional habitat clearing data and serve as the base reference layer for mapping KIP clearing and physical disturbance in a Geographic Information System (GIS). All of these data are being used to produce the final KIP Construction Footprint Map. To support fragmentation analysis, roads and trails are also being mapped as a component of this study.

2.1.4 Parameters of Concern

Parameters being measured are:

- Area cleared or disturbed by habitat type; and
- Width and lengths of roads and trails by type.

2.1.5 Study Area

The Terrestrial Plant, Habitat and Ecosystems Study Area (Map 1-1) is the study area for monitoring the KIP impacts since this area includes all of the planned clearing and physical disturbance, as well as a buffer to search for unanticipated clearing and physical disturbance.

2.1.6 Sample Locations

Habitat loss and alteration from clearing and physical disturbance are expected to occur inside the planned KIP Footprint (Map 1-1) and in adjacent areas. Any KIP related clearing and physical disturbance that could not be spatially defined prior to construction is not expected to occur outside of the Terrestrial Plant, Habitat and Ecosystem Study Area since it is a 150 m

buffer of the planned KIP Footprint. For this reason, field studies were confined to the Terrestrial Plant, Habitat and Ecosystems Study Area. Ground surveys are being confined to locations where there is potential understorey disturbance.

2.1.7 Sampling Frequency and Schedule

Fieldwork occurred in September 2013 and will continue each summer during construction and during the first summer after construction is complete.

2.1.8 Data Collection

The aerial extent of vegetation clearing, physical disturbance and overburden excavation were mapped from helicopter-based aerial surveys and photography in 2012 and 2013. In 2014, truck and foot-based ground survey will complement aerial surveys to identify understorey and ground disturbance that is not visible from the air.

Cleared and physically disturbed areas were recorded on field maps and/or in georeferenced photos. Notes on the type, size and severity of clearing and physical disturbance were taken. High resolution digital remote sensing collected at the end of construction will provide additional habitat clearing data and serve as the base reference layer for mapping KIP clearing and physical disturbance.

2.2 S1 AND S2 RARE PLANT SPECIES

2.2.1 Rationale

Rare plant species populations can be highly sensitive to the loss or disturbance of even a few individuals. The KIP EA (KHLP 2009) predicted that substantial effects on S1 and S2 plants were not expected since previous studies had not detected these species in the Terrestrial Plant, Habitat and Ecosystem Study Area. However, some of the species that have the potential to occur in the KIP Footprint area may have gone undetected due to their rarity. Consequently, mitigation includes pre-construction rare plant surveys for species ranked S1 and S2 by the

Manitoba Conservation Data Centre. In the unlikely event that any patches of S1 or S2 plant species are found within the planned borrow areas, the S1 plant patches will be avoided and the S2 plant patches will be avoided to the extent practicable.

This study includes pre-clearing surveys for S1 and S2 plants. In the event that any patches of such species are found then this study will also monitor the extent to which the mitigation is effectively implemented and whether there are any ongoing effects on these plants.

2.2.2 Objectives

The objective of this study is to monitor effects on S1 and S2 plants if any are discovered in the Terrestrial Plant, Habitat and Ecosystem Study Area during pre-construction surveys or other terrestrial habitat and plant field studies.

2.2.3 Design

S1 and S2 plant surveys are being conducted in KIP Footprint areas that were not previously surveyed and have the highest potential to include these species. If any S1 and S2 plant patches are discovered during pre-construction surveys or other terrestrial habitat and plant monitoring studies, then ground surveys in and around these patches will be conducted to monitor the extent to which these patches are preserved and whether there are any ongoing effects. Plant patch mapping will occur as soon as possible after the patch is discovered and be coordinated with other field studies, to the extent feasible.

2.2.4 Parameters of concern

Parameters being measured are:

- Locations and sizes of S1 and S2 plant patches by species; and,
- Extent and degree of KIP effects on any identified S1 or S2 plant patches.

2.2.5 Study Area

The Terrestrial Plant, Habitat and Ecosystems Study Area (Map 1-1) is the study area for monitoring S1 and S2 plant species.

2.2.6 Sample Locations

Field studies are confined to the Terrestrial Plant, Habitat and Ecosystems Study Area (Map 1-1) because all of the Project impacts are expected to occur inside this area. Pre-clearing ground surveys are being conducted in KIP Footprint areas that were not previously surveyed and have the highest potential to include these species. If any S1 and S2 plant patches are identified, ground surveys will occur in the immediately adjacent area.

2.2.7 Sampling frequency and schedule

Pre-construction field surveys were conducted during the 2011, 2012 and 2013 growing seasons. Additional field surveys will be conducted if and when new clearing is planned. Pre-clearing surveys are being conducted in the areas designated for clearing during the following year that have the highest potential to include S1 and S2 plant species, provided these areas were not already surveyed by other studies prior to construction. Additional growing season field studies would be triggered in the unlikely event that patches of S1 or S2 plant species are identified. The exact timing, duration and frequency of fieldwork to monitor avoidance of marked S1 and S2 plant patches will determine if and when S1 or S2 plant patches are found.

2.2.8 Data Collection

Any areas identified for pre-clearing surveys were searched for S1 and S2 species that have the potential to occur in the Terrestrial Plant, Habitat and Ecosystems Study Area. The list of potential species includes approximately 40 species based on species distribution records and past observations (see KHL P 2012). Within the Regional Study Area, no S1 species have been previously recorded while the four previously recorded S2 and one S1S2 species are elegant hawk's beard (*Crepis elegans*; S1S2); small pondweed (*Potamogeton pusillus ssp. tenuissimus*;

S2); Robbin’s pondweed (*Potamogeton robbinsii*; S2); swamp lousewort (*Pedicularis macrodonta*; S2). Field botanists searched for all species that could potentially occur in the KIP Footprint.

Searches were conducted along meandering and/or parallel transects located in the most likely habitats for these species, as well as other areas with the potential to support them. Incidental S1 and S2 plant observations were recorded while travelling between sampling areas, or while conducting other terrestrial habitat and plants fieldwork in the area. Areas searched in 2011 and 2012 included the start-up camp, the first phase of the main camp area and G-1 and G-5 borrow areas.

If S1 or S2 plant species are observed in the Terrestrial Plant, Habitat and Ecosystems Study Area, field studies will consist of documenting the location and patch size of the species. The extent and degree of KIP effects on any identified S1 and S2 plant patches will be documented.

2.3 INTRODUCTION AND SPREAD OF INVASIVE AND NON-NATIVE PLANTS

2.3.1 Rationale

Invasive plants are plant species that are growing outside of their country or region of origin and are able to out-compete or replace native plants (ISCM 2014), while non-native plants are plant species that are growing outside of their country or region of origin (referred to as ‘alien’ species by White et al. 1993). Invasive and/or non-native plants are of concern because they can crowd out other plant species and, in extreme cases, change vegetation composition. The KIP EA (KHLP 2009) predicted that the KIP was not expected to significantly increase the risk that invasive and/or non-native plants would crowd out sensitive species or convert habitat. There is a need to verify this prediction by documenting invasive plant spread in and around the KIP Footprint, determining the degree to which the KIP contributes to any invasive or non-native plant spread and assessing the effectiveness of mitigation measures in response to colonization of invasive plants.

2.3.2 Objectives

The objectives are to:

- Document the degree of invasive and non-native plant introduction and spread;
- If there is substantial introduction and/or spread, then:
 - Assess how EA predictions should be modified; and,
 - Recommend modifications to mitigation measures and EnvPP where appropriate.

2.3.3 Design

Invasive and non-native plant distribution changes are generally being monitored on an annual basis through vehicle and foot-based ground surveys in the KIP Footprint and areas at the edges of clearing and physical disturbance. However, vehicle and foot-based surveys were not possible in 2012 due to safety concerns related to the condition of the access road and the amount of traffic and construction on the road. Therefore, a low altitude aerial survey was conducted in 2012 to visually search for invasive plant patches. Spot ground checks were completed in a few cleared areas where helicopter landing was feasible.

In the event that invasive or non-native plants are found at the edges of cleared or physically disturbed areas, foot-based surveys will be extended further into undisturbed areas. Incidental observations will also be recorded during other field studies.

2.3.4 Parameters of concern

Locations and sizes of invasive or non-native plant species patches are being mapped by species in a GIS.

2.3.5 Study Area

The Terrestrial Plant, Habitat and Ecosystems Study Area (Map 1-1) is the study area for monitoring the introduction and/or spread of invasive and non-native plant species.

2.3.6 Sample Locations

Field studies are confined to the Terrestrial Plant, Habitat and Ecosystem Study Area because all of the KIP activities that could spread invasive and non-native plants are expected to occur inside this area.

2.3.7 Sampling frequency and schedule

Ground surveys were conducted in 2013 along the access road, in the start-up camp area, as well as borrow and other cleared areas that were safe for the field staff. Subsequent field surveys will be conducted every summer during construction and during the first summer after construction is complete. If there is evidence of substantial spread occurring, then additional fieldwork may need to be conducted.

2.3.8 Data Collection

During the 2012 low altitude aerial survey, construction and road areas were visually searched by the botanist for invasive plant patches; one ground spot check and one small incidental transect were also searched. During the 2013 ground survey, 200 m transects were surveyed by the botanist at stops located every 2 km along the access road, where it was safe to stop. Ground surveys were also conducted in cleared areas, particularly along the edges of cleared areas, and where heavy machinery activity was evident or remnant vegetation communities existed. Species patches that were encountered were marked, photographed and mapped, and the species name was recorded. Growing season invasive and non-native plant surveys conducted during subsequent years will consist of similar sampling along the access road and in the cleared or physically disturbed areas.

2.4 FIRE REGIME

2.4.1 Rationale

Effects predictions and significance assessments made for terrestrial habitat, ecosystems and plants in the EA Report could be substantially altered if the KIP causes fires that would not otherwise occur, or if the KIP alters the behavior of fires started by other sources (e.g., slash produced from clearing could affect fire behavior by allowing a naturally occurring fire to spread through areas that might otherwise serve as a fire break). Changes to the frequency and/or severity of fires could adversely affect ecosystem health. Accidental fire monitoring provides a means to determine whether there have been any KIP related fires or fire behavior effects and whether or not the effects change predictions made in the EA.

2.4.2 Objectives

The objectives are to:

- Determine if the KIP has caused any fires or influenced the behavior of naturally occurring fires; and,
- If the KIP has caused or influenced fires:
 - Assess whether the fires substantially altered any of the predicted KIP effects; and,
 - Recommend modifications to mitigation measures and the EnvPP to the extent feasible with available data.

2.4.3 Design

A review of Manitoba Hydro fire incident reports will be used to determine the timing and extent of any accidental fires that start as a result of KIP features or activities, along with helicopter surveys of the area to locate any new burns that have occurred since mapping was completed for the EA. If KIP causes or affects any fires that are larger than 30 ha, or if the cumulative area of KIP related fire effects reaches at least 50 ha, then a ground inspection of the burned areas will be conducted. If ground surveys indicate that the aerial extent of the habitats affected are

significant enough to substantially alter any KIP effects, then a fire effects report will be completed.

2.4.4 Parameters of concern

Parameters being measured are the:

- Number, type and extent of fires caused or influenced by the KIP;
- Area and types of habitat affected; and,
- Nature of effects on vegetation, soils and permafrost.

2.4.5 Study Area

The Local Study Area (Map 1-1) is the study area for accidental fire monitoring.

2.4.6 Sample Locations

Aerial surveys to identify new burns will be confined to the Local Study Area because all of the KIP impacts are expected to occur inside this area. If KIP causes any fires or alters the behavior of natural fires, then ground surveys will be confined to areas where the fire effects occur.

2.4.7 Sampling frequency and schedule

The terrestrial ecologist will map new burns using documentation from Manitoba Hydro and helicopter-based aerial surveys conducted during the summer of each construction year and during the year following Project completion. The mapping will be completed during the helicopter-based aerial surveys conducted to develop the KIP Footprint map.

If the extent of the fire meets the aforementioned criteria, ground surveys of the burns will be conducted once during the summer following the fire.

2.4.8 Data Collection

Mapped burns and associated Manitoba Hydro fire incident reports were reviewed to determine whether KIP may have caused any fires or influenced any natural fires. Several large fires started by sources other than KIP occurred in 2013. An aerial survey was completed in 2013 to photograph and document the general extent of burned area in the Local Study Area. Satellite imagery to be collected in summer 2014 will be used to map the extent and the severity of the burns in the Local Study Area. These data will be used to determine the locations for ground and aerial surveys in summer 2014 to determine whether KIP substantially influenced the behavior of these fires.

3.0 RESULTS

3.1 CONSTRUCTION CLEARING AND DISTURBANCE

Map 3-1 shows the construction areas surveyed by helicopter in September 2012 and September 2013. During the 2012 and 2013 surveys, the entire road length, the start-up camp, the portions of the main camp that had been cleared, borrow area G-5 and G-1, the borrow area adjacent to the start-up camp area, the borrow area approximately 3 km from PR 280 and the borrow area approximately 9 km from PR 280 were surveyed and photographed by helicopter. In 2013, the camp well access road, bird mitigation areas and the newly cleared areas in the first phase of the main camp were also surveyed.

Photos showing the extent of clearing and physical disturbance in 2013 are provided in Figure 3-1 to Figure 3-9. ECOSTEM (2013) provides corresponding photos from the 2012 monitoring surveys.

3.1.1 Access Road

At the time of the 2012 aerial survey, access road construction was underway on the access road, the base of which had been graveled up to Looking Back Creek, where the bridge was being built. In 2013, a sand base for the access road was built up to the corner near Work Area B and

was graveled nearly as far (Figure 3-1). Road construction work was underway on the road portion south of the main camp. All access road clearing was within the planned KIP Footprint boundary in 2012 and 2013.

3.1.2 Start-up Camp and Work Area

The start-up camp was cleared and graveled in 2012. This camp was complete and operational at the time of the aerial survey in 2013 (Figure 3-2). The adjacent borrow area was cleared and in use, starting in 2012, including the completed wastewater drainage field (Figure 3-3). All clearing and construction in this area was within the planned KIP Footprint boundary.

3.1.3 Borrow Areas

Although the areas cleared at the time of the 2013 survey have not been mapped in a GIS, a visual review of the field photos indicates that total clearing is substantially less than the planned KIP Footprint area.

In 2012, portions of the G-5 borrow area were being cleared at the time of the aerial survey. By the time of the 2013 survey, the rest of the proposed borrow area had been cleared and portions were in use (Figure 3-4). All construction activities in this area were within the planned KIP Footprint boundary.

The G-1 borrow area on the north side of the access road, approximately 17 km from PR 280 was in use at the time of the 2012 and 2013 surveys. This borrow area included access roads, two cleared areas, several geotechnical test sites and cutlines (Figure 3-5, Figure 3-6). A 3.5 ha cleared area was observed outside of the planned KIP Footprint on the south side of this borrow area (Map 3-1).

A borrow area south of the access road, approximately 3 km from PR 280 had been cleared and was in use during 2012 aerial surveys (Figure 3-7). In 2013, no additional clearing was observed from what had been cleared during 2012 surveys. All construction activities in this area were within the planned KIP Footprint boundary.

Approximately 9 km from PR 280, south of the access road, a borrow area was cleared and in use in 2012 (Figure 3-8). A small, 0.8 ha portion of the cleared borrow area was observed outside of the planned KIP Footprint (Map 3-1). No additional clearing was observed at this location in 2013 compared with what had been cleared at the time of the 2012 survey. The reported area increased from the 2012 report because more accurate mapping data was available from the 2013 ground surveys.

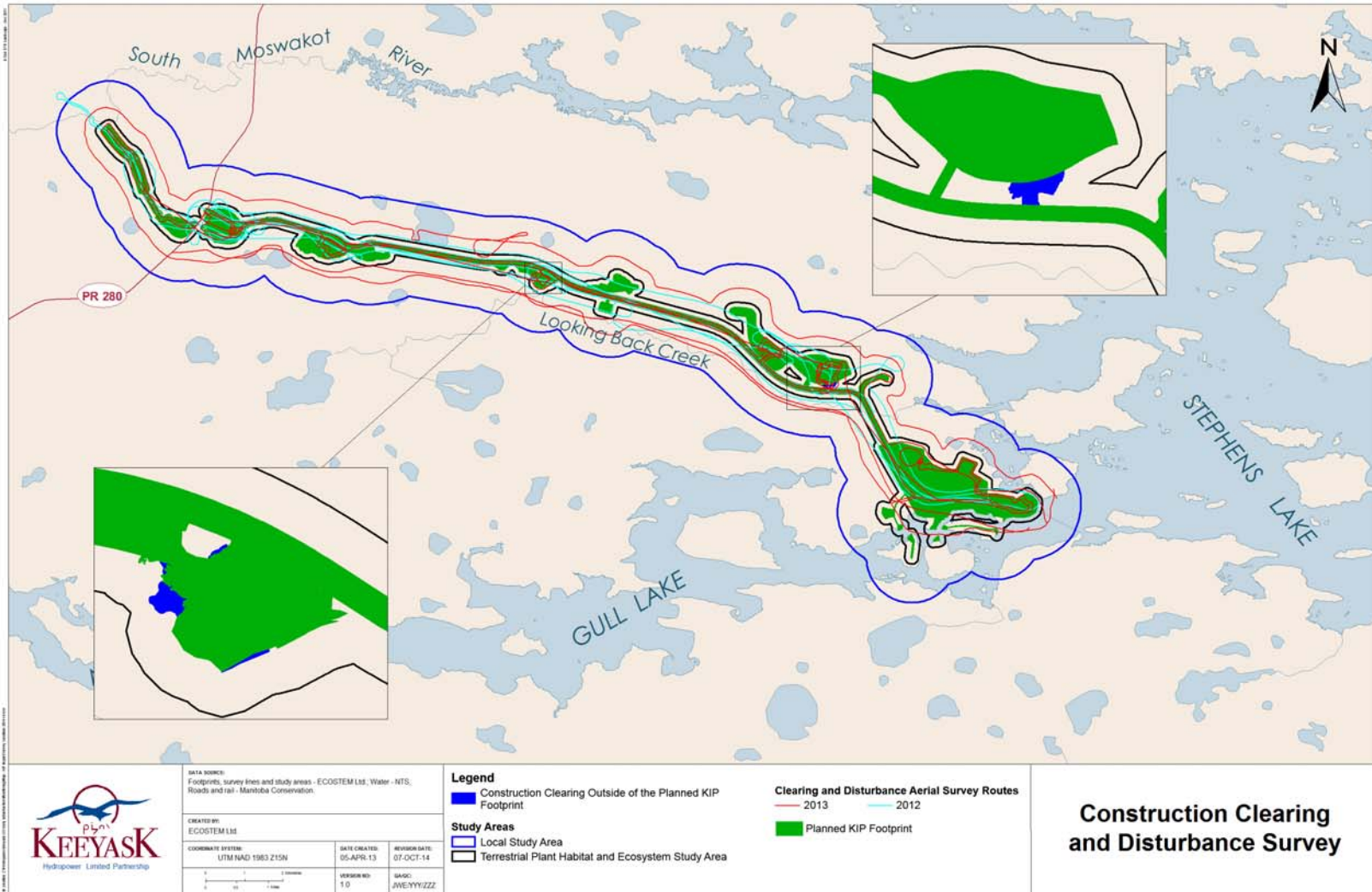
Except for the active portions of borrow areas G-1 and G-5, water had ponded in all of the borrow areas when surveys were conducted in 2012 and 2013.

3.1.4 Main Camp and Well Areas

In 2012, clearing had not begun in the main camp and well area, aside from the area to the south where the access road ends. At the time of the 2013 survey, the main camp area had been cleared and work was underway on the gravel base of the area, the Manitoba Hydro field office area was gravelled, and several trailers and a parking lot were in use (Figure 3-9). The helicopter pad area was cleared and a sand base was present. A large area within Work Area A also was cleared, and a gravelled road ran through this area. The road to the well area was cleared and gravelled (Figure 3-9). All clearing in this area was within the approved KIP Footprint boundary.

3.1.5 Trails

No trails were observed outside of the planned KIP Footprint.



Map 3-1: KIP Footprint clearing and physical disturbance - aerial survey locations in 2013.

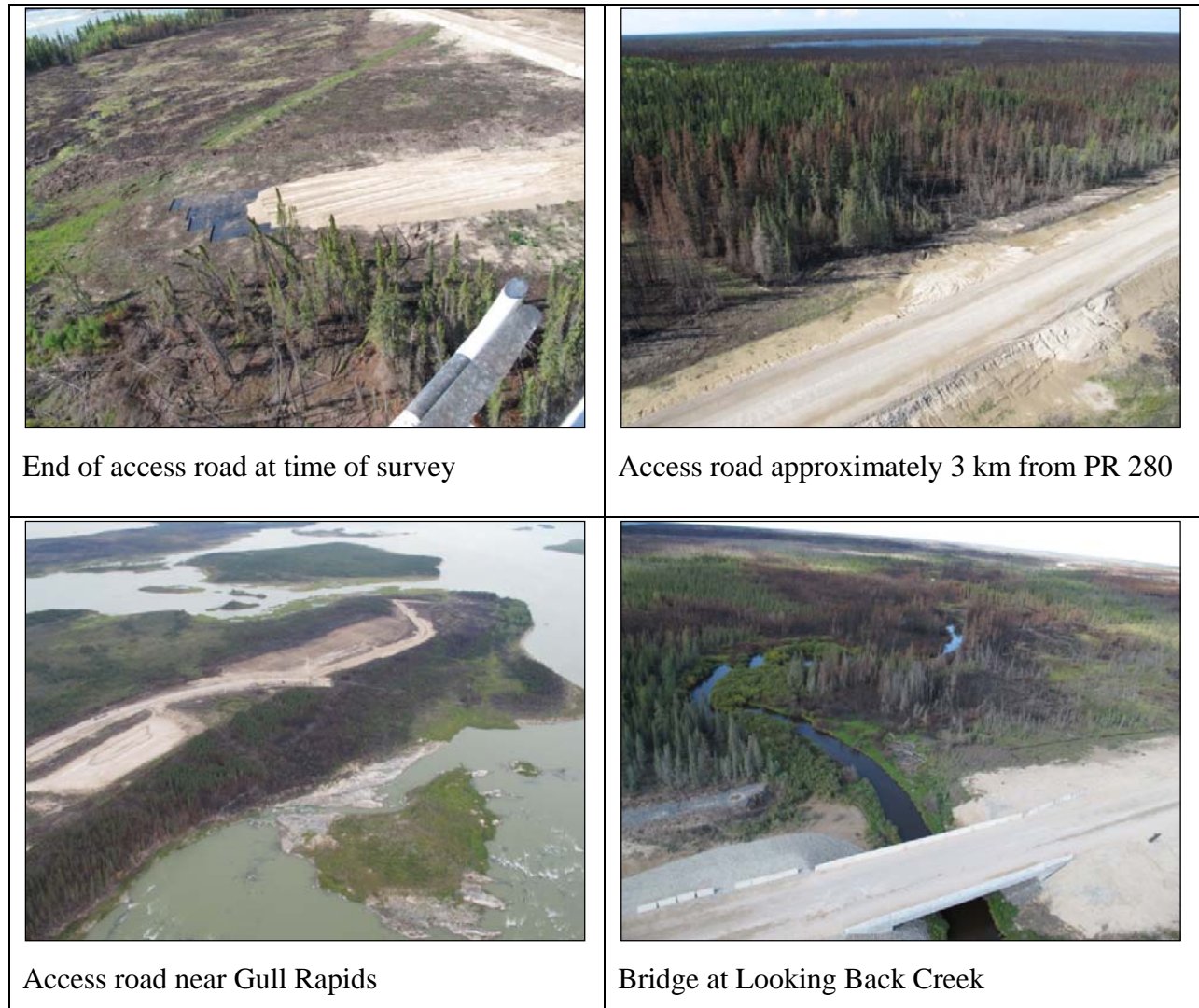


Figure 3-1: Construction areas along access road (September 2, 2013).



Figure 3-2: Start-up camp and work area near PR 280 (September 2, 2013).



Figure 3-3: Borrow area adjacent to the start-up camp and wastewater drainage field (September 2, 2013).



Figure 3-4: Clearing and excavation at G-5 borrow area (September 2, 2013).



Figure 3-5: Clearing and excavation in G-1 borrow area, west side clearing (September 2, 2013).



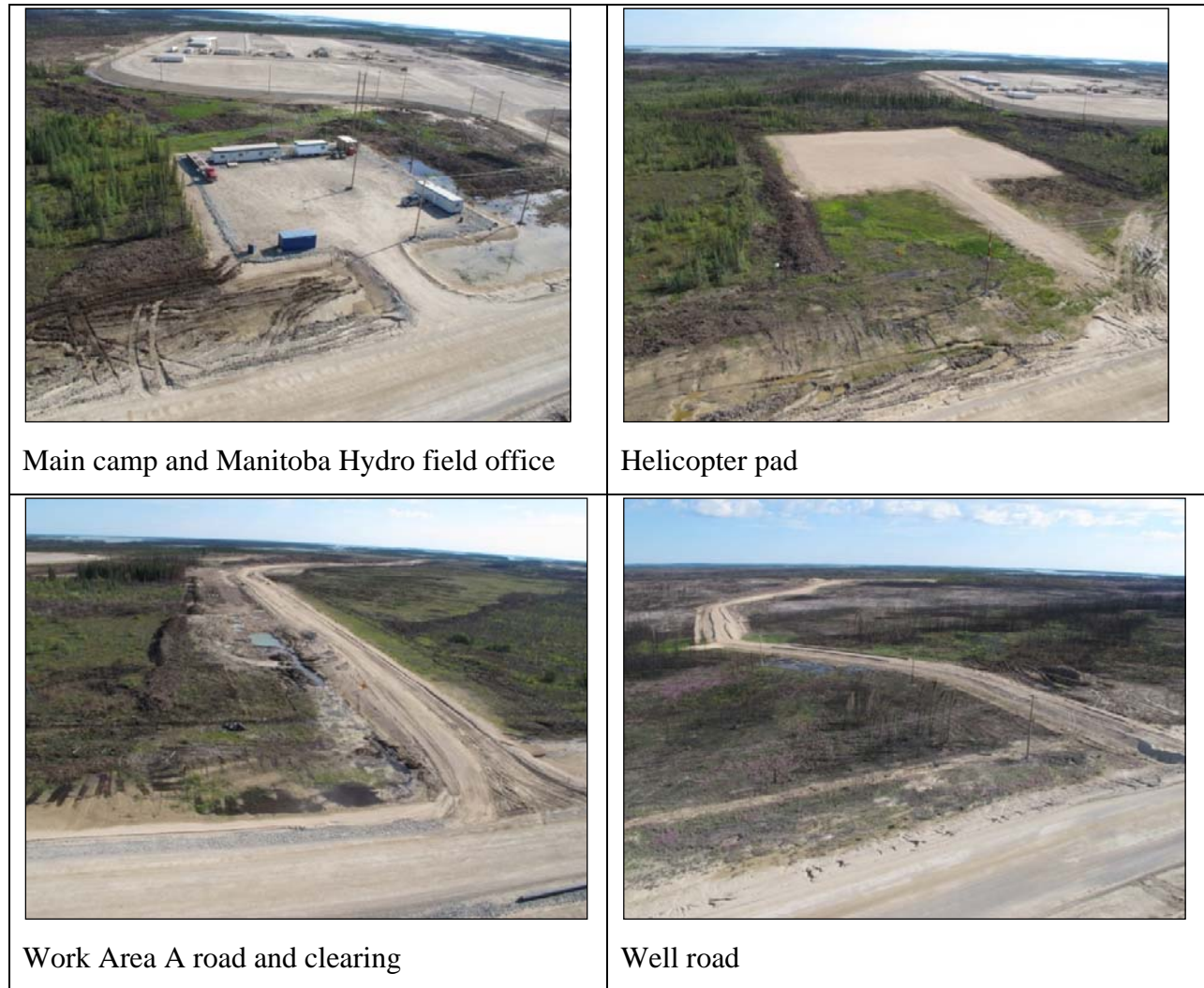
Figure 3-6: Clearing and excavation in G-1 borrow area, east side clearing (September 2, 2013).



Figure 3-7: Clearing and excavation in borrow area approximately 4 km from PR 280 (September 2, 2013).



Figure 3-8: Clearing and excavation in borrow area approximately 9 km from PR 280 (September 2, 2013).



Main camp and Manitoba Hydro field office

Helicopter pad

Work Area A road and clearing

Well road

Figure 3-9: Clearing and construction in the main camp and well road areas (September 2, 2013).

3.2 S1 AND S2 RARE PLANT SPECIES

Pre-clearing rare plant surveys were conducted on July 12, 13 and 14 in 2011, on June 26 and 27 in 2012 and on July 20 in 2013 at the locations shown in Map 3-2. The KIP Footprint components surveyed in 2011 included the start-up camp, the G-1 borrow area and the first phase of the main camp area, with additional surveys in the G-1 and G-5 borrow areas in 2012. The 2013 surveys were conducted in the breeding bird mitigation areas, which were located on islands in the Nelson River (Figure 3-10). The total length of survey transects was 20.7 km in 2011, 22.8 km in 2012 and 3.8 km in 2013.

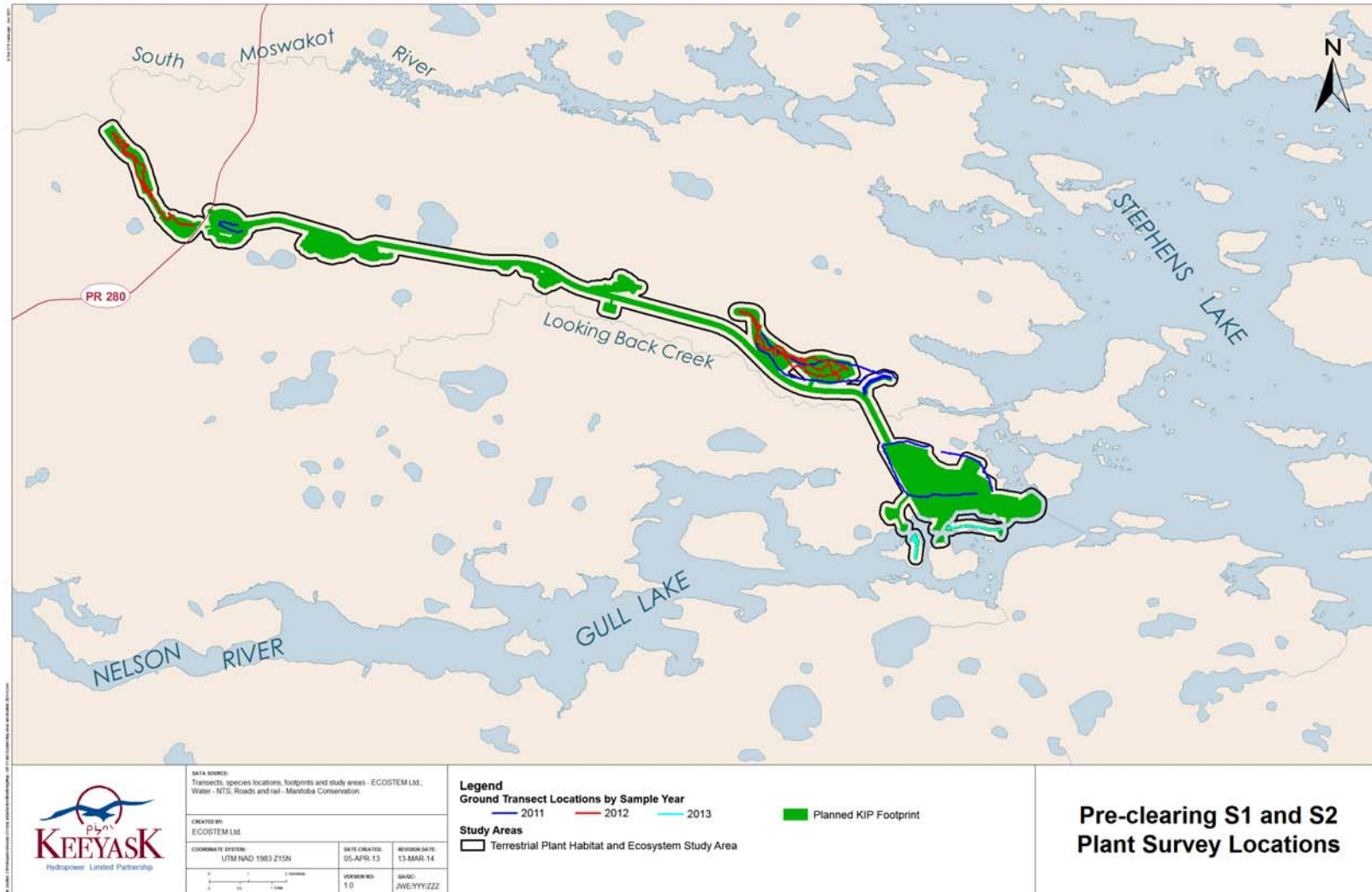
Partial vegetation clearing and surface organic matter removal were evident on some of the survey transects in 2012. No other vegetation clearing was evident in the surveyed areas in 2011 or 2013, except for existing cutlines and clearings.

No S1 or S2 species were observed either along any of the transects surveyed in 2011, 2012 and 2013, or incidentally in the Terrestrial Plant, Habitat and Ecosystems Study Area during fieldwork to date.

Two S3 species were recorded at seven locations during 2011 ground surveys - shrubby willow (*Salix arbusculoides*) and rock willow (*Salix vestita*). Additional S3 species were not found in 2012 or 2013.



Figure 3-10: Aerial view of portion of area included in the pre-clearing S1 and S2 plant surveys in the breeding bird mitigation area.



Map 3-2: S1 and S2 rare plant survey locations by year.

3.3 INTRODUCTION AND SPREAD OF INVASIVE AND NON-NATIVE PLANTS

Map 3-3 shows the 2012 areas surveyed by helicopter and the 2013 areas surveyed by foot for invasive and non-native plants. No invasive species were recorded in 2012, either during invasive plant aerial surveys, or incidentally while doing other aerial or ground surveys. Four invasive plant species were observed during 2013 ground surveys, all in the start-up camp area (Map 3-3). White sweet clover (*Melilotus albus*), alfalfa (*Medicago sativa*), perennial sow thistle (*Sonchus arvensis*) and common dandelion (*Taraxacum officinale*) (Figure 3-11) were observed at the south side of the start-up camp along a slope on the edge of the cleared camp area and between nearby ATCO trailers (Figure 3-12, Map 3-3). Alfalfa and perennial sow thistle were also observed in an area approximately 150 m further east.

No invasive species were observed in areas surveyed along the access road or in any of the other recently cleared areas. It is noted that the extent of ground surveys to date have been limited by safety concerns of working in active construction areas (Section 2.3.3), so immature or sparsely distributed individuals would likely go undetected. Some cleared areas were in use while ground surveys were occurring, and were unsafe to survey in 2013, including borrow area G-5, the east side of G-1 and the main camp area.

White sweet clover and alfalfa are ranked as moderate and minor invasive species in Canada, respectively (White et al. 1993). Common dandelion is a noxious weed (Government of Manitoba 1988) and perennial sow thistle is listed as having noxious weed seeds (Government of Canada, 2005), and is considered as an “other” weed by the Invasive Species Council of Manitoba (2014). As all four species observed are considered to be invasive or noxious, it is recommended that they be removed from the site by hand, preferably earlier in the season, before the plants have gone to seed or the roots of young plants become well established.

Cattail (*Typha* spp.) is another species that may meet the invasive plant criteria. While this is a common wetland species in southern areas of Manitoba, the only locations where this genus was detected in the large number of locations sampled for the KIP and the Keeyask Generation

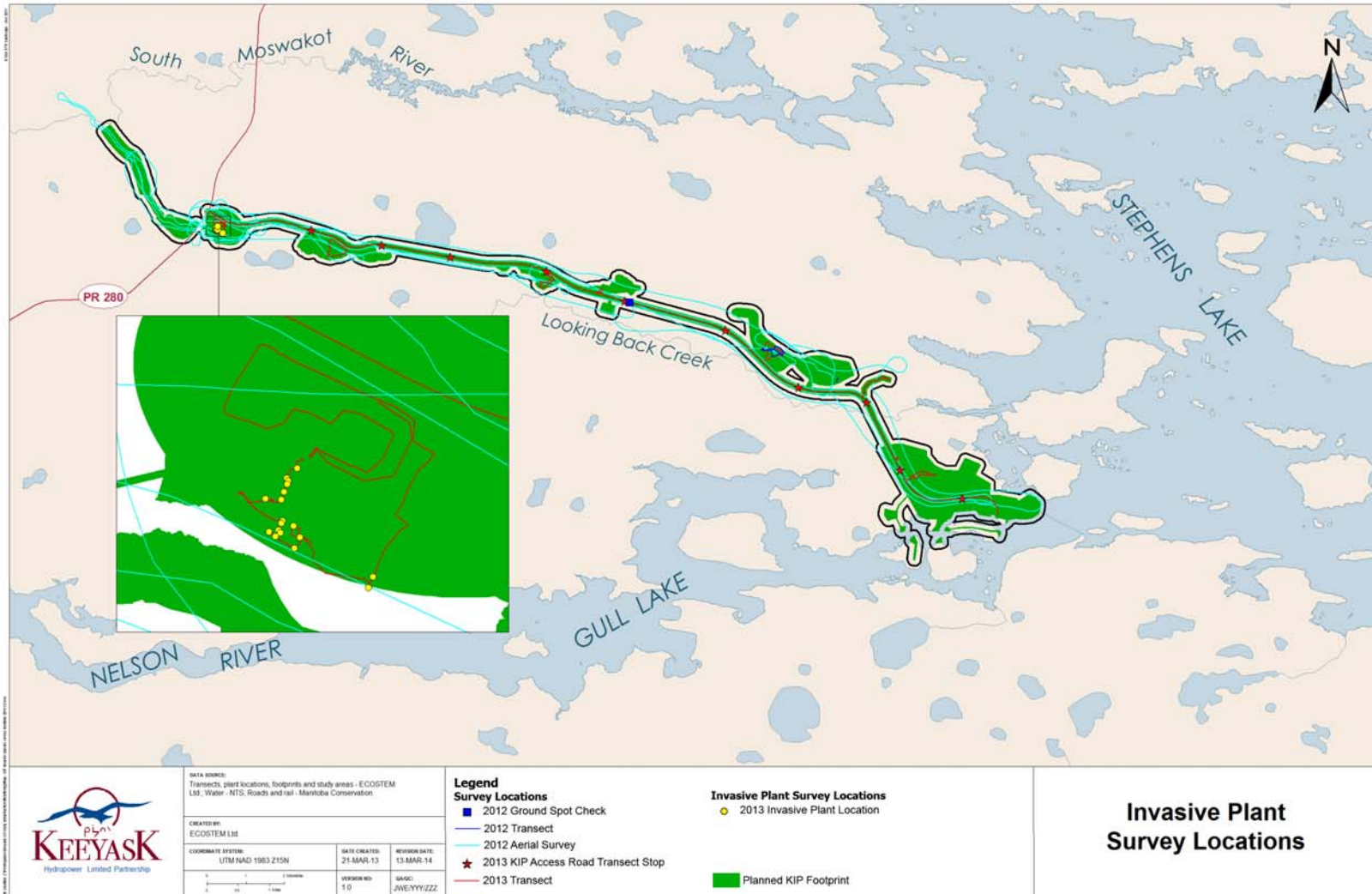
Project studies was in areas disturbed by humans. The potential for cattails to be classified as an invasive species in the KIP area is being evaluated.



Figure 3-11: Invasive species observed in the start-up camp area (August 31, 2013).



Figure 3-12: Invasive species locations within the start-up camp area (shown with red ovals) (August 31, 2013).

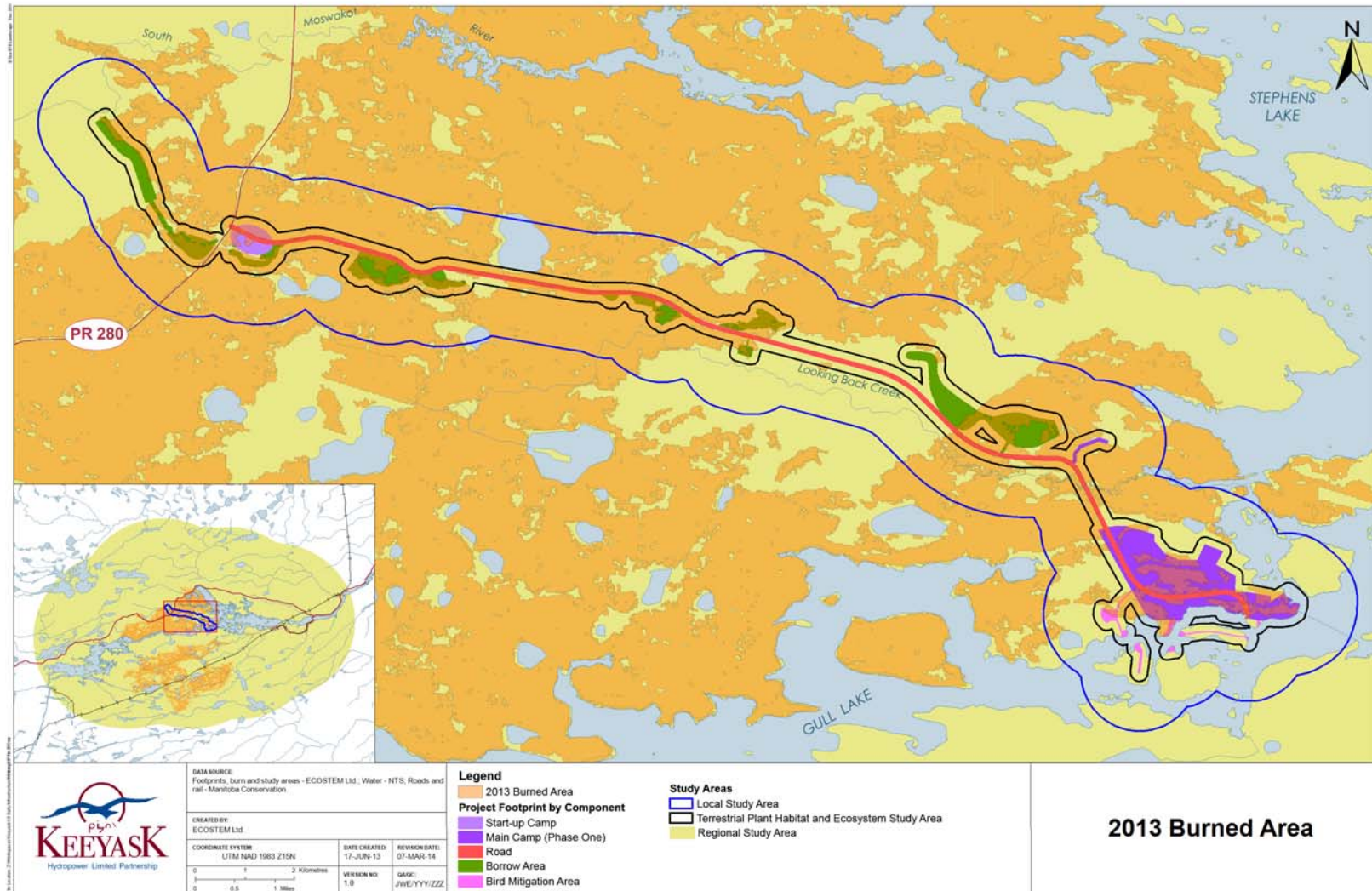


Map 3-3: KIP invasive plant survey transects and invasive/non-native species locations.

3.4 FIRE REGIME

Several large fires started by sources other than the KIP occurred in 2013. Map 3-4 shows the approximate locations of burned areas, as mapped from Landsat imagery acquired in late summer 2013. These burned areas were consistent with those observed during aerial surveys on September 2, 2013, when an aerial survey photographed the extent of burned area in the Local Study Area. The fire that swept through the Local Study Area burned right into the KIP Footprint in multiple areas (Map 3-4; see Figure 3-1, Figure 3-3, Figure 3-6, Figure 3-7 and Figure 3-8 for example photos).

Satellite imagery will be collected in summer 2014 to map the extent and the severity of the burns in the Local Study Area. These data, along with other available information, will be used to determine the locations for ground and aerial surveys in summer 2015 to collect data that will be used to determine whether the KIP substantially influenced the behavior of these fires.



Map 3-4: Preliminary map of areas burned in the KIP Study Areas in 2013.

4.0 DISCUSSION

4.1 CONSTRUCTION CLEARING AND DISTURBANCE

As described in the Terrestrial Plant, Habitat, and Ecosystem Monitoring 2012 – 2013 Annual Report (ECOSTEM 2013), Manitoba Conservation and Water Stewardship has approved a number of alterations to the planned KIP Footprint since 2009. The potential effects of these footprint alterations on terrestrial habitat and plants were evaluated prior to them being proposed to Manitoba Conservation and Water Stewardship, and were expected to be insignificant given the planned mitigation measures. Additionally, all of the alterations to the planned KIP Footprint were located within areas assumed to be affected in the Keeyask Generation Project cumulative effects assessment (KHLP 2012), and that assessment concluded that significant effects on terrestrial ecosystems, habitat and plants were not expected based on the mitigation measures outlined in the by the Keeyask Generation Project effects assessment and the KIP EA Report (KHLP 2009). On this basis, and in combination with the environmentally sensitive sites review completed prior to approval of the KIP license alterations, significant KIP effects on terrestrial habitat, ecosystems and plants are not anticipated.

All clearing and physical disturbance documented up to the 2013 field surveys were within the planned KIP Footprint with the exception of several small areas totalling 4.3 ha. The small exceptions were extensions of planned borrow pits located approximately 9 km and 15 km from PR 280. The magnitude of effects on the terrestrial habitat included in this small additional area is within that which was assessed in the KIP EA Report. Additionally, although the areas cleared at the time of the 2013 survey have not been mapped in a GIS, a visual review of the field photos indicates that total clearing is substantially less than the planned KIP Footprint area.

Several of the borrow areas had ponded water when the field surveys were conducted. If these borrow areas will not be used in the future for the Keeyask Generation Project, they could be investigated for their potential to be rehabilitated as marsh wetlands or marsh plant nursery sites after construction is complete.

Construction clearing and physical disturbance monitoring will continue in summer 2014.

4.2 S1 AND S2 RARE PLANT SPECIES

More than 47 km of pre-clearing S1 and S2 plant survey transects were searched between 2011 and 2013, to further verify the absence of S1 or S2 plants in the KIP Footprint. No S1 or S2 species were observed during these surveys, or incidentally during other surveys. Additional pre-clearing S1 and S2 plant surveys will occur if new areas are identified for clearing and they have not previously been surveyed for S1 and S2 plants.

Although two S3 species were recorded at seven locations in the Project Footprint, studies conducted in the area (KHLP 2012) suggest that both of these willow species are more abundant in the Regional Study Area than their provincial S-rank suggest, and no substantial negative effects are expected from development of the Project.

4.3 INTRODUCTION AND SPREAD OF INVASIVE AND NON-NATIVE PLANTS

Observations of invasive and non-native plants have been very limited to date. In general, vegetation was still absent or underdeveloped in much of the newly cleared areas since they were only recently disturbed. Also, the extent of ground surveys to date has been limited by safety concerns due to ongoing construction activities, so immature or sparsely distributed individuals would likely go undetected.

Invasive and/or non-native species were observed within the south end of the Keeyask start-up camp, which was a previously disturbed area. Four species of invasive plants were observed at the margin of the cleared start-up camp area, near the former parking lot, and in another area between some ATCO trailers. Invasive species were not observed to be spreading into the undisturbed areas adjacent to these locations.

Two of the four species observed during field studies (perennial sow thistle and common dandelion) are considered noxious species, while the other two (perennial sow thistle and alfalfa) are considered to be minor to moderate risk invasive species. It is recommended that the small number of invasive plants growing in the start-up camp area be removed by hand, in order to prevent further spread of these species within the camp. As perennial sow thistle is a noxious seed species, it is recommended that hand pulling be done prior to seed formation in the plants.

It is also recommended that site staff be trained to recognize the noxious weed species occurring in the area so they can initiate hand pulling between the monitoring surveys, so as to minimize further spread of these species. Hand pulling will generally be easier if it is undertaken early in the growing season before the roots of young plants become well established.

Continued surveys will be conducted to monitor invasive and non-native plant populations and determine whether or not additional control measures are needed in the future.

4.4 FIRE REGIME

Several large fires started by sources other than the KIP swept through the Local Study Area during the summer of 2013. The fires burned areas within the KIP Footprint at multiple locations. Satellite imagery of the fires will be collected in summer 2014. Data obtained from satellite imagery, ground surveys and aerial surveys will be used to plan and conduct ground and aerial surveys in 2015 to determine whether the KIP substantially influenced the behavior of these fires.

5.0 CONCLUSIONS

Terrestrial plant, habitat, and ecosystem monitoring results to March 2014 were consistent with EA Report predictions regarding actual KIP Footprint clearing, effects on S1 and S2 plant species and the extent to which construction activities could spread invasive and/or non-native plants. No modifications to monitoring programs, mitigation measures or EnvPP guidelines are recommended. Terrestrial plant, habitat, and ecosystem monitoring will continue in 2014.

6.0 REFERENCES

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