



Keeyask Generation Project Terrestrial Effects Monitoring Plan

Priority Plant Monitoring Report

TEMP-2023-08



KEYYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2023-08

PRIORITY PLANT MONITORING

YEAR 1 OPERATION

2022

Prepared for
Manitoba Hydro

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SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014. The vast majority of construction activities were completed by fall 2021, and the generating station was fully operational by March of 2022, with all seven units in service.

The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the generating station on the terrestrial environment - The Terrestrial Effects Monitoring Plan (TEMP). Monitoring results from the TEMP will help the KHLP, government regulators, members of local First Nation communities, and the general public understand how construction and operation of the generating station will affect the environment, and whether or not more needs to be done to reduce harmful effects.

This report describes the results of the priority plant monitoring conducted during 2022, the first summer of Operation monitoring for the terrestrial monitoring studies.

Why is the study being done?

Plants perform important functions in land ecosystems. Among other things, they provide food and shelter for wildlife, contribute to soil development, store carbon and ultimately are the source for most life because they convert solar energy to plant tissue. Some plants, called priority plants in this report, are particularly important for ecological reasons (e.g., rare species) and/or social reasons (e.g., traditional food and cultural importance to the Keeyask partner First Nations).

This report includes both of the TEMP priority plant monitoring studies. The Provincially Very Rare to Rare Plants study is being conducted to determine if any unknown rare plants were present in the construction areas by conducting additional searches for these species. If any rare plants are found, appropriate mitigation (e.g., avoiding those areas or transplanting plants to an area that won't be disturbed) is proposed.

The Priority Plants and Their Habitats study evaluates whether Project effects on plant species that are particularly important for ecological and/or social reasons are consistent with what was predicted in the environmental impact statement (EIS).

What was done?

Pre-clearing rare plant searches were not conducted in 2022 since new clearing for construction was not anticipated.

Rare plant surveys conducted from 2018 to 2022 found elegant hawksbeard, a very rare plant in Manitoba. Patches of elegant hawksbeard plants were found at the Start-up Camp and at several sites in Borrow Area B-6. The patches of plants were flagged so that they could be avoided by construction activities.

It was determined in 2019 that some of the plants in Borrow Area B-6 and the large patch of plants at the Start-up Camp could be affected by Project decommissioning activities. In September 2019 a botanist (plant specialist) transplanted three plants from Borrow Area B-6, and 92 plants from the Start-up Camp to other locations in the Construction Footprint that were at low risk for disturbance. In 2022, surveys monitored the distribution of elegant hawksbeard and the status of the transplanted plants.

Project monitoring of effects on known priority plant locations included documenting new priority plant locations found while conducting other TEMP monitoring.

What was found?

Monitoring determined that the number of elegant hawksbeard plants in Borrow Area B-6 continued to increase and spread into new areas in 2022, including the north bank and near the entrance of the borrow area.

The plants in the Start-up Camp remained undisturbed, and the number of plants had increased and continued to spread in the area. While the 2022 surveys found that none of the originally transplanted plants were alive, 10 new plants had seeded in 3 of the original transplant areas.

Elegant hawksbeard was also found in two new areas in the Construction Footprint, including a large patch at the Main Camp, and a single plant in Borrow Area Q-9 adjacent to the South Access Road.



Elegant hawksbeard, a rare plant found in disturbed areas of the Construction Footprint.

Other TEMP monitoring studies incidentally identified six new priority plant locations, including three new locations for rock willow, two for shrubby willow and one for American milkvetch. All but one location with rock willow and the American milkvetch location fell outside the Construction Footprint.

What does it mean?

Monitoring has shown that the transplanting of elegant hawksbeard has been successful to date, with new seedlings establishing in the transplant areas. Overall, elegant hawksbeard is doing well in the Project area, particularly at the original site in the Start-up Camp, and outside the recently disturbed areas in Borrow Area B-6. While it is recommended that disturbance of the known elegant hawksbeard sites be avoided or minimized where possible, planned rehabilitation activities in the Start-up Camp and Main Camp will remove plants growing at those locations. It is recommended that a portion of those plants be transplanted in 2023 to the nearest suitable area that will not be disturbed.

Residual Project effects on priority plants and their habitat were lower than predicted. Additional priority plant locations found outside of the Construction Footprint in 2022 increases the confidence that Project effects on these species were lower than assumed in the EIS.

What will be done next?

Priority plant monitoring in 2023 will include a ground survey to confirm whether one of the known priority plant locations is within the Construction Footprint, and a transplanting program to move plants from the Start-up Camp and Main Camp rehabilitation areas.

ACKNOWLEDGEMENTS

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STUDY TEAM

Dr. James Ehnes was the project manager and study designer.

This report uses data collected by other terrestrial monitoring studies.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt hydroelectric generating station (GS) and the associated facilities. The Project is located at the former Gull Rapids on the lower Nelson River in northern Manitoba where Gull Lake flows into Stephens Lake, 35 km upstream of the existing Kettle GS.

Project construction began in July 2014. The vast majority of construction activities had been completed by fall 2021. The reservoir was first brought to full supply level in September 2020 and the final generating unit went into service on March 9, 2022. This marked the beginning of the Operation period for the terrestrial monitoring studies.

The *Keeyask Generation Project Response to EIS Guidelines* (the EIS), completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project (KHLP 2012a). Technical supporting information for the terrestrial environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement Terrestrial Supporting Volume* (TE SV; KHLP 2012b).

The *Keeyask Generation Project Terrestrial Effects Monitoring Plan* (TEMP; KHLP 2015) was subsequently developed as part of the licensing process for the Project. Monitoring activities for various components of the terrestrial environment were described, including the focus of this report, priority plants, during the construction and operation phases.

Priority plants are defined as those plants that are particularly important for ecological and/or social reasons. Specifically, priority plants are the native plant species that are highly sensitive to Project impacts, make high contributions to ecosystem function and/or are of particular interest to the partner First Nations. A plant species is considered to be highly sensitive to Project impacts if it is globally, nationally, provincially or regionally rare, near a range limit, has low reproductive capacity, depends on rare environmental conditions and/or depends on the natural disturbance regime (wildlife studies monitor plant species that are critical for the survival and/or reproduction of an animal species). The partner First Nations have noted a variety of plants of traditional importance that are present in the Project area, such as *wihkis* (sweet flag; *Acorus americanus*) and dwarf Labrador tea (tea leaves; *Rhododendron tomentosum*).

Priority plant monitoring includes two studies: Provincially Very Rare To Rare Plants; and, Priority Plants and Their Habitats.

The Provincially Very Rare To Rare Plants study (see KHLP 2015, Section 3.1.2) conducts additional pre-clearing searches in areas of the Project zone of influence that were not previously surveyed and have the highest potential for supporting provincially very rare to rare plant species. In the unlikely event that a provincially very rare to rare species is discovered within these areas and there are not at least 20 known healthy patches outside of the terrestrial plants zone of influence, mitigation is recommended and relevant follow up monitoring is conducted.

Since TEMP was published, the MBCDC conservation concern terminology has changed from very rare or rare to critically imperiled or imperiled species. The remainder of this report uses the current MBCDC terminology.

The objectives of this study are to:

- Determine if any provincially critically imperiled to imperiled plants occur within the Project zone of influence; and,
- In the unlikely event that a provincially critically imperiled to imperiled plant is discovered:
 - Confirm that any identified locations are well marked for avoidance where avoidance is practicable;
 - Develop a transplanting plan for provincially very rare plant locations where avoidance is not practicable; and,
 - Monitor the survival and vigor of all plants in any identified locations.

Monitoring for this study was conducted annually from 2014 to 2022. ECOSTEM (2015; 2016; 2017a; 2018, 2019, 2020, 2021 and 2022b) provide the monitoring results for the years up to 2021.

The Priority Plants and Their Habitats study (see KHLP 2015, Section 3.1.3) verifies actual Project effects on known priority plant locations and priority plant habitats. This study begins at the end of Project construction, when the actual Construction Footprint is known, and is repeated periodically during operation.

The objectives of this study are to:

- Confirm Project effects on known priority plant locations; and,
- Locate and quantify Project effects on priority plant habitats.

Monitoring for this study was conducted in 2021 and 2022. A previous report (ECOSTEM 2022c) provides the results of monitoring conducted in 2021.

During construction, the monitoring for each of the priority plant studies was presented in separate reports. For operation, the monitoring is provided in a single report as the monitoring scope has declined considerably. That is, this report presents the results from the monitoring work conducted during 2022 for both Provincially Very Rare To Rare Plants and for Priority Plants and Their Habitats.

2.0 METHODS

Sections 3.1.2 and 3.1.3 of the TEMP details the methods for the two priority plant studies. The following summarizes the monitoring activities conducted for the first season of the operation phase, from June to September 2022. Construction phase monitoring activities, which extended from June 2014 to September 2021, are detailed in previous annual reports.

2.1 PROVINCIALY VERY RARE TO RARE PLANTS

2.1.1 APPROACH

The rare plant species included in this study were generally those which the Manitoba Conservation Data Centre (MBCDC) has classified as being critically imperiled to imperiled in Manitoba. This includes species with conservation status ranks of S1, S1?, S1S2, S2 or S2?. The two initial exceptions were small pondweed (*Potamogeton pusillus* spp. *tenuissimus*) and Robbins pondweed (*P. robbinsii*), since the EIS analysis concluded that these species are actually not imperiled in the Keeyask region. Muskeg lousewort (*Pedicularis macrodonta*) was ranked as S2 (imperiled) by the MBCDC when construction monitoring began. The species was later excluded after it was found at more than 20 locations outside of the potential Project zone of influence on plants Map 2-1). Additionally, the MBCDC has recently changed the species rank to S2S3 (vulnerable, potentially imperiled).

Uncommon plants of importance to the Keeyask partner First Nations recorded during field surveys to date have included northern Labrador tea and *wihkis* (sweet flag).

This monitoring study conducts pre-clearing rare plant surveys in areas that meet all of the following three criteria:

- Had not been previously surveyed for rare plants;
- Could be directly or indirectly affected by the Project and,
- Had the highest potential for supporting critically imperiled to imperiled species.

Pre-clearing rare plant surveys were not conducted in 2022 since new Project clearing was not anticipated at the time of the surveys. Monitoring activities in 2022 included surveys to monitor the survival and reproduction of elegant hawkbeard (*Crepis elegans* [also called *Askellia elegans*]) plants that had been transplanted in 2019.

2.1.2 ELEGANT HAWKSBEARD SURVEYS

Elegant hawksbeard (Figure 2-1) has been found at four sites during TEMP construction monitoring (Map 2-1). Elegant hawksbeard is ranked as a provincially critically imperiled (S1 species) by the Manitoba Conservation Data Centre (MBCDC 2021).

In 2018 and 2019, elegant hawksbeard plants were found at several sites in Borrow Area B-6, and at the Start-up Camp. In 2019, it was determined that some of the plants in Borrow Area B-6 were growing in an area scheduled to be revegetated during the Project's habitat rehabilitation program, and the plants at the Start-up Camp were growing in a high-traffic area that was planned for decommissioning the following fall.

In September 2019, plants from Borrow Area B-6 and the Start-up Camp were transplanted to other areas and sites because it was unlikely that they could be avoided by construction decommissioning activities (ECOSTEM 2020). In Borrow Area B-6, three plants were transplanted elsewhere in the same borrow area, to sites outside of the planned rehabilitation area (Table 2-1; Map 2-1). A total of 92 plants were transplanted from the large patch in the Start-up Camp to four different areas that were sufficiently separated to serve as independent populations. Two sites were established in an unused portion of the Start-up Camp footprint, and single patches were established in Borrow Areas G-5 and KM-4, and the Cemetery Site (Table 2-1; Map 2-1). The location of all transplant sites were recorded with a GPS, and all sites were marked with blue flagging tape.

In 2022 all transplant sites were re-visited, with one exception. The transplant site in Borrow Area G-5 was not re-visited because at the time of the planned visit, the entrance to the borrow area was gated and it could not be entered. At each transplant site, the surveyor searched the transplant area closely, as well as the wider area, in an effort to locate any remaining transplanted individuals, or new plants that may have established from seed.

All plant locations were marked by a GPS waypoint, and the boundaries of larger patches were mapped using a GPS tracklog.

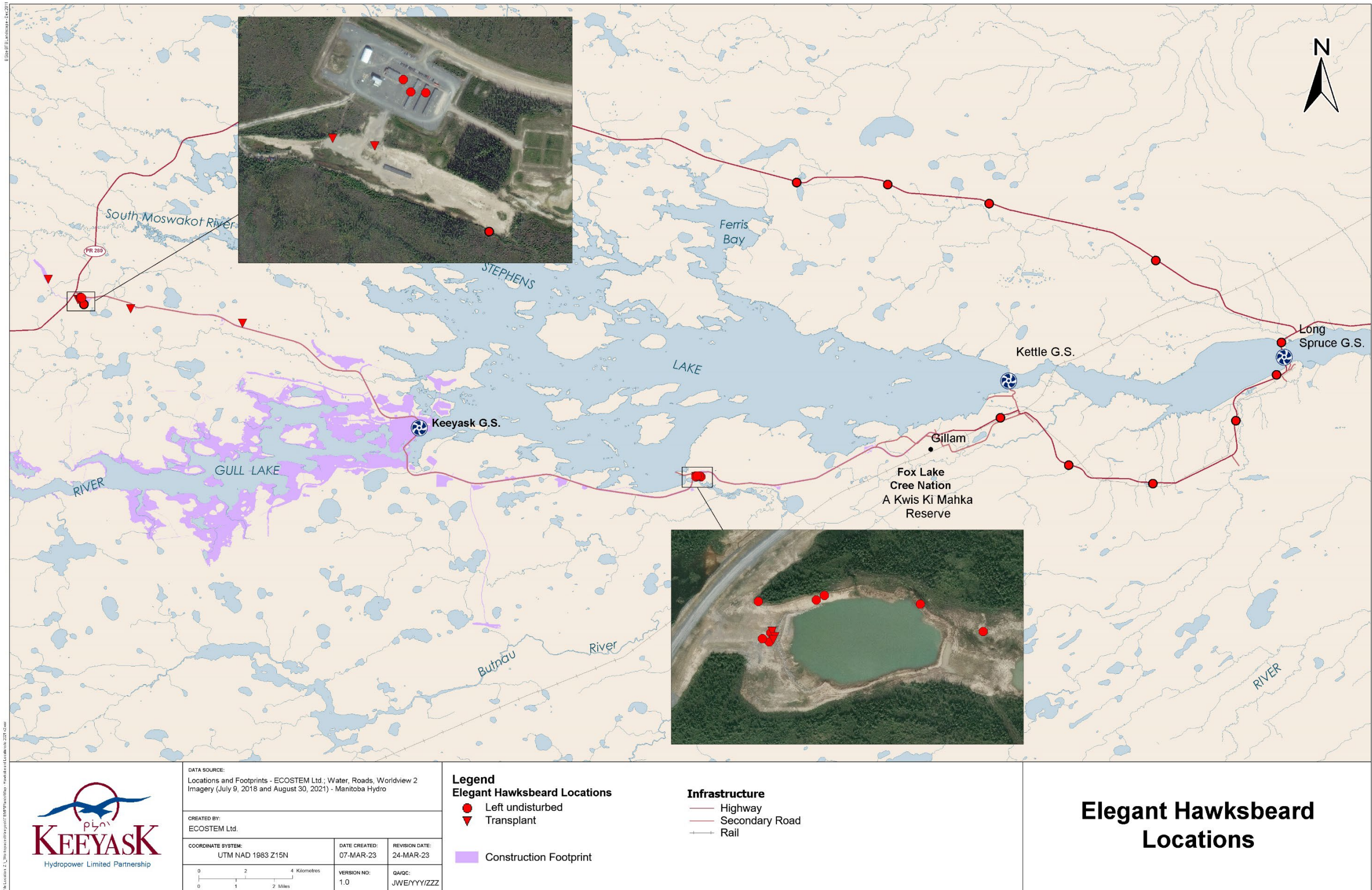


Figure 2-1: Elegant hawksbeard basal rosette in Borrow Area B-6 and flowering plant at Start-up Camp in 2022

Table 2-1: Number of elegant hawksbeard plants transplanted from their source areas, and the number of plants at each new site.

Source Location	Number of Plants Observed in 2019	Number of Plants Left at Source Site in 2019	Transplant Area	Number of Plants Transplanted in 2019
B-6 Borrow Area	26	23	Borrow Area B-6	3
			Start-up Camp ²	25
Start-up Camp ¹	126	34	Borrow Area G-5	24
			Borrow Area KM-4	25
			Cemetery Site	18
All	152	57		95

Notes: ¹ The number of plants in the large patch beside Dorm 1 was visually estimated to be approximately 125. ² Plants distributed between two separate sites.



Map 2-1: Known elegant hawksbeard sites identified in the Project area up to 2021

2.2 PRIORITY PLANTS AND THEIR HABITATS

2.2.1 APPROACH

Actual Project effects on priority plants and their habitat were monitored by ground surveys and by using the mapping produced by other TEMP studies, including Terrestrial Habitat Clearing, Disturbance and Indirect Effects (TEMP, Section 2.1) and Wetland Function (Section 2.5). Ground surveys evaluated the state of known priority plant locations within the Project zone of influence. Mapping was used to evaluate effects on priority plant habitat. Actual effects on priority plants were previously evaluated for the construction phase (ECOSTEM 2022c). This evaluation will be repeated periodically during operation.

The areas that were predicted to be impacted by the Project during construction and operation at the time of the EIS are referred to as the Licensed Construction Footprint. The areas actually impacted by the Project during the construction phase are referred to as the Construction Footprint. ECOSTEM (2022a) provides the Construction Footprint and the methods used to produce it. In brief, the Construction Footprint includes all areas where there was Project clearing or physical disturbance up to September 2021. The Construction Footprint includes both terrestrial and aquatic areas.

The parameters measured for each priority plant species are:

- The number of known locations affected by the Project; and,
- The locations and amounts of their habitat directly and indirectly affected by the Project.

This report provides results for the first parameter. The second parameter was evaluated at the end of the construction phase monitoring for direct Project effects. Indirect effects will be first evaluated in year five of operation as it takes several years for these to be manifested.

2.2.2 KNOWN PLANT LOCATIONS

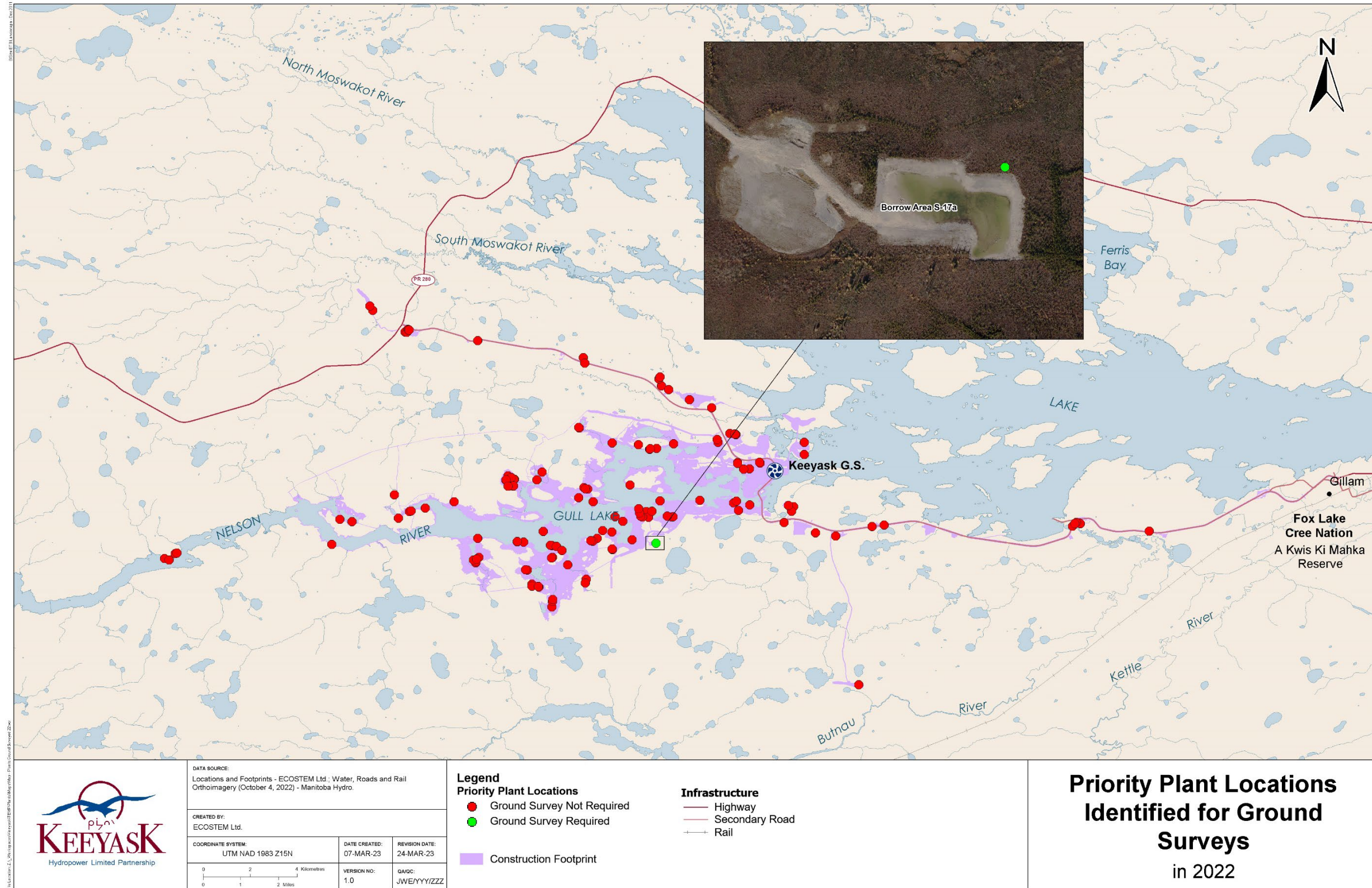
The known priority plant locations include those available at the time that the EIS was completed as well as the locations identified since then. The additional locations were obtained from the pre-clearing rare plant surveys (ECOSTEM 2022c), and from incidental observations recorded during ground surveys for other terrestrial habitat and plant monitoring studies.

Construction phase monitoring for effects on the known priority plants began with a desktop determination of which of the known locations were within the Construction Footprint. A comparison was then made of the number of predicted versus actual locations impacted.

The precision of the mapped Construction Footprint is within +/- 5 metres of the actual boundary. Additionally there is typically a ~3-5 metre positional error in GPS waypoints for a plant location.

For this reason, ground surveys in 2022 were done to confirm that the locations within a 10m buffer of the mapped Construction Footprint had actually been impacted, and document the nature of Project effects at each location.

Known priority plant locations selected for ground surveys in 2022 included known provincially critically imperilled to vulnerable species that were determined by the desktop study to be within 10 metres of the mapped Construction Footprint, which included a single location for a provincially vulnerable plant (rock willow (*Salix vestita*); Map 2-2). The remaining known priority plant locations were 30 metres or more from the Construction Footprint. The status of these plant locations were discussed in a previous report (ECOSTEM 2022c).



Map 2-2: Priority plant locations identified for ground surveys in 2022

3.0 RESULTS

3.1 PROVINCIALY VERY RARE TO RARE PLANTS

3.1.1 ELEGANT HAWKSBEARD SURVEYS

3.1.1.1 BORROW AREA B-6 PLANTS

In Borrow Area B-6, 26 elegant hawksbeard plants had been marked for avoidance in 2019 (Map 3-1). This included the three plants that had been transplanted in September, and an additional 23 pre-existing plants that had not been disturbed (Table 3-1).

Table 3-1: Number of elegant hawksbeard plants observed from 2019 to 2022 at transplanted sites and at sites left undisturbed

Area	Status	Number of Plants 2019	Number of Plants 2020	Number of Plants 2021	Number of Plants 2022	Percent of 2019 Plants Remaining in 2022
B-6 Borrow Area	Left undisturbed	23	29	23	124 ³	539
	Transplanted	3	0	0	0	0
Start-up Camp	Left undisturbed ¹	31	202	250	426	1374
	Transplanted ²	25	13	0	7 ⁴	28
G-5 Borrow Area	Transplanted	24	21	Unknown ⁵	Unknown ⁵	Unknown ⁵
KM-4 Borrow Area	Transplanted	25	23	1	3 ⁴	12
Cemetery Site	Transplanted	18	13	3	0	0
Total number of plants		149	301	277	560	448 ³

Notes: ¹ The number of plants in the large patch beside Dorm 1 was an estimate. ² Plants distributed between two separate sites.

³ Likely an underestimate because one large patch was not visited in 2022. ⁴ These represent seedlings and not the original transplants. ⁵ Status of plants unknown because site was not accessible in 2021 or 2022.

As of 2022, one elegant hawksbeard seedling remained in the general transplant area. Construction activity related to the decommissioning of construction areas along the South

Access Road (SAR) had covered the transplant sites and most of the new seedlings establishing there in 2021. A new patch of plants found on the north bank in 2021 expanded into two patches with approximately 88 individuals (Photo 3-1). Two new patches were found near the SAR ditch on either side of the opening into the Borrow Area. On the north side, a patch of 23 plants (7 in flower; Photo 3-2) was observed. This patch was located near a location that was left undisturbed in 2020 and not visited in 2021. The patch on the south side of the opening included 11 plants (1 flowering), plus a single flowering plant that was not far away.

Two additional known sites on the northeast side of Borrow Area B-6 supported approximately 20 plants in 2020. These sites were not visited in 2021 or 2022, but they were well outside the area impacted by recent construction activities.

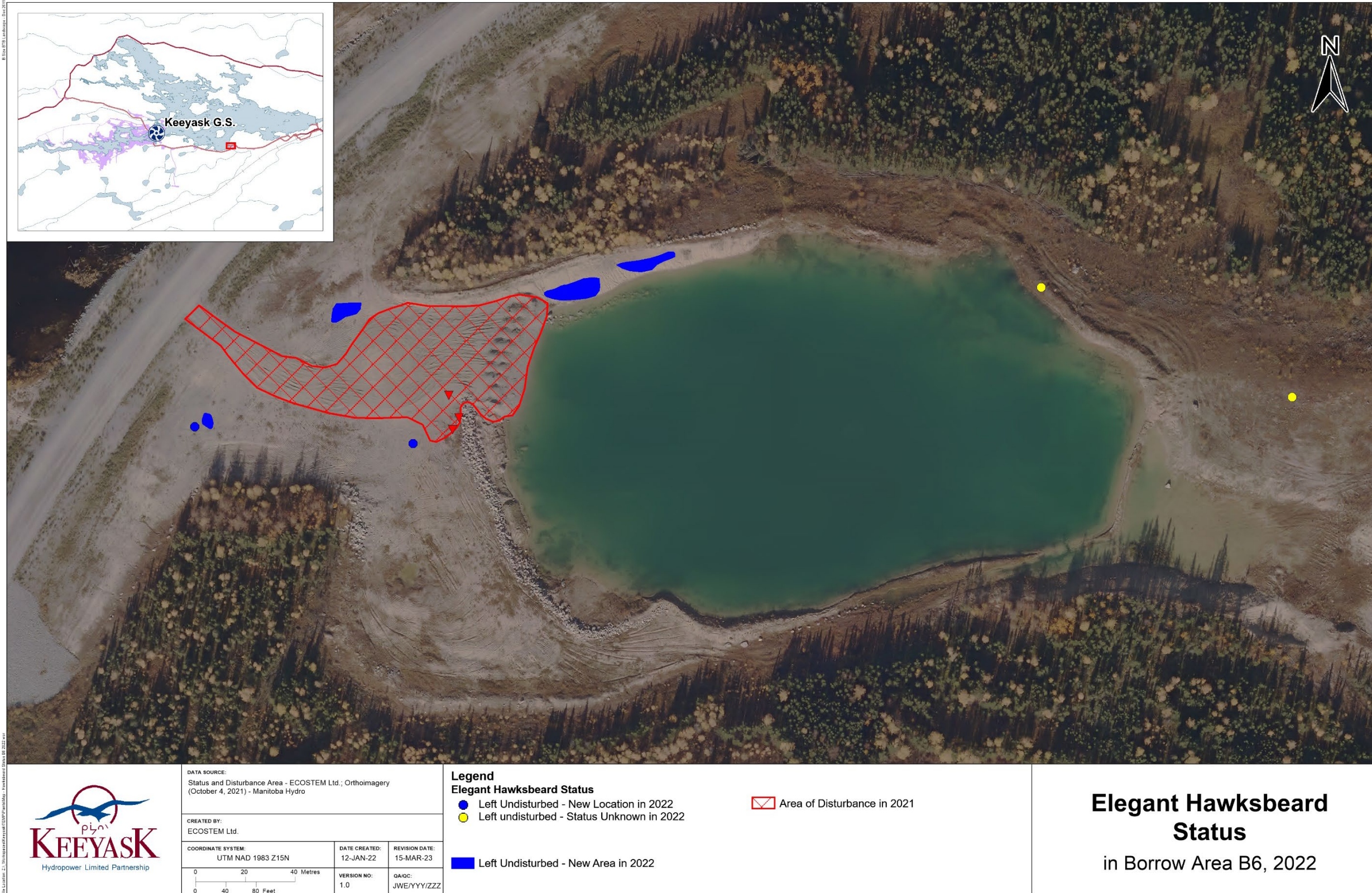
In Borrow Area B-6, there was a net gain in the number of plants found between the 2021 and 2022 surveys. Excluding the potential plants that are still present at the sites that weren't visited in 2022, the total number of known elegant hawksbeard plants at Borrow Area B-6 had increased by approximately 539% between 2019 and 2022 (Table 3-1).



Photo 3-1: Elegant hawksbeard growing on the north bank of Borrow Area B-6 in 2022



Photo 3-2: Elegant hawkbeard in flower on the north bank of Borrow Area B-6 in 2022



Map 3-1: Elegant hawksbeard status at undisturbed and transplanted sites in Borrow Area B-6 in 2022

3.1.1.2 START-UP CAMP PLANTS

For the Start-up Camp, 92 plants were transplanted to other Project areas in September 2019, leaving at least 31 plants undisturbed in the original area (Table 3-1). In 2019, the large patch of 31 plants at the Start-up Camp was marked for avoidance.

Surveys in 2020 and 2021 found that the original patch remained undisturbed, and the number of individuals there had increased to an estimated minimum of 250 plants by 2021. As of September 2020, the overall survival rate of the transplanted plants was approximately 76%. By late August 2021, the survival rate had declined to 6% for the transplant sites that were visited, with only four out of 68ⁱ originally transplanted plants found (Table 3-1). All of the surviving transplanted plants had flowered and seeded by the time of the 2021 surveys. No newly seeded plants were found at any of the transplant sites.

As of early August 2022, the undisturbed patch had grown to include much of the areas surrounding the dorms and dining room, many locations spread-out in the old office and work areas, as well as locations north and west of the ring road (Map 3-2). The estimated minimum number of plants was 426 (Photo 3-3; Photo 3-4).

In 2022, none of the originally transplanted plants were found, however, a total of 10 new seedlings were found in three of the sites where plants had been transplanted (Photo 3-5). These included a total of seven new seedlings in each of the two transplant sites in the unused portion of the Start-up Camp (Photo 3-6), and three seedlings at the transplant site in Borrow Area KM-4 (Map 3-2; Photo 3-7). None of the new seedlings had flowered or seeded at the time of the surveys.

At one of the transplant sites in the Start-up Camp, non-native plants, including common dandelion (*Taraxacum officinale*) and white sweet-clover (*Melilotus albus*), were increasing in cover at the transplant site. At the Cemetery Site naturally regenerating alder was expanding into the transplant site (Photo 3-8).

The status of the transplanted plants in Borrow Area G-5 was unknown for 2021 and 2022 as it was not accessible during the surveys.

ⁱ Excluding 24 plants transplanted into Borrow Area G-5, whose status are unknown.



Photo 3-3: Recording elegant hawksbeard near the site of the original patch of elegant hawksbeard at Start-up Camp in 2022 (plants too small to be clearly visible in photo)



Photo 3-4: Elegant hawksbeard (basal rosettes and flowering) growing at the original site at Start-up Camp in 2022



Photo 3-5: New elegant hawksbeard plants growing in a transplanted area at the Start-up Camp in 2022



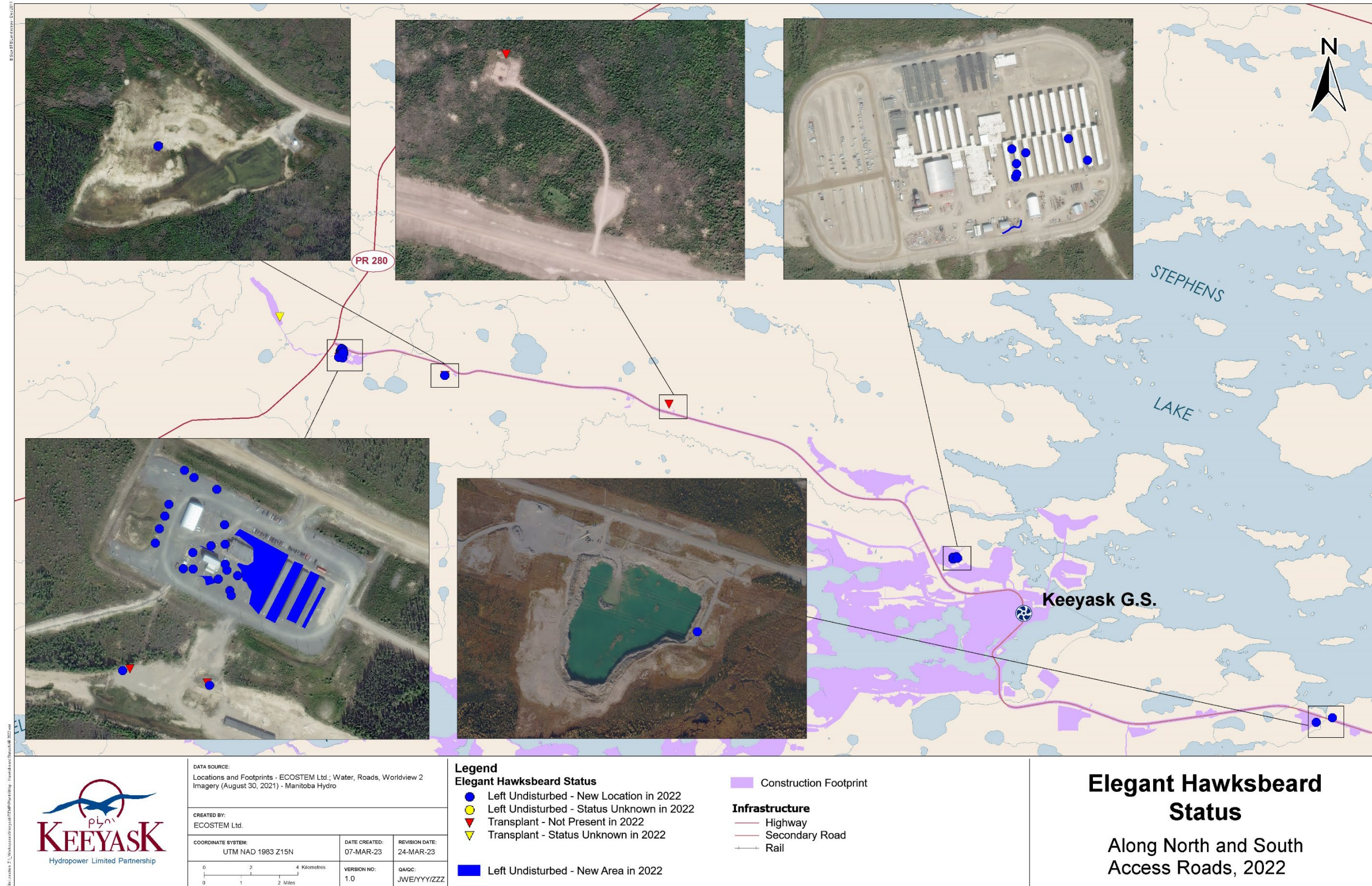
Photo 3-6: Elegant hawksbeard seedling growing in one of the transplant areas at the Start-up Camp in 2022



Photo 3-7: Elegant hawksbeard plants (circled) growing near the transplant area in Borrow Area KM-4 in 2022



Photo 3-8: Regenerating alder in the elegant hawksbeard transplant site at the Cemetery Site in 2022



Map 3-2: Elegant hawksbeard status at undisturbed and transplanted sites in 2022 at locations along the North Access Road and Borrow Area Q-9

3.1.1.3 NEW AREAS WITH PLANTS

In addition to the incidental plants found in the Startup Camp, incidental observations were made of elegant hawksbeard in two new areas in 2022; the Main Camp area and Borrow Area Q-9 (Map 3-2; Table 3-2).

Table 3-2: Number of elegant hawksbeard plants observed in new locations in 2022

Area	Status	Number of Plants 2022
Main Camp	Left undisturbed	>100 ¹
Borrow Area Q-9	Left undisturbed	1

Notes: ¹ This number of plants is partially an estimate based on the density recorded within the band.

In the Main Camp area, several single plants were observed between the dorm trailers on the south side of the camp complex (Map 3-2). The remaining 3 plants were spread out between other dorms. One low density band of elegant hawksbeard (>100 plants estimated; Photo 3-9) was recorded near a small building between the south part of the ring road and the Northern Maintenance Services shop. Approximately half the plants growing in Main Camp were seeding.

One individual was recorded in the Borrow Area Q-9. This plant was found along the old road next to a large mineral berm on the east side of the quarry pond in Borrow Area Q-9. Some effort was put into looking for additional plants in this area, but only 1 was observed.



Photo 3-9: Flowering elegant hawksbeard growing in the Main Camp area in 2022.

3.2 PRIORITY PLANT LOCATIONS

One location of rock willow, a provincially vulnerable (S3) species, was identified for ground survey in 2022 (Map 3-3). It remains unconfirmed as to whether this plant location is actually outside the Construction Footprint as field crews overlooked visiting this location during the 2022 surveys. The location will be visited in 2023 when nearby invasive plant surveys are being carried out.

New locations for three provincially critically imperiled to vulnerable species were incidentally recorded in the Licensed Construction Footprint during 2022 monitoring surveys. These included one location for American milkvetch (*Astragalus americanus*; possibly imperiled (S2S3); Photo 3-10), two locations for shrubby willow (*Salix arbusculoides*; possibly imperiled (S2S3); Photo 3-11), and three locations for rock willow (Table 3-3; Map 3-3; Photo 3-12).

All the new plants were living, but one location for American milkvetch and one location for rock willow were within areas disturbed by the reservoir (Table 3-3; Map 3-3).



Photo 3-10: American milkvetch growing in the future reservoir area in 2016



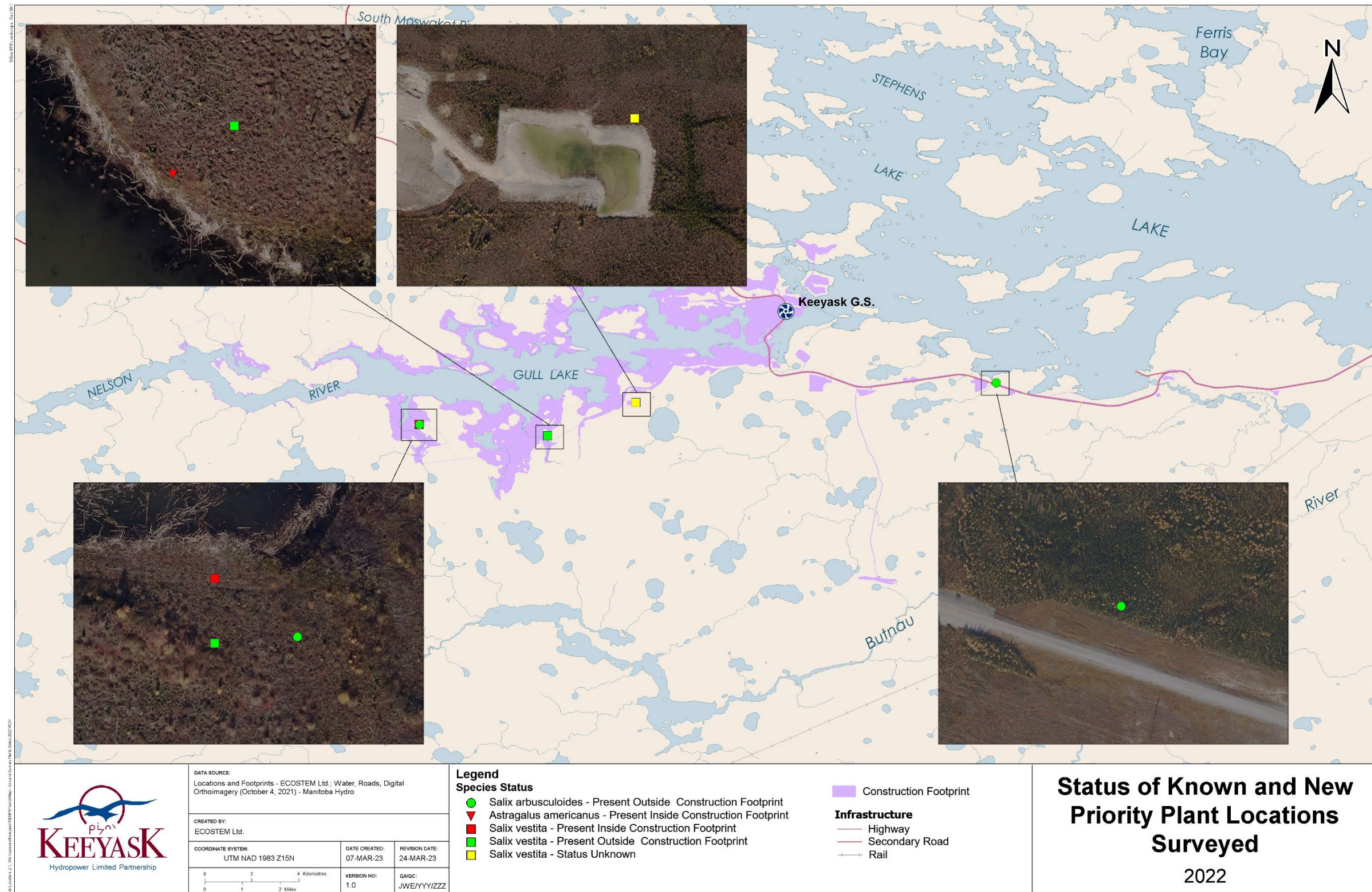
Photo 3-11: Shrubby willow growing near the reservoir shoreline in 2022



Photo 3-12: Rock willow growing near the reservoir shoreline in 2022

Table 3-3. Known priority plant locations for species with new locations in 2022

Species	Common Name	Reason(s) for Inclusion ¹	Number of Known Locations				
			Within the Licensed Construction Footprint			Within Construction Footprint (i.e., the actual Construction Footprint)	Construction Footprint Minus At Time of EIS
			At Time of EIS	Found After EIS	Total		
<i>Astragalus americanus</i>	American milkvetch	CI-V	0	2	2	2	2
<i>Salix arbusculoides</i> ⁴	shrubby willow	CI-V; RL	9	2	11	6	-3
<i>Salix vestita</i>	rock willow	CI-V; RL	7	4	11	3	-4
All			337	43	24	11	-5



Map 3-3: Status of known priority plant locations ground surveyed, and new locations identified in 2022

4.0 DISCUSSION

4.1 PROVINCIALY VERY RARE TO RARE PLANTS

Surveys at the beginning of the Operation period mapped the spread of elegant hawksbeard, a critically imperiled species, within the Construction Footprint. Surveys from 2018 to 2021 found that the number of individuals was increasing annually, and by 2022, the plant was becoming well established in certain areas and was spreading to other parts of the Construction Footprint (e.g., the Main Camp) without intervention.

These plants had naturally established on Project-disturbed substrates. All of these plants were found on mineral substrates in highly disturbed sites in Project borrow and camp areas.

Finding elegant hawksbeard in some of the newly developed borrow areas was not surprising. Under natural conditions, this species is typically found growing on recently disturbed, coarse substrates such as stream banks, gravelly flats, sandbars and roadsides (FNA 2023). Additionally, it is known that this species can establish in human-disturbed sites as it was previously found on disturbed bare gravel and mineral sites in the Project region and in the Wuskwatim Generation Project footprint (ECOSTEM 2017b). All of the elegant hawksbeard sites found in the Project region prior to Project construction were along Highways 280 and 290, which are continually disturbed environments. In the Wuskwatim Generation Project footprint, elegant hawksbeard was found on disturbed bare gravel and mineral sites, and was becoming widespread in some areas.

The transplanting program conducted in September 2019 moved a total of 95 plants into other portions of the Construction footprint that were at low risk for further disturbance. The goal was to conserve the local populations by providing an additional seed source for the nearby seedbank and by facilitating seed dispersal into other areas.

Surveys one year after transplanting found that the survival rate of the transplants was at least 76%. While the 2022 surveys did not find any surviving transplants, several new vegetative seedlings were found growing for the first time in three of the transplant areas.

This trend was not unexpected. Legge (1971) found that transplanted elegant hawksbeard remained in a vegetative state for nine months, followed by two to three flowering cycles, after which the plants died. Most of the elegant hawksbeard plants were transplanted from the Start-up Camp when they were at an early stage in their vegetative cycle.

The substrate and other environmental conditions at some of the transplant sites may eventually become unsuitable for ongoing seed germination. It has been noted previously that at least two of the transplant locations had increasing native and/or non-native vegetation cover, such as the location at the Cemetery Site. No transplanted plants or new seedlings were found at this location during monitoring. It may be the case that the conditions in this spot have become unsuitable for the survival of elegant hawksbeard.

Some of the known elegant hawksbeard plants remain at risk because they are in active Project areas as well as in areas planned for decommissioning and rehabilitation. Unanticipated material placement activities in Borrow Area B-6 in 2021 removed several new plants that had established in 2020. Additionally, although the plants at the Start-up Camp location remain undisturbed, decommissioning of that site is still planned. Decommissioning of the Main Camp, where new patches were found this year, is also to be completed.

The findings from monitoring from this study and those done for the Wuskwatim Generation Project provide evidence to indicate that elegant hawksbeard can continue to colonize exposed, coarse mineral substrates that are no longer being used by the Project. The continued natural spread of elegant hawksbeard into new areas, in combination with the early success of the transplanting program, suggests that the plant is relatively secure within the Construction Footprint.

As elegant hawksbeard is an S1 species and it remains uncertain if new plants will continue to thrive at the transplant sites, it is recommended that disturbance of all the known sites be avoided or minimized, where possible. The Start-up Camp and Main Camp are permanently closed and will be rehabilitated, which will involve substrate preparation that would remove existing vegetation. It is recommended that a portion of the plants from each location should be transplanted in 2023 to the nearest suitable location that will not be disturbed. If it is feasible, a portion of the elegant hawksbeard patches at each site should be protected to act as a seed source after site preparation is complete.

4.2 PRIORITY PLANT LOCATIONS

Construction monitoring found that a vast majority of direct Project effects on priority plants were lower than assumed in the EIS. This was primarily due to the actual Construction Footprint being 20% smaller than assumed in the EIS (ECOSTEM 2022a).

Three new locations for a provincially vulnerable species (rock willow) were incidentally found during other TEMP monitoring studies. Two of these were outside of the Construction Footprint. In addition, new locations were found for two possibly imperiled species, American milkvetch and shrubby willow. Both locations of the latter were also outside of the Construction Footprint. For both species, this resulted in a net increase for the number of known locations outside of the Construction Footprint compared to those within the Construction Footprint.

The new locations incidentally recorded in sample locations for other monitoring is a positive finding because it suggests that these plants are not particularly scarce in the Project area.

5.0 SUMMARY AND CONCLUSIONS

5.1 PROVINCIALY VERY RARE TO RARE PLANTS

Elegant hawksbeard is a critically imperiled plant in Manitoba. Rare plant surveys conducted in 2018 and 2019 found elegant hawksbeard plants in the Start-up Camp and in Borrow Area B-6. It was determined in 2019 that some of the plants in Borrow Area B-6 as well as the large patch of plants at the Start-up Camp were at risk from ongoing Project construction and rehabilitation activities. In September 2019, 95 elegant hawksbeard plants were transplanted to other sites in the Construction Footprint that were at low risk for disturbance.

Priority plant monitoring surveys in 2022 focused on plant survival at the known elegant hawksbeard sites, and on the success of the 2019 transplanting program.

While construction decommissioning activity had unintentionally removed several elegant hawksbeard plants, many new plants continued to establish and spread in several patches on the north bank of Borrow Area B-6, as well as in new areas near the entrance of the borrow area.

Plants in the Start-up Camp continued to spread. Many plants were also found growing in the Main Camp for the first time in 2022, and one plant was found in Borrow Area Q-9 adjacent to the South Access Road. Monitoring found that while none of the originally transplanted individuals remained, 10 new seedlings were growing at 3 of the transplant locations. At one transplant site (the Cemetery Site), no new seedlings were found, and it appears likely that site conditions have become unsuitable due to competition from native species.

Overall, elegant hawksbeard is doing well in the Project area, particularly at the first-discovered site in the Start-up Camp, and outside the recently disturbed areas in Borrow Area B-6. The number of known plants has been increasing annually up to 2022, and has spread into two new areas.

It is recommended that disturbance of the known elegant hawksbeard sites be avoided or minimized, where possible. Preserving these plants helps maintain local populations of a species that is critically imperiled in Manitoba by providing a seed source for the local seedbank and for dispersal to other areas. Planned rehabilitation activities in the Start-up Camp and Main Camp will likely remove the plants growing at those locations. It is recommended that a portion of those plants be transplanted in 2023 to the nearest suitable area that will not be disturbed, and if possible, that some patches be avoided in order for them to act as a seed source.

Due to its prolific spread in the Construction Footprint, it is recommended that monitoring of the elegant hawksbeard transplanted in 2019 is not needed for 2023. Plants to be transplanted from the Start-up Camp and Main Camp in 2023 will continue to be monitored. Elegant hawksbeard will continue to be incidentally recorded during other monitoring surveys, and the status of the plant will continue to be monitored to determine if any further mitigation is needed in the future.

5.2 PRIORITY PLANT LOCATIONS

A previous annual report determined that Project effects on priority plants were lower than assumed in the EIS (ECOSTEM 2022a). A single priority plant location for rock willow, a provincially vulnerable species, within 10 metres of the mapped Construction Footprint was identified for a ground survey to determine its status. A ground survey in 2023 will confirm its status while other surveys are being conducted in the area.

Monitoring for other TEMP studies incidentally identified six new priority plant locations, including three new locations for rock willow. Two of these locations fell outside the Construction Footprint. Additional known locations outside of the Construction Footprint increases the confidence that Project effects on these species were lower than assumed in the EIS.

The next monitoring for priority plants other than elegant hawksbeard will occur in 2026.

6.0 LITERATURE CITED

- ECOSTEM Ltd. 2015. 2014 Rare Plant Survey. Terrestrial Effects Monitoring Plan Report #TEMP-2015-02. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2015.
- ECOSTEM Ltd. 2016. Terrestrial Plant, Habitat, and Ecosystem Monitoring Report. Keeyask Generation Project Terrestrial Effects Monitoring Plan Annual Report #TEMP-2016-01. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2016.
- ECOSTEM Ltd. 2017a. Keeyask Transmission Project: Environmental Effects Monitoring – Priority Plant Monitoring in 2016. A report prepared for Manitoba Hydro by ECOSTEM Ltd., May 2017.
- ECOSTEM Ltd. 2017b. Wuskwatim Generation Project: Operation Monitoring: Effects on Ecologically Sensitive Plant Species. Report # 17-09. A report prepared for Wuskwatim Power Limited Partnership by ECOSTEM Ltd., May 2017.
- ECOSTEM Ltd. 2018. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2018-04: Provincially Very Rare and Rare Plant Monitoring Report. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2018.
- ECOSTEM Ltd. 2019. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2019-04: Provincially Very Rare and Rare Plant Monitoring. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2019.
- ECOSTEM Ltd. 2020. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2020-04: Provincially Very Rare and Rare Plant Monitoring. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2020.
- ECOSTEM Ltd. 2021. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2021-04: Provincially Very Rare and Rare Plant Monitoring. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2021.
- ECOSTEM Ltd. 2022a. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2022-01: Habitat Loss and Disturbance Monitoring. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2022.
- ECOSTEM Ltd. 2022b. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2022-04: Provincially Very Rare and Rare Plant Monitoring. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2022.
- ECOSTEM Ltd. 2022c. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2022-08: Priority Plants and Their Habitats Monitoring. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2022.
- Flora of North America (FNA). 2023. [Online]
http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250066444 [Accessed Jan 13, 2023]

Keeyask Hydropower Limited Partnership (KHLP). 2012a. Keeyask Generation Project Environmental Impact Statement: Response to EIS Guidelines, Winnipeg, Manitoba. June 2012.

Keeyask Hydropower Limited Partnership (KHLP). 2012b. Keeyask Generation Project Environmental Impact Statement: Terrestrial Environment Supporting Volume, Winnipeg, Manitoba. June 2012.

Keeyask Hydropower Limited Partnership (KHLP). 2015. Keeyask Generation Project Terrestrial Effects Monitoring Plan. Winnipeg, Manitoba. December 2015.

Legge, A.H. 1971. The gene-ecology of *Crepis nana* Richardson and *Crepis elegans* Hooker in arctic and alpine North America. A thesis submitted to Oregon State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy. June 1971.

Manitoba Conservation Data Centre (MBCDC). 2021. Species and Plant Community Database. [Online] <https://www.gov.mb.ca/sd/cdc/db.html> [Accessed November, 2021]