

Massasauga Site Fidelity and Translocation Study

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Organization Nominated: Ontario Ministry of Transportation, Northeastern Region

Overview

The Massasauga rattlesnake has been assessed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) due to a historical population decline, continued habitat fragmentation and loss, and human persecution. It is listed as Threatened on Schedule 1 of the *Species at Risk Act* (SARA), and Threatened provincially in Ontario under the *Endangered Species Act* (ESA). Canada hosts 8-10% of the global distribution of this species. The eastern Georgian Bay and Bruce Peninsula Massasauga populations are believed to be the largest and most secure found anywhere across the species entire range.

The future Highway 69 expansion (from two lanes to four-lanes) from Parry Sound to Sudbury will be built through the eastern Georgian Bay Massasauga habitat, and as such, will be one of the most permeable highways in Canada. At this stage of the design, the Ontario Ministry of Transportation (MTO) is planning to construct 93 eco-passages (large crossings underneath the highway that provide safe passage for wildlife) which will include approximately 140 kilometres (km) of fencing designed to keep the animals off of the roadway and to funnel them towards the eco-passages.

In addition to general habitat and species impacts, the future highway will destroy a large Massasauga hibernaculum (the Source Site). Figure 1 in the Appendix shows the future highway design going through the Source Site. Once construction through this area begins, the animals that currently use the Source Site will no longer have a hibernation site.

As a requirement under the ESA, the Ontario Ministry of Transportation (MTO) obtained a section 17.2(c) permit for the highway project. This permit prescribes extensive mitigation measures required to construct and operate the highway, and a requirement to fund scientific research at the Source Site.

The Massasauga

The Massasauga is the only rattlesnake as well as the only venomous snake in Ontario. It ranges in size from about 47-76cm and is a brownish grey to dark grey colour with dark blotches along its entire body.

The Massasauga is generally harmless unless provoked or startled. An obvious feature of the Massasauga is the rattle on the end of its tail. It will not always rattle and sometimes remains quiet to try to avoid detection, but when it does rattle, it produces a buzzing, insect-like rattling noise.

The Massasauga lives in a variety of open range habitats where it hunts for prey. Its diet consists of small mammals and birds. It has a heat sensor between its eye and nostril that helps in hunting for these warm blooded animals. It tends to shift its habitat seasonally spending most of the summer in dry upland sites and the rest of the year in forested wetland type regions such as swamps and river deltas. Female Massasaugas that are incubating young are not often seen as they stay hidden away in a micro habitat with rocks and leaves as cover. Mating occurs between mid-June to August and can produce anywhere in the range of 6-20 young. Mating normally doesn't occur every year, but rather every second or third year. The Massasauga hibernates all winter, from October to April, by itself or in small groups typically of 2 or 3 using old mammal burrows, rock crevasses, tree root systems, barn floors or any similar environment.

The Massasauga has a large range that extends across the middle of the United States up to Ontario. The Southern Ontario populations on the Bruce Peninsula and the eastern shore of Georgian Bay represent the northern extent of its range.

Threats to the Massasauga historically have been the same as those to most snakes; the loss of habitat through development of farmland and urban areas. The major threat today is the fragmentation and further loss of habitat due to road construction within its range. Human persecution of the Massasauga is still a factor but in recent years snake deaths from direct human actions have decreased because of increased public awareness.

The Massasauga is understood to show strong fidelity to hibernation sites (hibernacula). This evidence supports arguments that hibernacula of snakes are significant and critical habitats for survival of populations and individuals. The ecological community that forms hibernacula, and possibly the specific hibernaculum within that community, is likely used throughout the life of most individuals. Therefore protection of this ecological community is a key conservation strategy.

Having access to suitable hibernation areas appears to be critical to the survival of individual Massasaugas. Snakes in northern climates must hibernate during the winter to avoid death by freezing to death or desiccation. Past radio telemetry studies have demonstrated that Massasauga typically re-use the same hibernation sites year after year, suggesting that suitable sites are uncommon. In some cases, a number of individual hibernacula may be concentrated in a relatively small area (0.1 hectares) that provides favourable hydrogeological conditions. The study Source Site, however, is a large hibernaculum (approximately 1.9 ha).

Construction of Four-Lane Highway 69

The future highway construction will permanently destroy a known hibernaculum (the Source Site). This provides a study opportunity to enhance our knowledge of the species. What happens when a Massasauga is no longer able to access its traditional hibernation site? Will it remain in the area, searching above ground, until winter sets in (should that occur, it can be assumed that those snakes would not survive the winter)? Will it find another site?

Translocating wildlife involves moving individuals from their native habitat or activity area to areas outside their normal range or to a part of their range removed from the threat. Wildlife managers use translocation for a variety of reasons including habitat destruction, resolution of conflict with humans and establishing new or augmenting existing populations. Research has shown that the success of translocation varies considerably with the species involved, the methods used and the intended result. However, until we determine the impacts of translocation on Massasauga behaviour and spatial ecology, we will not be able to determine how effective translocation can be or if this recovery action should be part of a long term/permanent conservation strategy.

This study will determine the strength of site fidelity of Massasauga to hibernacula and whether translocation of individuals to alternate hibernacula is an effective mitigation strategy to impacts of harmful alteration or destruction of hibernacula in landscapes impacted by development.

The Study

The Massasauga Site Fidelity and Translocation Study (the Study) is funded by MTO and being undertaken by Wildlife Preservation Canada. Ron Black, the Lead Researcher, is also a Management Biologist with the Ontario Ministry of Natural Resources and Forestry, and an Advisor to the Massasauga Recovery Team.

The Study began in 2012 and will be completed in summer of 2015. The objective of the Study is to study site fidelity of Massasaugas to their hibernation site, and to determine whether translocation to alternate hibernation sites is a viable conservation strategy to mitigate the impacts of habitat destruction.

This study is being carried out in a landscape that has a rich supply and distribution of ecological communities that provide confirmed and potential Massasauga hibernacula. The results of this study will influence mitigation measures for the future highway expansion, and assist in the recovery strategy for Massasauga in the Georgian Bay region.

This multi-year study involves several stages. During Year 1, snakes known to hibernate in the Source Site were captured and implanted with radio telemetry units. Surgical implantations were conducted at the Toronto Zoo. These implanted snakes were then tracked and monitored in order to learn their behaviours (i.e. what direction do they travel in, where do they forage, who is gravid (pregnant), how many young do they have, when do they return to hibernate, do they always go back to the same site, etc). In total, 31 Massasaugas were implanted with transmitters.

Since one of the requirements of the study is to translocate individuals to different hibernacula, it was also necessary to determine, with certainty, where these alternate sites are located. The best way to know if a location is a viable hibernaculum is to determine that it is actually being used by other Massasauga. This was completed during Year 1.

Year 2 (2013) involved more tracking and behaviour modelling. In the fall, once the animals started moving back to their hibernation sites, the implanted snakes were captured and translocated to alternate sites. A total of 20 tagged animals were translocated; 18 remained where they were taken; 1 returned to his original site, and 1 female selected a completely different site. After the translocation, the animals were allowed to react naturally without any additional interference. Of those 20 animals, 12 were from the Source Site, the other 8 used different hibernaculum in the area.

Year 3 (2014) involved further monitoring (winter survival, movement post-translocation). This year also involved the simulated destruction of the Source Site. As previously mentioned, the Source Site will be destroyed by the construction of the future highway. In order to simulate that post-construction environment, MTO tendered a contract to completely fence off the Source Site. Photos are provided in Figure 2 of the Appendix.

Along with the fencing, traps were installed at regular intervals to capture all of the animals as they entered the Source Site. In total, 1,180 metres (m) of fencing was installed in an enclosed loop all around the Source Site. Nine (9) traps were inserted into the fencing.

The traps were opened up on August 18, 2014, and were monitored at least twice daily until mid-October. Every Massasauga trapped was documented, pit-tagged, weighed and measured. A total of 102 Massasauga entered the Source Site to overwinter in 2014 (the Source Site was originally thought to overwinter approximately 20 individuals).

Those 20 translocated snakes were also monitored in 2014. Of the 20 that were taken to new hibernation sites the year before:

- 9 went back to their native sites this fall
- 2 went back to their release site
- 4 selected new sites
- 5 were lost (stayed at the fence, did not try to find a new site on their own)

At the time of report preparation, the statistical analysis of the years of study is still underway. The significance of the data collected has yet to be interpreted, as the study is not complete until June 2015.

Also of interest, the Source Site is also the choice hibernaculum to other species:

- Eastern Hognose
- Common Garter
- Northern Ringneck
- Northern Water
- Green frogs
- Wood frogs
- Peepers

- Yellow spotted salamander
- Blue spotted salamander

The final cost of the fencing contract was \$425,000. The research cost to the Ministry of Transportation is approximately \$355,000. Additional funding has been provided by other agencies as well.

Study Significance

There are still 82 km of Highway 69 four-laning to be completed, all of which is within Massasauga habitat.

The mitigation measures and principles to be applied to the Highway 69 expansion project (as required by the ESA Permit), with respect to Massasauga, include:

- Avoiding sensitive habitat areas.
- Installing exclusion systems (such as fencing) to prevent snakes from entering the highway Project site during periods of construction activity, and to provide passage snakes during periods of no construction activity.
- Installing exclusion systems around material stockpiles that could be used as nesting materials or nesting sites.
- Establishment of designated construction vehicle travelways, warning measures along travelways where snake presence is most likely, and speed regulations to maximize early identification of a species and safe stopping of vehicles and equipment.
- Establishment of timing windows during which construction activities can and cannot be undertaken so as to avoid disturbance of Massasauga during hibernation, nesting, or other sensitive periods.
- In those places where the highway will sever habitat for Massasauga, MTO will install passage systems under the highway to maintain connectivity (93 currently planned).
- Adaptive Management - changes to the mitigation plans on an ongoing basis will be employed towards continuous improvement as new information, techniques, science, and technology becomes available.

In addition to the above principles, the results of the Study will be applied to future construction, and methodologies and designs may need to be altered as a result.

While the results of the study have not be analysed and reported yet (expected later this year), the data do not appear to support translocation as a conservation strategy to offset

habitat destruction. Only 2 of the 20 Massasaugas that were translocated returned to their new hibernacula, and 5 were deemed to have perished while attempting to enter the “destroyed” Source Site. This suggests that once the highway is built and the hibernaculum destroyed completely, many animals may return to the site and freeze to death looking for it.

The ESA approvals for the Highway 69 expansion project require MTO to apply an “adaptive management” approach to the mitigation measures identified in its ESA permit. Many of the mitigation measures were developed based on the best known science at the time, and it was acknowledged that the measures may not be as effective as expected, or that better measures may be identified and developed in the future.

Based on the initial results, and the Adaptive Management approach, MTO may be required to conduct multiple years of translocation activities prior to construction, in order to ensure all of the animals are safely relocated. If MTO is required to implement this type of program, the cost per year is estimated to be approximately \$50,000. If, however, the translocation is successful, this type of pre-construction mitigation requirement would need to be implemented whenever hibernation habitat is known or suspected.

As previously identified, the Source Site hibernaculum is quite large, measuring around 1.9 hectares. Along with the large area the Source Site occupies, it is also used by a large number of Massasauga. During the 2014 simulated destruction portion of the study, 102 Massasauga were collected trying to enter the Source Site. Typical hibernacula are much smaller, and therefore house fewer animals. In order to translocate all 102 snakes, multiple alternate hibernacula will need to be identified. They cannot all be translocated to only 1 or 2 sites.

Additional design modifications may still be required, once the Study results have been documented. Potential changes could include:

- Additional culverts added to provide safe passage (currently there is one crossing designed in the area)
- Alternate habitat may need to be created to off-set the impacts of the highway project

The density of habitat and individual Massasauga throughout this area of the East Georgian Bay may also require modifications to standard construction methods, in order to ensure compliance with the ESA approvals:

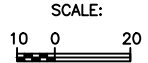
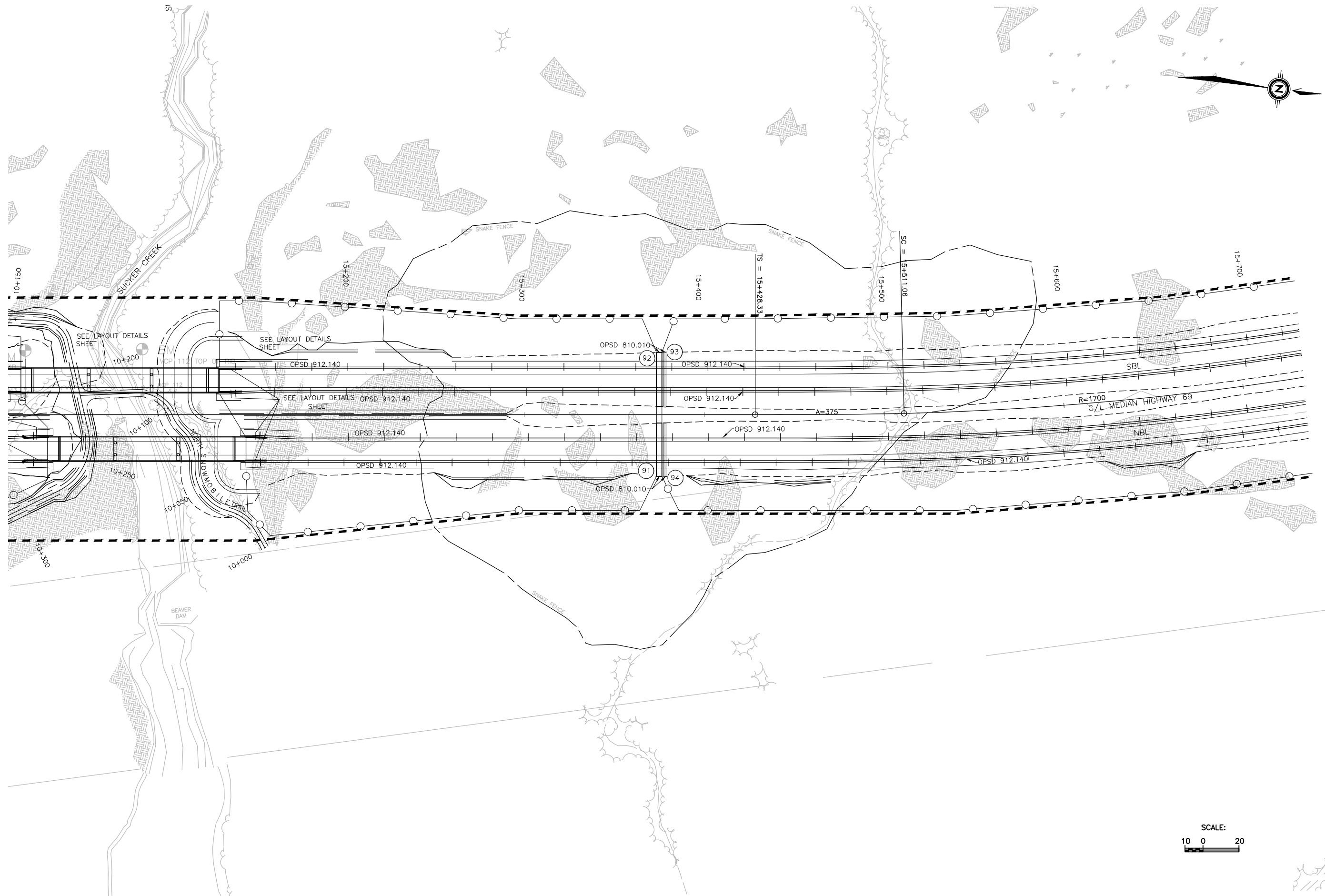
- Water levels will need to be protected (a primary component of a viable hibernation site)
- Blasting will need to be minimized and controlled to ensure fly rock does not impact the surrounding animals or habitat
- Multiple specialists will be required on site throughout to oversee activities and ensure animals are safely removed from construction areas.

This could impact production rates and length of construction contracts.

Perhaps of greater significance than the direct impacts to the Highway 69 expansion project is the scientific data that may not allow translocation as a conservation measure in the future. Should the results of the study indicate that translocation is never a viable strategy, the implications for linear development could be severe.

From the perspective of species conservation, the information and knowledge captured by this study is the most detailed to date on this population. The multiple years of tracking, the number of animals captured and marked (over 250 individuals have been captured in the study area), the behavioural data collected, is the most extensive Massasauga research in North America.

The fenced-off Source Site is also providing a unique opportunity for research biologists to capture survival rates in the area. Since every animal entering the Source Site was captured, tagged and/or marked, it will be possible to compare that to all of the animals that exit the site this spring. The configuration of the traps will be reversed this spring, capturing all of the animals as they exit. They will be weighed, measured, and released, providing the ability to quantify winter survival rates, something not previously captured.



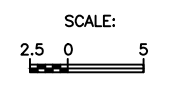
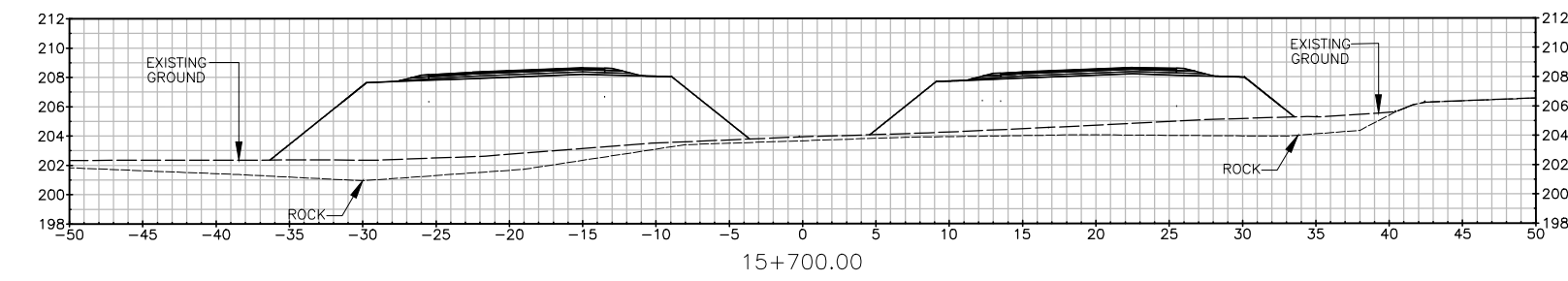
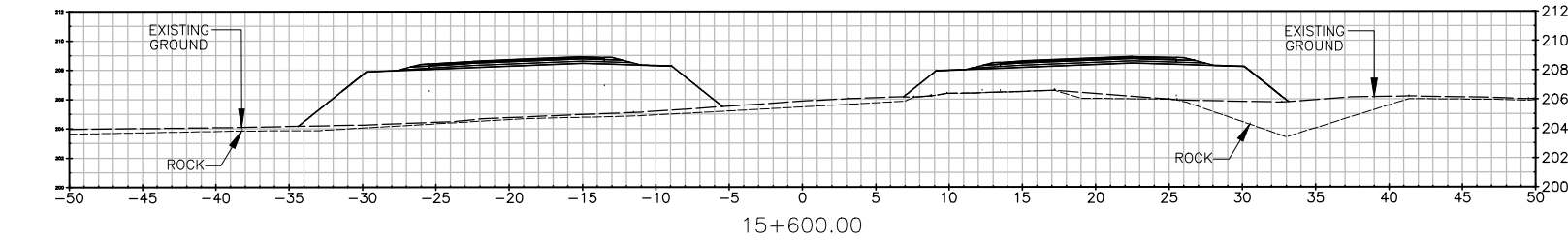
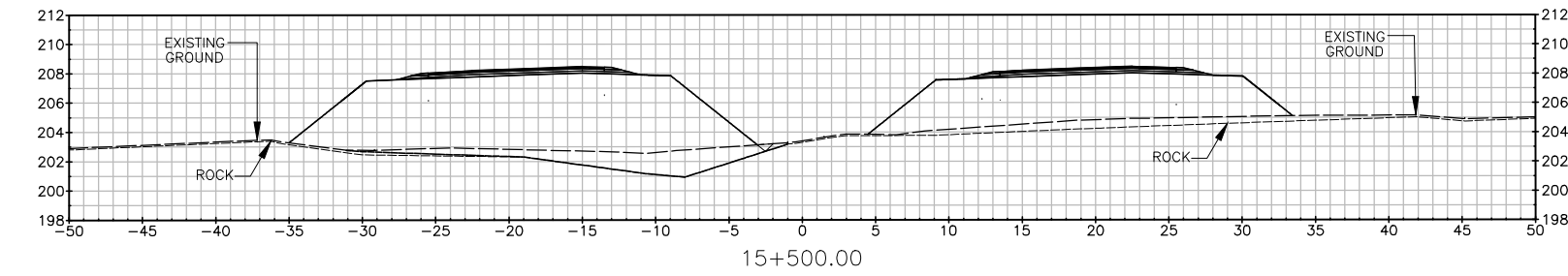
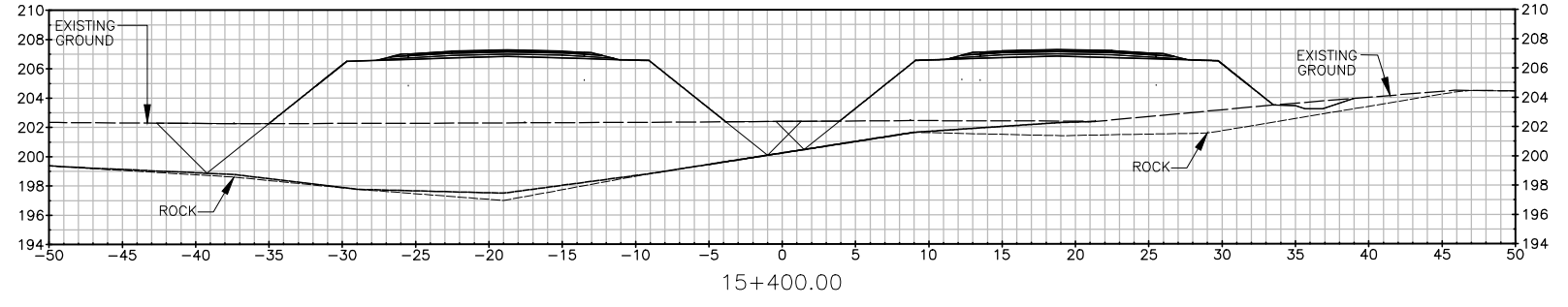
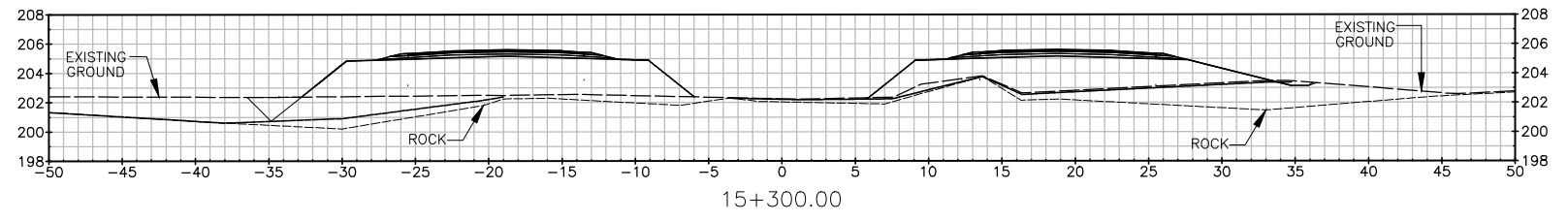
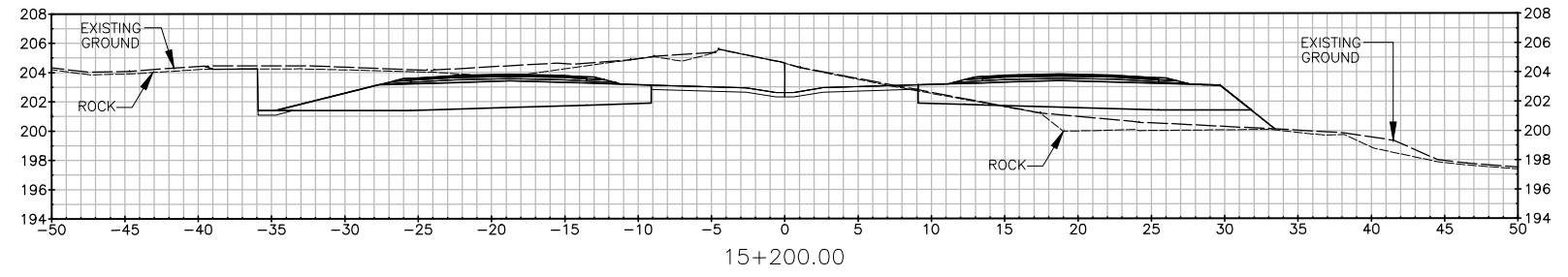


Figure 2 – Study Photos



Source Site Fencing



Massasauga

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Massasauga handling for pit tag implantation

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Trap installation and layout