



MEADOWBANK MINE

2019 WILDLIFE MONITORING SUMMARY REPORT

FINAL

APPENDIX N

2019 Meadowbank Non-Native Plant Monitoring Study

TECHNICAL MEMORANDUM

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Project No. 19124290-468-TM-Rev0

TO Robin Allard
Agnico Eagle Mines Limited

CC Carolina Leseigneur Torres, Corey De La Mare, Valerie Coenen, Jen Range

FROM Chris Shapka, Danielle Mai

EMAIL cleseigneurtorres@golder.com,
jrange@golder.com

2019 MEADOWBANK NON-NATIVE PLANT MONITORING STUDY

1.0 BACKGROUND

The goal of the 2019 non-native plants surveys is to assess/monitor for the potential introduction of non-native plant species, including weeds or invasive species. Surveys were completed per the monitoring approach outlined in the Terrestrial Environment and Monitoring Plan (TEMP) for the Meadowbank Complex. The Government of Nunavut (GN) and Environment and Climate Change Canada (ECCC) define a non-native species as 'an organism that is not normally found in a region (CESCC 2010). Any introductions of non-native plant species must be promptly reported to the GN Department of Environment.

Non-native plant surveys targeted areas with a high potential of occurrence for the Meadowbank Complex (i.e., areas of disturbance where colonization by non-native species is most likely). The non-native plant information collected provides an understanding of the presence or spread of non-native plant species and inform on the efficacy of current cleaning and protection measures on site per the TEMP. The results may serve as a basis for the development of a non-native plant management plan, if needed, over time. For the 2019 survey period, no non-native plants were recorded for the Meadowbank Complex.

2.0 METHODS

Surveys at the Meadowbank Complex were conducted by a Golder Ecologist between 9-16 August 2019. The Meadowbank Complex area includes the All Weather Access Road (AWAR), the Whale Tail Haul Road (haul road) and Whale Tail (Amaruq deposit), and Meadowbank Mine footprint areas.

The Canadian Endangered Species Conservation Council (CESCC) identified 17 species not normally found in Nunavut with a potential for becoming established, 14 of which are vascular (non-native) plants to the region (CESCC 2010; Table 1). This survey focused on the 14 non-native vascular plant species and excluded the two bird species and one butterfly species considered non-native species in Nunavut (CESCC 2010). Species were documented as they were encountered. Non-native plant surveys consisted of targeted surveys focused within high-priority or potential areas. The high-potential areas were identified as the Project area perimeter, along existing roads/trails or areas of disturbance within the Project area, as well as adjacent to the Haul Road (Amaruq).

Given the length of the haul road, the road will be travelled via vehicle at slow speeds, while observers look for obvious signs of weed infestations along road margins. Periodic stops should be undertaken to complete meanders in areas with high potential (pull-outs, work areas etc.). Use a GPS to collect a trackfile of the meander route, and when non-native/invasive species are encountered, the following information will be recorded: Ysite ID; Ysurveyor name; YGPS coordinates; Yphotos of the occurrence / infestation; Yspecies name; Yestimated area of infestation (e.g., 10 m x10 m); Yestimated number of plants (e.g., <10, 10 to 100, 100 to 1,000, >1,000) of each species; Yestimated cover of bare ground; Ygrowth stage (i.e., seedling, in bud, seed set, expired) of each species; Yrecommended action for each species; and Yrecord of any hand pulling completed.

Table 1: Government of Nunavut, Department of Environment Non-native Species

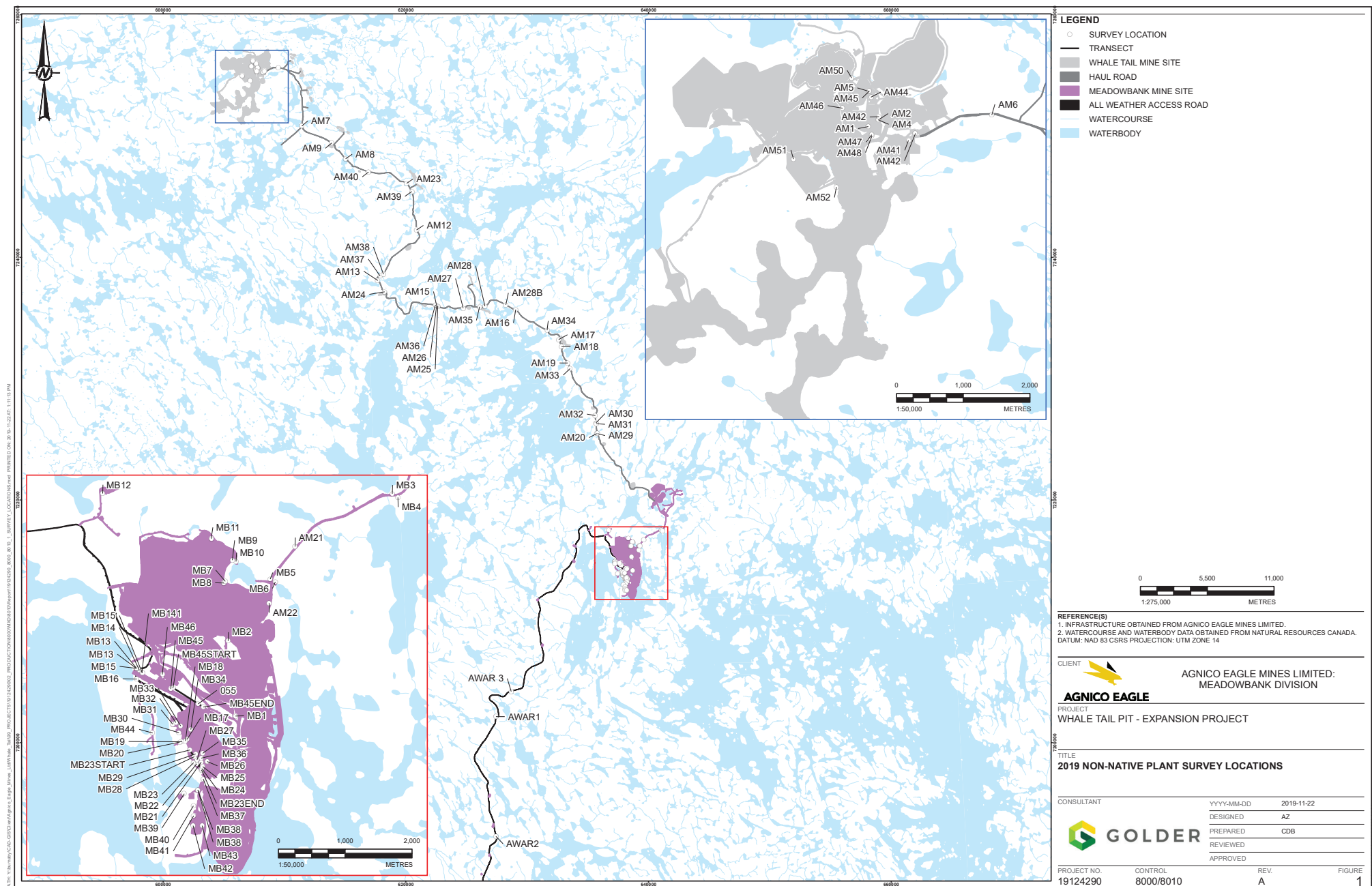
CESCC Status (2010) ¹	ACIMS Scientific Name ²	Common Name
Non-native	<i>Amaranthus retroflexus</i>	green amaranth
Non-native	<i>Barbarea vulgaris</i>	yellow rocket
Non-native	<i>Capsella bursa-pastoris</i>	shepherd's purse
Non-native	<i>Carum carvi</i>	wild caraway
Non-native	<i>Hordeum vulgare</i>	common barley
Non-native	<i>Leucanthemum vulgare</i>	oxeye daisy
Non-native	<i>Papaver somniferum</i>	opium poppy
Non-native	<i>Plantago major</i>	common plantain
Non-native	<i>Polygonum aviculare</i>	prostrate knotweed
Non-native	<i>Puccinellia distans</i>	spreading alkali grass
Non-native	<i>Sonchus arvensis</i>	field sow thistle
Non-native	<i>Taraxacum officinale</i>	common dandelion
Non-native	<i>Thlaspi arvense</i>	field pennygrass
Non-native	<i>Vicia cracca</i>	tufted vetch

¹ CESCC = The Canadian Endangered Species Council.

² ACIMS = Alberta Conservation Information Management System (2018).

Due to the large extent of the Meadowbank Complex area, non-native plant surveys were executed as targeted surveys focused within high-priority or potential areas. High-potential areas were identified including highly trafficked areas (i.e., fuel station), wastewater discharge area, areas surrounding buildings, shipping containers and the dump, for example. Due to time constraints the AWAR was surveyed from the Meadowbank Mine site to Kilometer (KM) 70 only at slow speed, while observing for weed infestations along road margins. Periodic stops were undertaken to complete meanders in areas with high potential (pull-outs, work areas etc.). A GPS was used to collect a trackfile of the meander route.

A total of 107 locations were surveyed (Figure 1). Locations assessed included the sides of the haul roads, as well as both Whale Tail and Meadowbank Mine footprint areas.



The AWAR and haul road were travelled via vehicle at slow speeds, while observers looked for obvious signs of non-native plant occurrences along road margins. Obvious signs included showy inflorescence, fruiting structures, and other key characteristics that distinguished non-native species from endemic plant species. Periodic stops were undertaken to complete meanders in areas with high potential (pull-outs, work areas etc.). The following information was recorded when non-native species were encountered:

- site ID;
- surveyor name;
- GPS coordinates;
- photos of the occurrence / infestation;
- species name;
- estimated area of infestation (e.g., 10 m x10 m);
- estimated number of plants (e.g., <10, 10 to 100, 100 to 1,000, >1,000) of each species;
- estimated cover of bare ground;
- growth stage (i.e., seedling, in bud, seed set, expired) of each species;
- recommended action for each species; and
- record of any hand pulling (if completed).

3.0 RESULTS

No non-native plants, as identified by the CESSC, were recorded along the haul road, AWAR, Whale Tail and Meadowbank Mine footprints.

Although not listed as a non-native species by the CESSC, populations of flaxweed (*Descurainia sophia*) and scentless chamomile (*Matricaria perforata*), both non-endemic to the Arctic, were observed within the surveyed locations. Table 2 provides a summary of the non-native plant survey findings from the August 2019 surveys at locations shown on Figure 1. Detailed survey results are presented in Appendix A and representative photographs are presented in Appendix B.

Table 2: Summary of Key Non-native Vegetation Survey Findings

	Number of Survey Locations	Percent of Total
Non-Native Occurrences	0	0%
No Non-native Vegetation Observed ¹	106	99%
Species of Special Concern	1	1%
Total	107	100%

¹ These sites may require subsequent visits to confirm continued absence of non-native species.

Scentless chamomile is listed as Secondary Noxious and Noxious in the Canadian Weed Seeds Order (*Seeds Act* 2016). A single plant was observed near a building close to the water at the Meadowbank Mine site (at location MB32 shown on Figure 1, refer to Appendix A and Photograph 5 in Appendix B). The most effective method of treatment is hand pulling (Government of Alberta 2007); the plant was hand pulled and disposed of safely by an Agnico Eagle employee on 15 August 2019.

Flixweed is an introduced agricultural weed from Europe, Asia and North Africa (Dickinson 2006; ABMI 2019) and is non-native to Nunavut. Flixweed was observed on the Meadowbank Mine site (at locations MB13, MB15, MB23, and MB41 shown on Figure 1, refer to Appendix A and B). Infestations of flixweed were found to be most dense along the perimeter of the airstrip, and the southwest edge of the Meadowbank Mine site. The southwest border of the airport runway was found to have the tallest and densest population of flixweed, assessed as exceeding the largest population density category of >1000. The southwest edge of the Meadowbank Mine site was also observed to have high densities of this species, especially around the workshop and shipping container storage areas. Observed flixweed populations have not encroached onto the tundra, and all observations were limited to disturbed areas (see representative photographs in Appendix B). It follows that disturbed areas on the Meadowbank Mine site were highly likely to have occurrences of flixweed.

4.0 CONCLUSION AND RECOMMENDATIONS

No non-native plant species for Nunavut, as identified by the CESCC, were recorded during the 2019 surveys for the Meadowbank Complex, though two plant species which are non-endemic to the Arctic were detected:

- Although not listed as a non-native plant by the CESCC, the noxious weed scentless chamomile should be continually monitored to prevent further infestations. The Government of Alberta states that noxious weeds have the ability to spread rapidly, degrade habitats and reduce biodiversity, and must be controlled to prevent further establishment and spread (Government of Alberta 2012).
- Flixweed has not migrated from the Meadowbank Mine site through the haul road or to the Whale Tail Mine site. Although flixweed is also not on the CESCC species list, it should be controlled to contain the infestation to the Meadowbank Mine site and AWAR and prevent spread north to new locations.

Efforts for non-native plant management, including identified non-endemic species, should continue and added diligence should be undertaken with regards to areas of high traffic.

Continued and thorough cleaning of equipment and materials prior to entering the site, per the TEMP, will prevent seed of non-native species from being introduced. Surveys for the 14 non-native plant species identified by CESCC as well as other non-native species should continue to be completed annually. Mechanical control such as mowing or hand pulling, as appropriate for the site setting, is recommended for any identified non-native plant species. If hand pulling with a shovel, the plant material should be collected in bags and disposed of at an offsite location. Mowing is a viable option if the following conditions are met:

- there is access for a mowing unit;
- the terrain is not too steep or hazardous; or
- if the phenology of the plant stage is not at risk for greater seed dispersal (consult with a vegetation ecologist prior to mowing).

Chemical herbicide treatments are not recommended to be used at this point as the tundra is a very sensitive ecosystem. As a further measure of prevention, the CESSC (2010) has developed posters that show non-native species in Nunavut. These can easily be displayed at the Meadowbank Complex and incorporated into on-boarding materials, which could be used to supplement non-native plant information and posters used on-site.

A management plan for non-native plant species employing adaptive management may be implemented if the non-endemic and other non-native plant species continue to be observed and/or are observed to spread further within the Meadowbank Complex area. A non-native plant management plan would describe the methods for the eradication, control and/or minimization of the encroachment of non-native plant species into new areas, and outline additional measures such as on-boarding and training in the identification of non-native plant species for the area.

5.0 CLOSURE

We trust this meets your needs and if you have any questions or concerns, feel free to contact the undersigned at your convenience.

Regards,

Golder Associates Ltd.



Chris Shapka, B.Sc., P. Biol., P.Ag.
Terrestrial Ecologist



Valerie Coenen
Senior Terrestrial Ecologist



Corey De La Mare, P. Biol.
Principal, Senior Ecologist

DM/CS/VC/CLT/CDLM/jr

[https://golderassociates.sharepoint.com/sites/110051/project files/5 technical work/05_reporting_data_mgmt/invasive plants reporting/rev0/19124290-468-tm-mbk_2019invasiveplants-rev0.docx](https://golderassociates.sharepoint.com/sites/110051/project%20files/5%20technical%20work/05_reporting_data_mgmt/invasive%20plants%20reporting/rev0/19124290-468-tm-mbk_2019invasiveplants-rev0.docx)

Attachments:

Appendix A – Meadowbank Complex – 2019 Non-Native Plant Survey Results

Appendix B – Meadowbank Complex – 2019 Non-Native Plant Survey Representative Photographs

References

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APPENDIX A

**Meadowbank Complex - 2019 Non-
Native Plant Species Survey
Results**

Table A-1: Non-native Plant Survey Results

Survey Location	Plot ID	Scientific name	Common name	No of Plants	Population Description	Population Size (m ²)	Latitude	Longitude
AWAR	MB19DMW053	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	6000	64.830528	-96.31408
Meadowbank Mine Site	MB19DMW021	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous dense occurrence of a species	300	65.029533	-96.08618
Meadowbank Mine Site	MB19DMW023	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	400	65.028863	-96.084373
Meadowbank Mine Site	MB19DMW025	<i>Descurainia Sophia</i>	Flixweed	<10	few sporadically occurring individuals	n/r	65.028082	-96.086278
Meadowbank Mine Site	MB19DMW028	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	500	65.019387	-96.072845
Meadowbank Mine Site	MB19DMW029	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	600	65.019337	-96.073485
Meadowbank Mine Site	MB19DMW030	<i>Descurainia Sophia</i>	Flixweed	10-99	several sporadically occurring individuals	10	65.016522	-96.066998
Meadowbank Mine Site	MB19DMW031	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	500	65.016507	-96.069418
Meadowbank Mine Site	MB19DMW032	<i>Descurainia Sophia</i>	Flixweed	100 to 499	continuous dense occurrence of a species	25	65.015647	-96.066913
Meadowbank Mine Site	MB19DMW033	<i>Descurainia Sophia</i>	Flixweed	500 to 999	continuous uniform occurrence of well-spaced individuals	500	65.015898	-96.066555
Meadowbank Mine Site	MB19DMW034	<i>Descurainia Sophia</i>	Flixweed	10 to 99	a few patches or clumps of species	1	65.016563	-96.065065
Meadowbank Mine Site	MB19DMW035	<i>Descurainia Sophia</i>	Flixweed	500-1000	continuous occurrence of a species with few gaps in distribution	400	65.016858	-96.068308
Meadowbank Mine Site	MB19DMW036	<i>Descurainia Sophia</i>	Flixweed	100 to 499	continuous occurrence of a species with few gaps in distribution	10	65.017272	-96.069137
Meadowbank Mine Site	MB19DMW037	<i>Descurainia Sophia</i>	Flixweed	100 to 499	continuous uniform occurrence of well-spaced individuals	20	65.017648	-96.06860
Meadowbank Mine Site	MB19DMW039	<i>Descurainia Sophia</i>	Flixweed	10 to 99	continuous uniform occurrence of well-spaced individuals	5	65.021773	-96.075445

Survey Location	Plot ID	Scientific name	Common name	No of Plants	Population Description	Population Size (m ²)	Latitude	Longitude
Meadowbank Mine Site	MB19DMW040	<i>Tripleurospermum inodorum</i>	Scentless chamomile	1	single individual	0.25	65.022007	-96.074423
Meadowbank Mine Site	MB19DMW041	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	50	65.021492	-96.073017
Meadowbank Mine Site	MB19DMW042	<i>Descurainia Sophia</i>	Flixweed	10 to 99	several sporadically occurring individuals	n/1	65.020958	-96.069835
Meadowbank Mine Site	MB19DMW043	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	400	65.017702	-96.066375
Meadowbank Mine Site	MB19DMW044	<i>Descurainia Sophia</i>	Flixweed	500 to 999	continuous occurrence of a species with few gaps in distribution	100	65.017038	-96.066917
Meadowbank Mine Site	MB19DMW045	<i>Descurainia Sophia</i>	Flixweed	10-99	a single patch or clump of species	4	65.014245	-96.066593
Meadowbank Mine Site	MB19DMW046	<i>Descurainia Sophia</i>	Flixweed	10-99	several sporadically occurring individuals	5	65.012790	-96.068462
Meadowbank Mine Site	MB19DMW048	<i>Descurainia Sophia</i>	Flixweed	<10	rare individual; single occurrence	0.25	65.010675	-96.070085
Meadowbank Mine Site	MB19DMW049	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous dense occurrence of a species	7500	65.009357	-96.070187
Meadowbank Mine Site	MB19DMW050	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	250	65.008037	-96.070547
Meadowbank Mine Site	MB19DMW051	<i>Descurainia Sophia</i>	Flixweed	10-99	a single patch or clump of species	2	65.007975	-96.06762
Meadowbank Mine Site	MB19DMW055	<i>Descurainia Sophia</i>	Flixweed	>1,000	continuous occurrence of a species with few gaps in distribution	~10000	65.026552	-96.075548
Meadowbank Mine Site	MB19DMW056	<i>Descurainia Sophia</i>	Flixweed	10-99	a single patch or clump of species	25	65.02853	-96.07802
Whale Tail Mine Site	MB19DMW026	<i>Descurainia Sophia</i>	Flixweed	10-99	several sporadically occurring individuals	4	65.019687	-96.071088

n/r – not recorded

APPENDIX B

Meadowbank Complex - 2019 Non-
Native Plant Species Survey
Representative Photographs



Photo 1. Flowering flxweed (*Descurainia Sophia*) at Meadowbank Mine (MB13).



Photo 2. Flowering flxweed at Meadowbank Mine (along MB23 transect).



Photo 3. Vegetative flxweed at Meadowbank Mine (MB15).



Photo 4. Post-seed flxweed at Meadowbank Mine (along MB23 transect).



Photo 5. Flowering scentless chamomile (*Tripleurospermum inodorum*) located at Meadowbank Mine (MB32).



Photo 6. Dead and flowering flxweed located at Meadowbank Mine (MB41).