



VISUAL IMPACT ASSESSMENT

BURNCO WEST COCHRANE #2 GRAVEL PIT
NE ¼ 14-026-05 W5M TO NE ¼ 15-026-05 W5M

Prepared for:
BURNCO ROCK PRODUCTS LTD.

Prepared by:
MATRIX SOLUTIONS INC.

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Calgary, Alberta

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Prepared for BURNCO Rock Products Ltd., September 2022



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1 INTRODUCTION

BURNCO Rock Products Ltd. is currently operating the West Cochrane gravel pit that is located approximately 5 km west of Cochrane. This site, located within NW ¼ 13-026-05 W5M, was first opened in 2016 and provides aggregate (sand and gravel) to construction projects in the Cochrane and Calgary areas (Figure 1). Upon depletion of the existing site, BURNCO is proposing to develop the West Cochrane #2 Gravel Pit (the Project), to provide a long-term source of aggregate for the Cochrane and Calgary areas. The Disturbance Area refers to the Project boundary and is located from NE ¼ 14-026-05 W5M to NE ¼ 15-026-05 W5M (Figure 1). It is envisioned that this site will supply aggregate in the years ahead, and that it will also provide high-quality aggregate for use in asphalt and ready-mix production through development of a washing location.

Matrix Solutions Inc. was retained by BURNCO to complete a Visual Impact Assessment (VIA) in association with the proposed expansion. This VIA has been completed for the proposed expansion to the existing pit to meet the visual impact information requirements requested by BURNCO.

2 PROJECT AND STUDY AREA DESCRIPTION

2.1 Project Area

Operations at this site will include earth works, extraction of aggregate, and crushing, washing, loading, and scaling of trucks to haul materials to market. The aggregate from these lands will be extracted in phases, with progressive reclamation occurring to minimize the size of open pit area.

The phased development will also allow for a phased approach to site infrastructure, which will include the phased development of a screening berm along Highway 1A. The existing highway access at Range Road 51 will continue to serve as the highway access for the Disturbance Area. Other infrastructure will include a river diversion to provide water for use in washing and dust control, and there will also be recharge ponds to allow for dewatering operations.

It is anticipated that the Disturbance Area will have a lifespan of 30 years. Once the aggregate has been depleted, the area will progressively be reclaimed back to equivalent pre-disturbance land capacity.

The Disturbance Area includes one contiguous area (Figure 1), which has a total area of approximately 124.9 ha. Figure 2 shows the existing and proposed berms measuring up to 7 to 8 m in height. The predominant land use is cultivation and pasture, with small areas of riparian (Matrix 2022).

Generally, the Disturbance Area slopes from north to south, from Highway 1A to the Bow River. East to west the Disturbance Area is relatively level, with a slight downslope to the east, except for a valley/coulee to the south of the central part of the Disturbance Area (Figure 3).

2.2 Study Area

The Study Area represents a 4 km buffer of the Disturbance Area, generally guided by the topography of the area. This area includes several apparent acreages/farms to the north and west. North of the Bow River, topography generally slopes from north to south and is characterized by several ridges running north to south. Topography south of the Bow River generally slopes from south to north (Figure 1). Land use is predominantly cultivation and pasture, with interspersed riparian areas associated with larger drainage features. Large portions of Stoney Indian Reserve are densely-treed with the remainder of the Study Area having small and isolated patches of densely-treed areas (Figure 1).

3 ASSESSMENT METHODS

3.1 Analysis Methods

Two methods of analysis were completed to evaluate the visual impact to receptors. Viewshed analysis was completed for all receptors and three-dimensional (3D) visual modelling was completed for a selection of locations to support the viewshed analysis and impact assessment. All analyses were conducted using ArcGIS, Version 10.7 (ESRI 2022), with the Spatial and 3D Analyst extensions, unless indicated otherwise.

3.1.1 Viewshed Analysis Methods

Viewsheds, which represent the total visible ground areas from a single location, were modelled for the Disturbance Area, using specific receptor locations on the landscape considered as potentially important. This modelling technique accounts for the curvature of the earth and for refraction through air (ESRI 2022). This technique can be considered conservative and likely to over-estimate the visibility of the Disturbance Area in the Study Area. The modelling does not take the following into account:

- climatic conditions, such as cloud cover, rain, mist, or fog
- mitigation techniques, such as vegetation screening
- individual observer variations
- variations in vegetative density
- seasonal variations in vegetative cover

This analysis allows the user to quantitatively evaluate the total area visible by an individual point observer. Qualitatively, it also allows the user to identify areas of full, partial, or no visibility (Figure A).

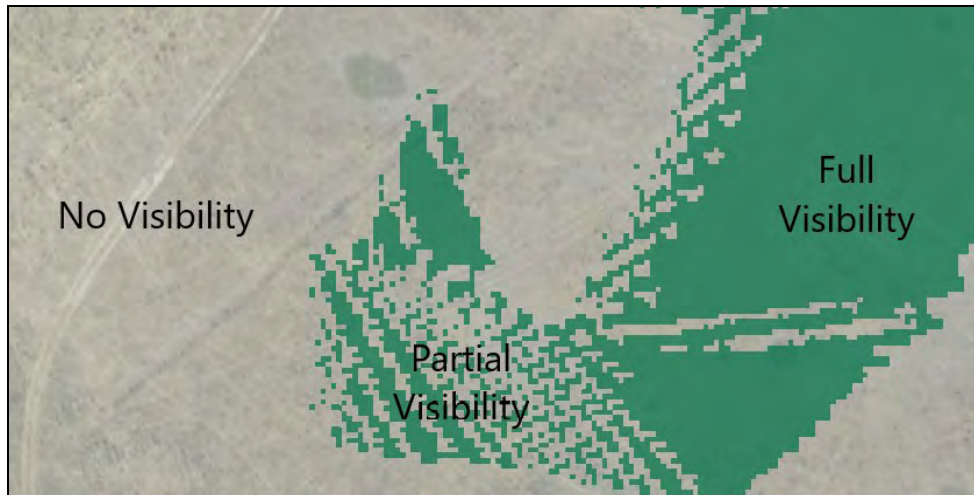


FIGURE A Demonstration of Full, Partial, and No Visibility Areas

3.1.1.1 Viewshed Model Data

Visual modelling used two separate terrain base models provided by BURSCO, incorporating bare earth AltaLIS LiDAR15 (Light Detection and Ranging; AltaLIS 2022) outside of the general Project Area, and higher resolution bare earth LiDAR within the Project Area. These terrain models were provided in contour .dwg format by BURSCO. These contours were subsequently contoured and interpolated into 1 m horizontal resolution raster datasets for analysis (Figure 3).

- The Existing Conditions model represents the current state of the topography.
- The Full Site Mined model represents the “Existing Conditions” topography as it initially exists, but also incorporates “final” elevations modelled by BURSCO within the Disturbance Area, incorporating the topography of mined pit floors, proposed berms, and borrow areas.

Full feature LiDAR is a high-resolution digital elevation dataset that includes the vegetation canopy in its representation of the surface. In this instance, full-feature LiDAR was not available, so bare earth LiDAR was used. As a result, the visual obstruction caused by vegetation cannot be taken into account in this analysis, resulting in a conservative estimate of visibility.

3.1.1.2 Viewshed Receptor Identification

The viewshed analysis, in this case, models the total viewable area from an individual observer/receptor. Using Valtus® (Valtus 2022) imagery acquired in 2022, point locations representing potentially important receptors were selected and verified by two separate analysts, respectively. These receptors were qualitatively separated by Matrix and BURSCO into spatial clusters to simplify analysis.

Receptor viewing heights were modelled using a height of 3 m for all point receptors, representing an approximation of a view out of a first storey window.

3.1.2 3D Visual Modelling Methods

At several locations in the Study Area, digital photographs were captured during typical visual conditions. These digital photographs show the “Existing Conditions” view, representing the current state of the topography. Global Mapper was used to convert these images into a 3D Model, and Corel Photo-Paint was then utilized to superimpose berms into the images with modelled ground cover. These modified images are a representation of the Full Site Mined model berms, showing the “Existing Conditions” topography as they initially exist, but also incorporating “final” elevations modelled by BURNCO within the Disturbance Area, incorporating the topography of potential berms. These “Full Site Mined” images will also include proposed tree and shrub planting along berms, as discussed in the Project Tree Planting Plan.

3.2 Impact Classification and Mitigation Identification

For the purposes of impact assessment, the receptors will be evaluated in two separate manners:

- Receptors beyond 1.6 km (one section) from the Disturbance Area will be discussed in spatial clusters.
- Receptors within 1.6 km (one section) of the Disturbance Area, as well as receptors that are isolated from other receptors, will be discussed individually.

3.2.1 Receptors Beyond 1.6 km From Disturbance Area

For all point receptors beyond 1.6 km from the Disturbance Area, the total area of their respective viewsheds was calculated and the expected impact on each receptor was documented:

- Any receptor that cannot see the Disturbance Area under “Existing Conditions” is considered to have no visual impact.
- Some receptors will be able to view only small portions of the site in the current state. In absence of specific terms of reference to follow for Rocky View County Visual Assessments, Matrix will consider anything under 10% of the Disturbance Area (12.5 ha) to have low-magnitude visual impact on those receptors.
- For any receptor with a view of over 10% of the site in the Existing Conditions model, BURNCO’s proposed berms will be evaluated.
 - ✦ If the proposed berms reduce overall viewshed of the Disturbance Area to below 10%, the berms can be considered to be relatively effective and visual impact can be interpreted to be low in magnitude.

- ✦ If the proposed berms do not reduce the total viewshed of the Disturbance Area to below 10%, interpreted visual impact can be considered low to moderate in magnitude, depending on the total area visible within the Disturbance Area and the distance from the Project Area.

3.2.2 Receptors Within 1.6 km From Project Area and Directly to the North

For all point receptors within 1.6 km from the Disturbance Area and receptors that are isolated from others, Matrix calculated the area of their respective viewsheds and documented the expected impact on each receptor:

- Any receptor that cannot see the site under “Existing Conditions” is considered to have no visual impact.
- Given the proximity to the Disturbance Area, the expected impact will be discussed in both quantitative and qualitative terms for each individual receptor in this grouping and mitigations will be assessed and proposed.
- To evaluate if further mitigation is possible, the 3D Analyst “Line Of Sight” tool in ArcGIS will be used to assess if an additional mitigation is feasible.
 - ✦ In some cases, further mitigation may be possible and recommendations will be made.
 - ✦ In other cases, given the large elevation differences in the area, it is expected that mitigations may not be feasible.

The 3D Visual Models will be taken into account in evaluating the impact for all receptors, and cross-sections have also been constructed in Autodesk® Civil 3D® to demonstrate the Existing Conditions and Full Site Mined terrain models in the immediate vicinity of the Disturbance Area.

4 VIEWSHED AND 3D VISUAL RESULTS

4.1 Receptors

A total of 26 receptors were identified in the Study Area (Figure 4). These receptors have been grouped in two peripheral clusters to the west and northwest (Clusters A and B, respectively) and a central set of receptors (nominally referred to here as Cluster X). Additionally, a large section of Highway 1A is located within the Study Area, as well as a small portion of Highway 40 (Figure 4).

Appendix A provides a full list of point receptors (26 in total), including general descriptions, elevations, and location information. All receptors are mapped on Figure 4, which also identifies the five locations (with viewing directions) where 3D visual modelling was completed. The only receptors that are located

within 1.6 km of the Disturbance Area are X01 to X07. X10 is located at 1.63 km and has therefore been included in this group of point receptors.

4.2 Viewshed Analysis

For all 26 point receptors, the visible area was quantified for both the Existing Conditions and Full Site Mined models, calculating the total Disturbance Area and percentage of the Disturbance Area that is visible from that each receptor. Additionally, Matrix calculated the total Study Area visible before and after mitigation and a percentage loss in total Study Area viewshed (Table 1). Within Cluster A, the receptor with the highest quantitative Full Site Mined model viewshed values (generally correlating to highest impact) is A09. None of the receptors in Cluster B have any view into the Project before or after the disturbance.

Appendix B displays viewshed maps for receptor A09, as well as each Cluster X receptor. This shows the viewshed for each receptor, both for the Existing Conditions model and the Full Site Mined model.

Out of 26 total receptors, 16 receptors did not have a view into the Disturbance Area in the Existing Conditions model case. One of these receptors (X01) is located within 1.6 km of the Disturbance Area.

Of the remaining ten receptors:

- One receptor (X02) currently has less than 10% of the Disturbance Area in view. This receptor is located within 1.6 km of the Disturbance Area.
- Six receptors (A08, X03 to X06, and X10) have greater than 10% of the Disturbance Area in view in Existing Conditions model, but proposed berms have reduced this to less than 10% of the Disturbance Area in view. Of these, six receptors (X03 to X06, and X10) are located within 1.6 km of the Disturbance Area.
- Three receptors (A09, X07, and X09) have greater than 10% of the Disturbance Area in view and proposed berms have not reduced this to less than 10% of the Disturbance Area in view. Of these, only one receptor (X07) is located within 1.6 km of the Disturbance Area.

For all receptors, Matrix evaluated the amount of reduction of Study Area viewable from the receptor. In almost all cases, the total loss in viewshed is under 10%; the exceptions being the three nearest receptors (X04, X05, and X06) to the Disturbance Area.

4.3 3D Visual Modelling Analysis

BURNCO selected five locations to provide insight into the views from various locations and to contextualize the quantitative results from the viewshed analysis. General information for each of these

sites is listed in Table 2, their locations and view directions are mapped on Figure 4, and views are presented in Figure 6.

5 IMPACT AND MITIGATIONS

5.1 Cluster A (and Highway 40)

Most receptors evaluated in Cluster A cannot see the Disturbance Area in the Existing Conditions model, with only A08 and A09 exceeding the 10% cut-off. A08 is mitigated below 10% by the proposed berms, while A9 is mitigated to ~20% view into the site. Given the view represented in View V1 (Figure 6a), it is anticipated that the visual impact to any of these receptors in Cluster A will be non-existent to low, depending on their individual locations and distance from the site. With its location within Cluster A, Highway 40 is judged to have a similar impact assessment (Table 1 and Figure 5).

5.2 Cluster B

No receptors in Cluster B can see the Disturbance Area in the Existing Conditions model nor in the Full Site Mined model, and therefore they are deemed to have no visual impact (Table 1 and Figure 5).

5.3 Highway 1A

With the views represented in Views V2, V3, and V4 (Figures 6b, 6c, and 6d), the proposed berms along Highway 1A (visible on Figures 2 and 6; proposed in this report and the Project Planting Plan [Appendix C]) appear to be sufficient to reduce or remove views into the site in the immediate vicinity of the Disturbance Area. Moderate elevation rises in the west of the Study Area may allow for greater views into the site (as evidenced in Receptor A09's impact assessment). However, this occurs at a large distance from the site. The loss of overall view area in the Study Area will likely be large, given the proximity to the berms. Overall impact to Highway 1A as a receptor is expected to vary between low to moderate, depending on location. Potential mitigative vegetation planting on berms have been proposed to minimize the proposed Project's impacts on visual amenity and landscape character relative to Highway 1A (Figure 5).

5.4 Cluster X

Given their proximity to the Disturbance Area or their isolation relative to other receptors, each receptor in Cluster X will be discussed individually:

- Receptor X01 cannot see the Disturbance Area in the Existing Conditions model, due to topography, and is thus deemed to have no visual impact (Table 1 and Figure 5).

- Receptor X02 can see little of the Disturbance Area in the Existing Conditions model (9%), due to topography. This has been mitigated to 1% by the proposed berms. It is expected that this receptor will have low visual impact (Table 1 and Figure 5).
- Receptor X03 can see approximately 25% of the Disturbance Area in the Existing Conditions model. This view appears to be mostly partial to full view into the western part of the Disturbance Area, and a smaller area of partial view into the eastern part of the Disturbance Area. These have been mitigated to approximately 4% by the proposed berms, with most of that existing view being in the eastern (farther) part of the Disturbance Area. This may be further mitigated by berm vegetation planting, as proposed in the Project Planting Plan (Appendix C). It is expected that this receptor will have low to moderate visual impact (Table 1 and Figure 5).
- Receptors X04, X05, and X06 can see approximately 34%, 12%, and 19% of the Disturbance Area, respectively, in the Existing Conditions model. These have been mitigated by the proposed berms to approximately 3%, 2%, and 3%, respectively, with those views being primarily of the berms. These may partially be further mitigated by berm vegetation planting, as proposed in the Project Planting Plan (Appendix C). However, these receptors experience approximate reductions of 13%, 34%, and 14% of their overall views, respectively, due to their proximity to the proposed berms. It is expected that these receptors will have moderate to high visual impacts. A representative view for these receptors is represented in View V4 (Figure 6d), although this view does not show proposed vegetation planting on the western facing berms, which should improve the visual amenity of those berms.
- Receptor X07 can see approximately 50% of the Disturbance Area in the Existing Conditions model. This has been further mitigated to approximately 23% by the proposed berms. This may be partially mitigated by berm vegetation planting, as proposed in the Project Planting Plan (Appendix C). It is expected that this receptor will have high visual impact. An optimistic, though roughly representative view for this receptor is represented in View V5 (Figure 6e), although this view does not show proposed vegetation planting on the northern facing berm directly south of the receptor. This planting should improve the visual amenity of that berm.
- Receptor X08 effectively cannot see the Disturbance Area in the Existing Conditions model, due to topography, and is thus deemed to have no visual impact.
- Receptor X09 can see approximately 56% of the Disturbance Area in the Existing Conditions model. This view appears to be mostly partial to full view into the western part of the Disturbance Area. These have been mitigated to approximately 13% by the proposed berms. This may be further mitigated by berm vegetation planting, as proposed in the Project Planting Plan (Appendix C). Due to its distance from the Disturbance Area, it is expected that this receptor will have low to moderate visual impact.

- Receptor X10 can see approximately 13% of the Disturbance Area in the Existing Conditions model. This has been mitigated to 7% by the proposed berms. These views may be further mitigated partially by berm vegetation planting, as proposed in the Project Planting Plan (Appendix C). It is expected that this receptor will have low to moderate visual impact (Table 1 and Figure 5).

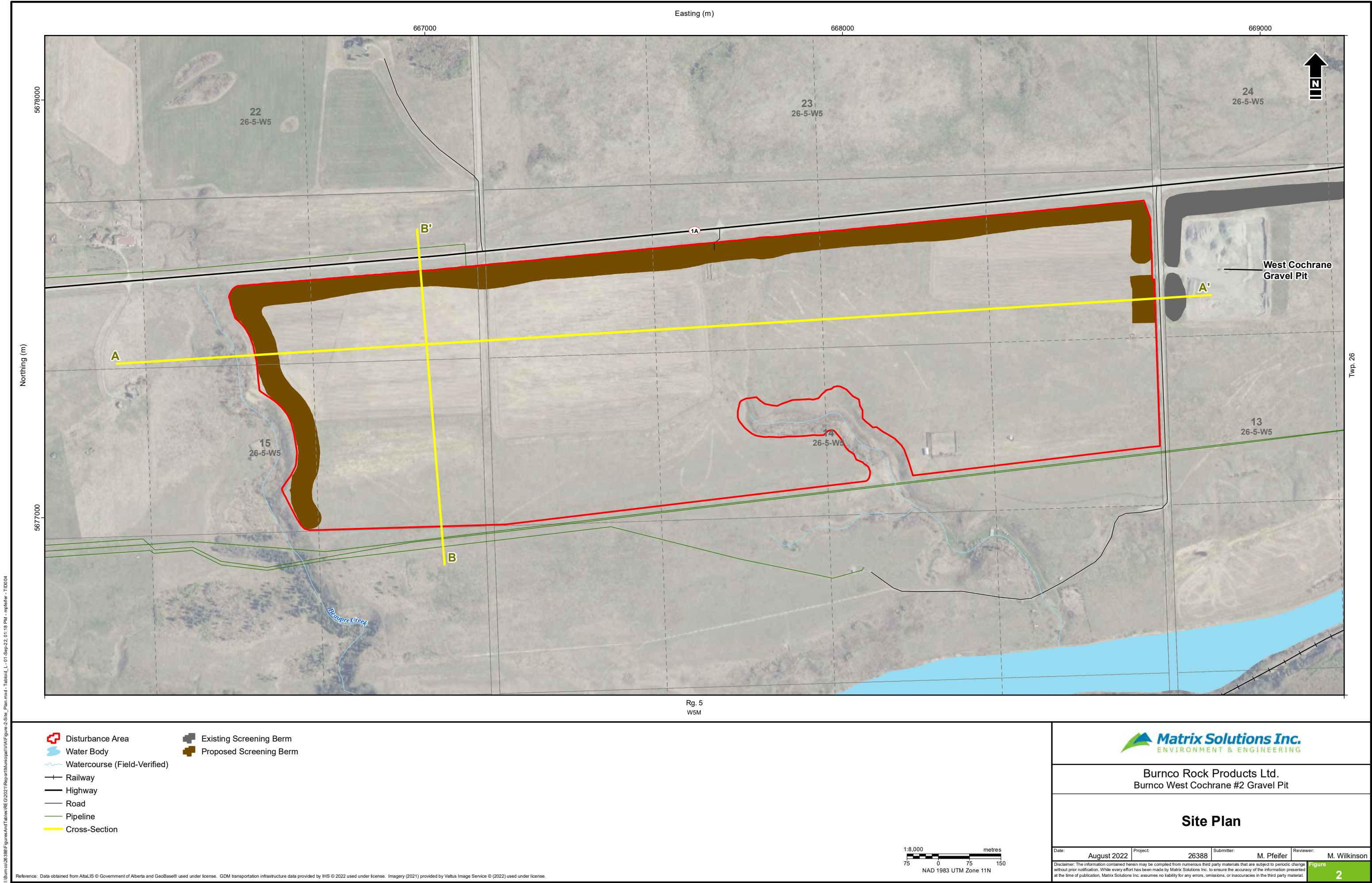
6 SUMMARY

The visual impact for Highway 1A is expected to range from low to moderate, although the proposed berms appear to be relatively successful in their mitigative affects. The visual impacts for 26 point receptors are expected to range from non-existent to high magnitude. The visual impacts to the receptors in Clusters A and B are expected to be primarily limited to low magnitude, primarily due to their distance from the Project Area. The only exception may be A09, which may have a low to moderate magnitude. The receptors in Cluster X vary in impact: ranging from non-existent to low for X01, X02, and X08; low to moderate for X03, X09, and X10; and moderate to high for X04 to X07. In most cases, the high elevations of receptors relative to the Project Area suggest that further mitigations are not likely feasible, although selective planting will improve screening for some receptors and improve the visual amenity of the screening berms.

The visual impacts are generally local, long-term, and reversible. These impacts will be reduced in the long term when BURNCO's activities are finished, with facilities being removed and disturbed areas being reclaimed.

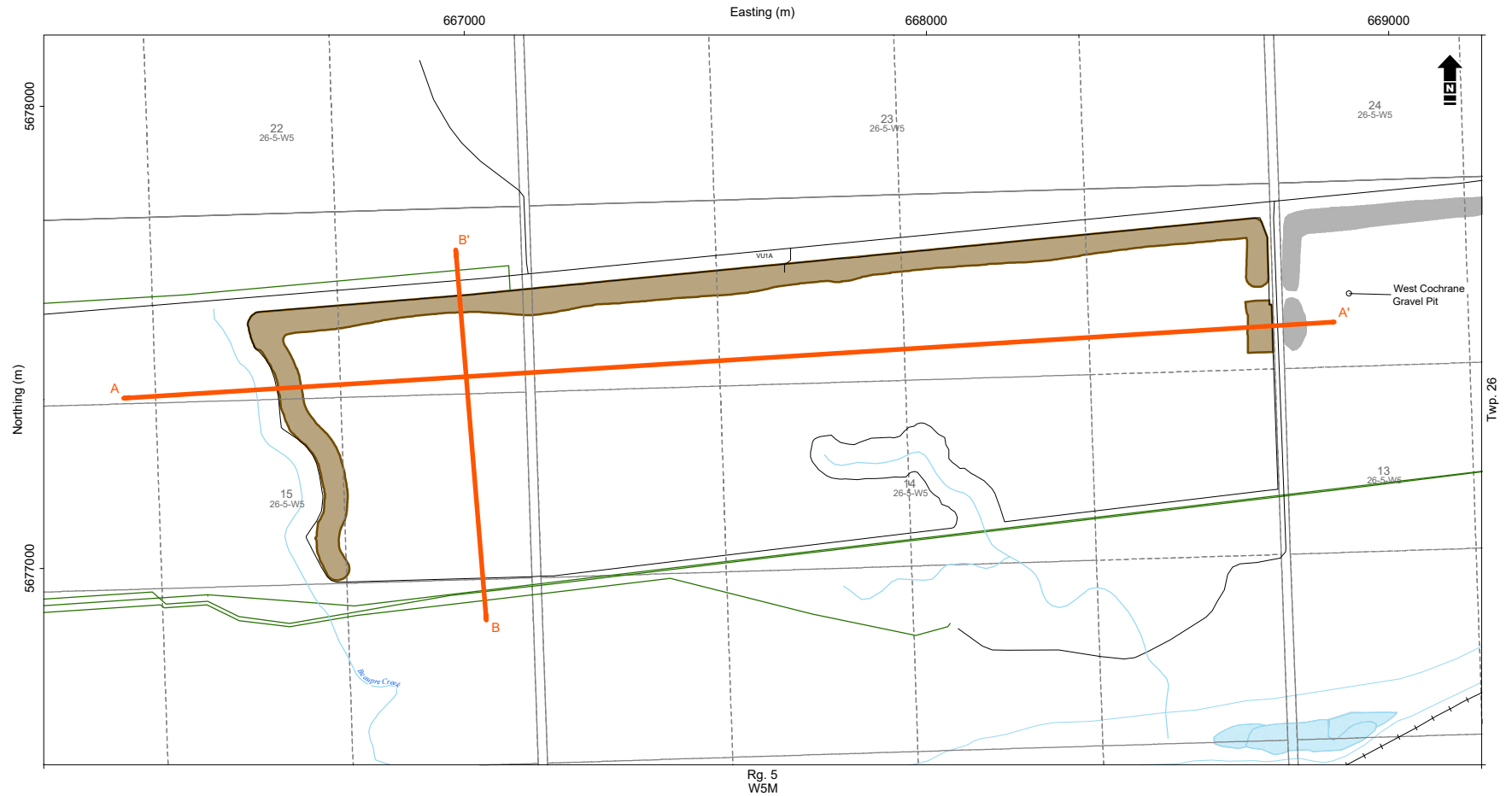
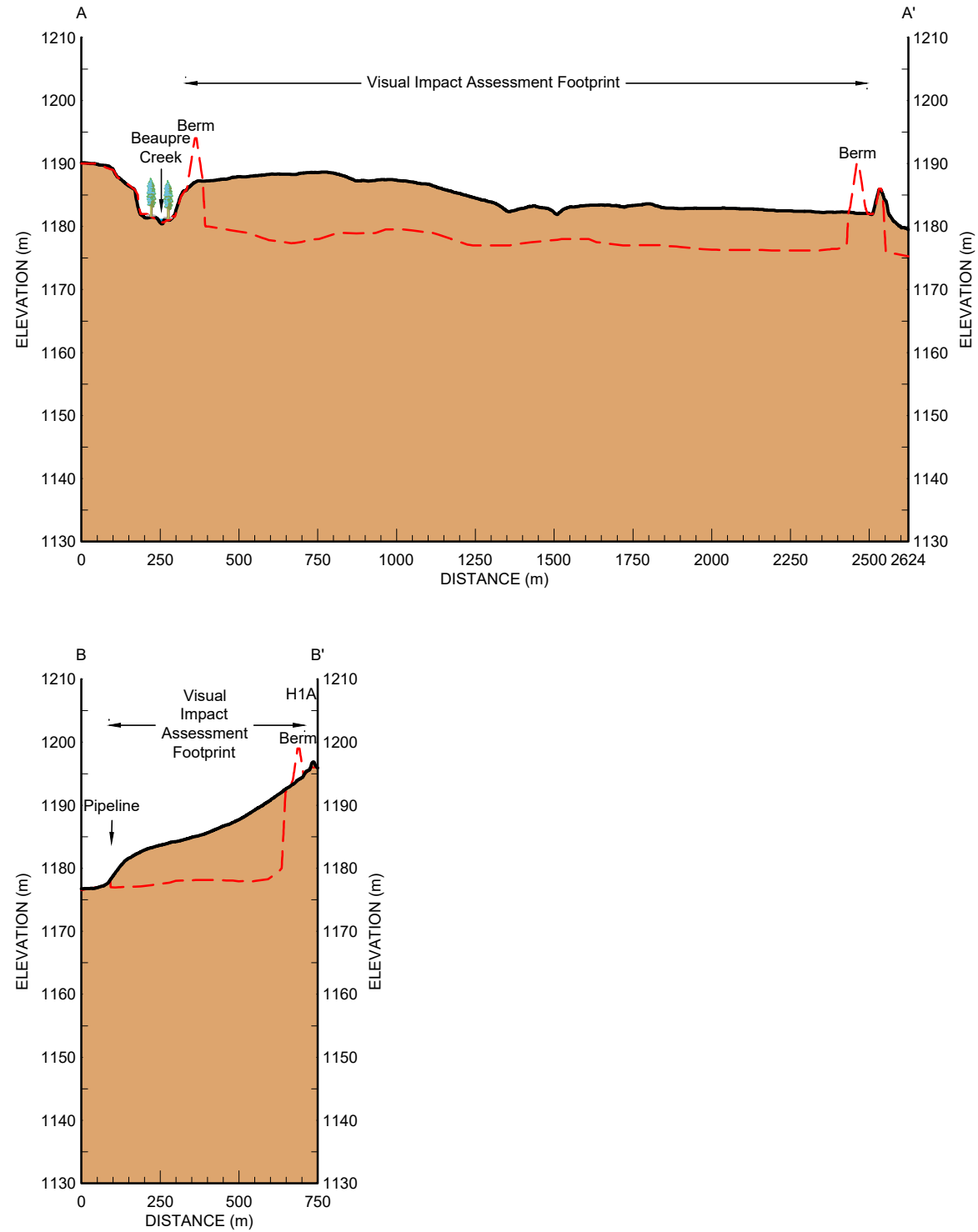
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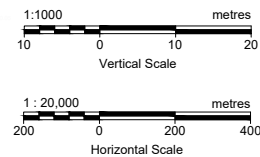


Plot 1:1 = Tabloid (L)

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- Final Mine Surface
- Existing Tree Area
- Water Course
- Existing Screening Berm
- Proposed Screening Berm
- Visual Impact Assessment Footprint



Note: Figure(s) must be used in conjunction with the attached report and is subject to the limitations and conditions stated in the report.

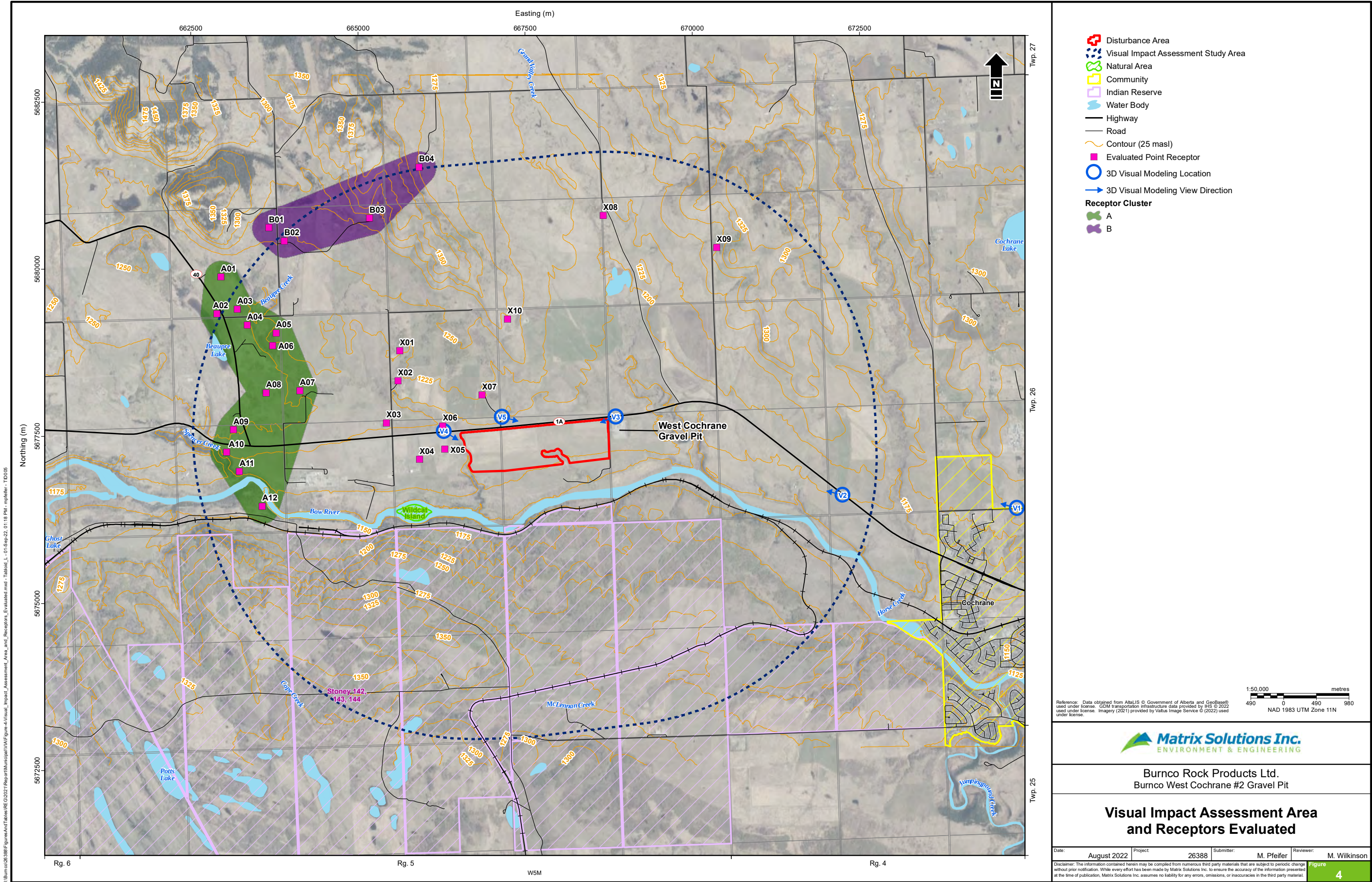


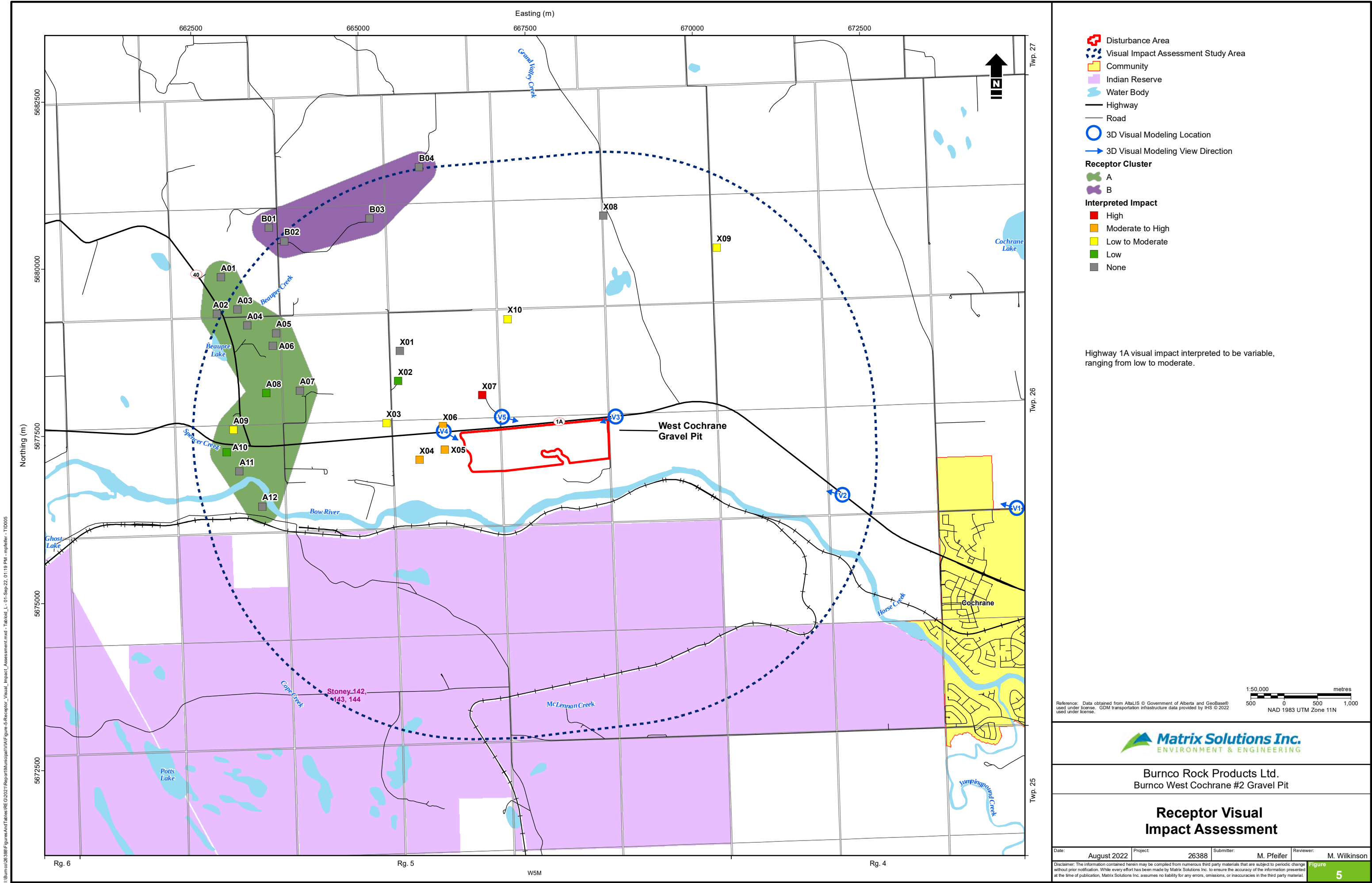
Burnco Rock Products Ltd.
West Cochrane Gravel Pit

Cross-sections

Date: August 2022 Project: 26388-XSVA-22 Submitter: M. Pfeifer Reviewer: M. Wilkinson

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Pre-development



Post-development



Burnco Rock Products Ltd.
West Cochrane Gravel Pit

3D Visual Model: V1

Date:	August 2022	Project:	26388-VA-22	Technical:	M. Pfeifer	Reviewer:	M. Wilkinson
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Figure 6a



Pre-development



Post-development



Burnco Rock Products Ltd.
West Cochrane Gravel Pit

3D Visual Model: V2

Date:	August 2022	Project:	26388-VA-22	Technical:	M. Pfeifer	Reviewer:	M. Wilkinson
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**Figure
6b**



Pre-development



Post-development



Burnco Rock Products Ltd.
West Cochrane Gravel Pit

3D Visual Model: V3

Date:	August 2022	Project:	26388-VA-22	Technical:	M. Pfeifer	Reviewer:	M. Wilkinson
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Figure
6c



Pre-development



Post-development



Burnco Rock Products Ltd.
West Cochrane Gravel Pit

3D Visual Model: V4

Date:	August 2022	Project:	26388-VA-22	Technical:	M. Pfeifer	Reviewer:	M. Wilkinson
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Figure
6d



Pre-development



Post-development



Burnco Rock Products Ltd.
West Cochrane Gravel Pit

3D Visual Model: V5

Date:	August 2022	Project:	26388-VA-22	Technical:	M. Pfeifer	Reviewer:	M. Wilkinson
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Figure
6e

Table 1
Visible Area Calculation and Impact Classification for Each Receptor
BURNCO Rock Products Ltd.
West Cochrane Gravel Pit

Receptor	Area of Disturbance Area Currently Viewable (ha)	Percent of Disturbance Area Currently Viewable	Area of Disturbanec Area Viewable After Mining / Mitigation (ha)	Percent of Disturbance Area Viewable After Mining / Mitigation	Area of Study Area Currently Viewable (ha)	Area of Study Area Viewable After Mining / Mitigation (ha)	Percent Loss of Total Study Area View After Mining / Mitigation	Viewshed Quantitative Summary	Visual Impact Assessment
A01	0	0%	0	0%	828	828	0%	0% of Project Area Visible	None
A02	0	0%	0	0%	902	902	0%	0% of Project Area Visible	None
A03	0	0%	0	0%	1017	1017	0%	0% of Project Area Visible	None
A04	0	0%	0	0%	896	896	0%	0% of Project Area Visible	None
A05	0	0%	0	0%	841	841	0%	0% of Project Area Visible	None
A06	0	0%	0	0%	274	274	0%	0% of Project Area Visible	None
A07	0	0%	0	0%	1124	1124	0%	0% of Project Area Visible	None
A08	31	25%	4	3%	1503	1460	3%	<10% of Project Area Visible	Low
A09	62	49%	24	20%	1803	1756	3%	>10% of Project Area Visible	Low to Moderate
A10	0	0%	1	1%	699	677	3%	<10% of Project Area Visible	Low
A11	0	0%	0	0%	582	582	0%	0% of Project Area Visible	None
A12	0	0%	0	0%	195	195	0%	0% of Project Area Visible	None
B01	0	0%	0	0%	1134	1134	0%	0% of Project Area Visible	None
B02	0	0%	0	0%	950	950	0%	0% of Project Area Visible	None
B03	0	0%	0	0%	1220	1220	0%	0% of Project Area Visible	None
B04	0	0%	0	0%	876	876	0%	0% of Project Area Visible	None
X01	0	0%	0	0%	765	765	0%	0% of Project Area Visible	None
X02	11	9%	2	1%	976	958	2%	<10% of Project Area Visible	Low
X03	32	25%	5	4%	1181	1114	6%	Mitigated to <10% of Project Area Visible	Low to Moderate
X04	43	34%	4	3%	1341	1172	13%	Mitigated to <10% of Project Area Visible, Large Overall View Reduction	Moderate to High
X05	16	12%	2	2%	1054	693	34%	Mitigated to <10% of Project Area Visible, Large Overall View Reduction	Moderate to High
X06	24	19%	4	3%	1114	961	14%	Mitigated to <10% of Project Area Visible, Large Overall View Reduction	Moderate to High
X07	63	50%	29	23%	1923	1881	2%	>10% of Project Area Visible	High
X08	0	0%	0	0%	861	861	0%	0% of Project Area Visible	None
X09	70	56%	17	13%	1751	1694	3%	>10% of Project Area Visible	Moderate
X10	16	13%	8	7%	2034	2024	0%	Mitigated to <10% of Project Area Visible	Low to Moderate

Table 2**3D Modeled Visual Description, Location, and Elevation**

BURNCO Rock Products Ltd.

West Cochrane Gravel Pit

3D Visual	Legal Land Survey Location	Approximate Elevation (masl)	Distance From Site (m)	Northing (NAD 83 Zone 11)	Easting (NAD 83 Zone 11)
V1	02-16-026-04W5	1232	6145	5676428	674860
V2	04-17-026-04W5	1181	3536	5676624	672253
V3	13-13-026-05W5	1188	143	5677797	668859
V4	14-15-026-05W5	1194	250	5677578	666286
V5	04-23-026-05W5	1211	185	5677793	667153

APPENDIX A

Receptor Description, Location, and Elevation

Appendix A

Receptor Description, Location, and Elevation

BURNCO Rock Products Ltd.

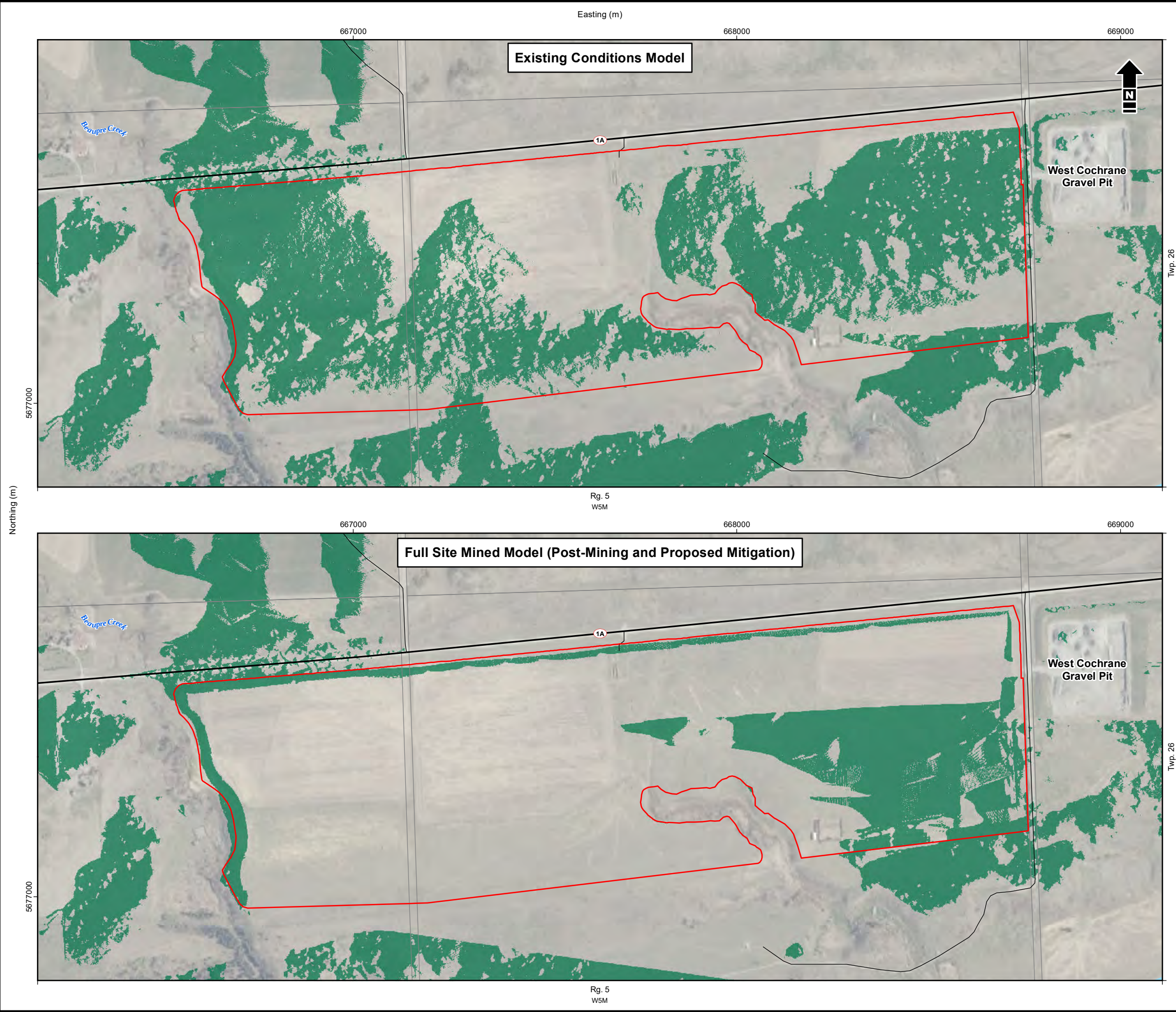
West Cochrane Gravel Pit

Receptor	General Description	Legal Land Survey Location	Approximate Elevation (masl)	Distance From Site (m)	Northing (NAD 83 Zone 11)	Easting (NAD 83 Zone 11)
A01	Residence	06-29-026-05W5	1242	4283	5679883	662950
A02	Residence	03-29-026-05W5	1241	4060	5679333	662892
A03	Residence	02-29-026-05W5	1241	3822	5679400	663196
A04	Residence	15-20-026-05W5	1235	3582	5679165	663343
A05	Residence	16-20-026-05W5	1232	3145	5679047	663776
A06	Residence	09-20-026-05W5	1219	3104	5678856	663724
A07	Residence	05-21-026-05W5	1225	2485	5678184	664134
A08	Residence	08-20-026-05W5	1235	2967	5678148	663630
A09	Residence	15-17-026-05W5	1234	3397	5677599	663135
A10	Residence	14-17-026-05W5	1203	3505	5677263	663036
A11	Residence	10-17-026-05W5	1194	3349	5676975	663228
A12	Residence	01-17-026-05W5	1157	3151	5676452	663567
B01	Residence	16-29-026-05W5	1264	4207	5680620	663666
B02	Residence	12-28-026-05W5	1252	3903	5680423	663901
B03	Residence	16-28-026-05W5	1286	3494	5680765	665172
B04	Residence	06-34-026-05W5	1298	4024	5681529	665914
X01	Residence	12-22-026-05W5	1227	1533	5678779	665627
X02	Yamnuska Wolfdog Sanctuary	05-22-026-05W5	1217	1222	5678330	665602
X03	Residence	16-16-026-05W5	1205	1116	5677699	665429
X04	Residence (Cornish)	12-15-026-05W5	1191	699	5677153	665922
X05	Residence	11-15-026-05W5	1187	300	5677308	666299
X06	Residence (Levesque)	14-15-026-05W5	1196	290	5677654	666269
X07	Residence (McNabb)	01-22-026-05W5	1226	536	5678119	666859
X08	Residence	13-25-026-05W5	1210	3042	5680801	668671
X09	Residence	12-30-026-04W5	1275	3048	5680325	670368
X10	Residence	13-23-026-05W5	1269	1632	5679256	667242

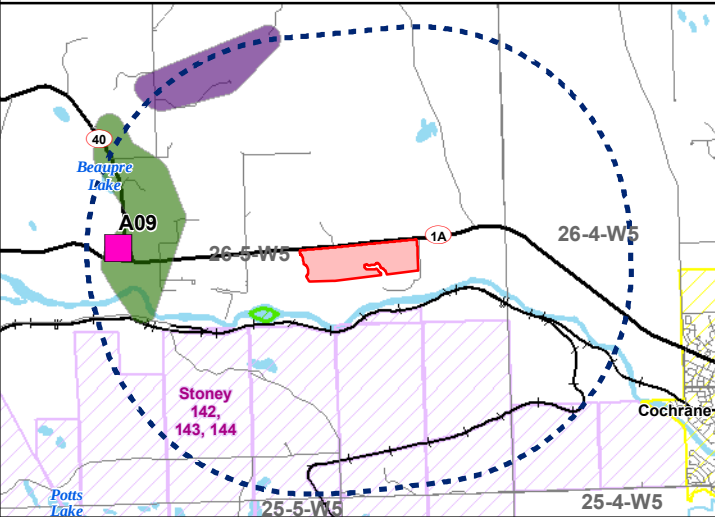
APPENDIX B

Visible Areas for Each Receptor

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- Disturbance Area
- Visual Impact Assessment Study Area
- Visible Area From Receptor
- Community
- Water Body
- Highway
- Road
- Evaluated Point Receptor



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1:10,000
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metres
NAD 1983 UTM Zone 11N

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Burnco Rock Products Ltd.
Burnco West Cochrane #2 Gravel Pit

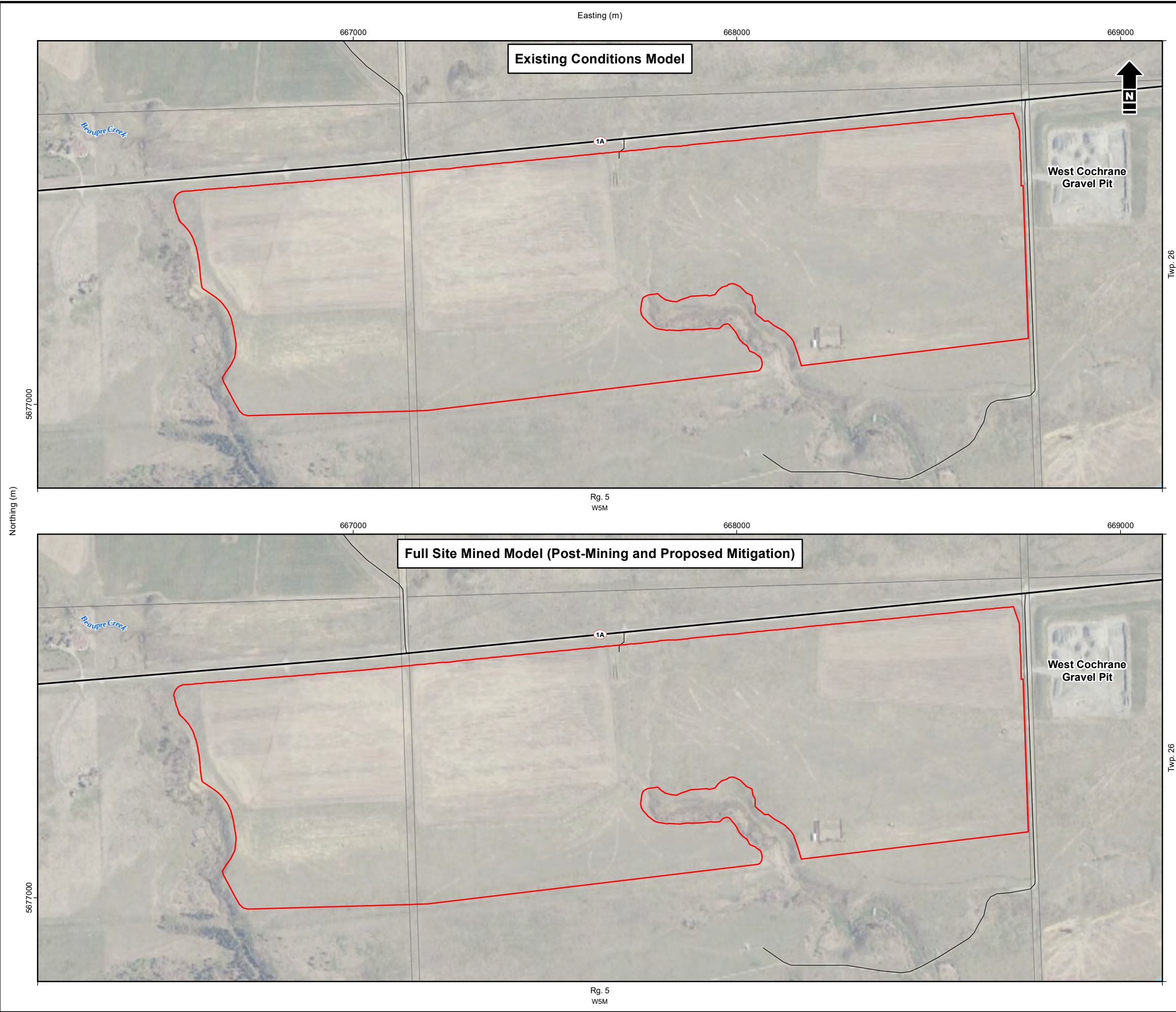
Visual Areas For Receptor A09

Date: October 2019	Project: 26388	Submitter: M. Pfeifer	Reviewer: M. Wilkinson
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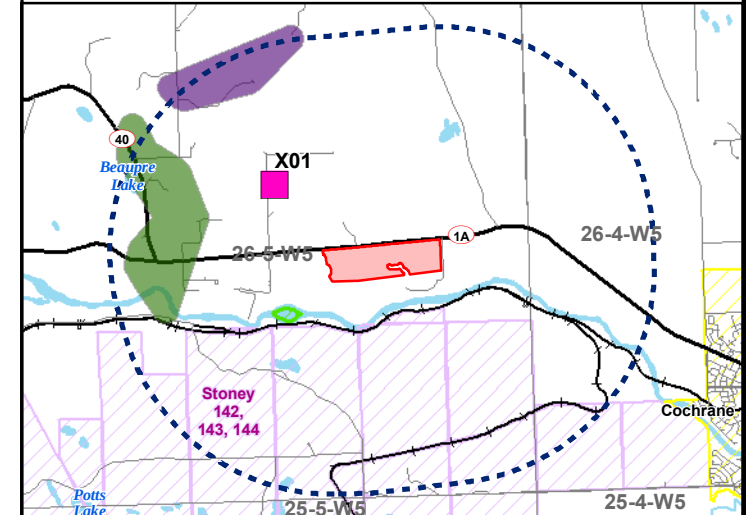
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Figure
B1

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- Disturbance Area
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metres

100 0 100 200

NAD 1983 UTM Zone 11N



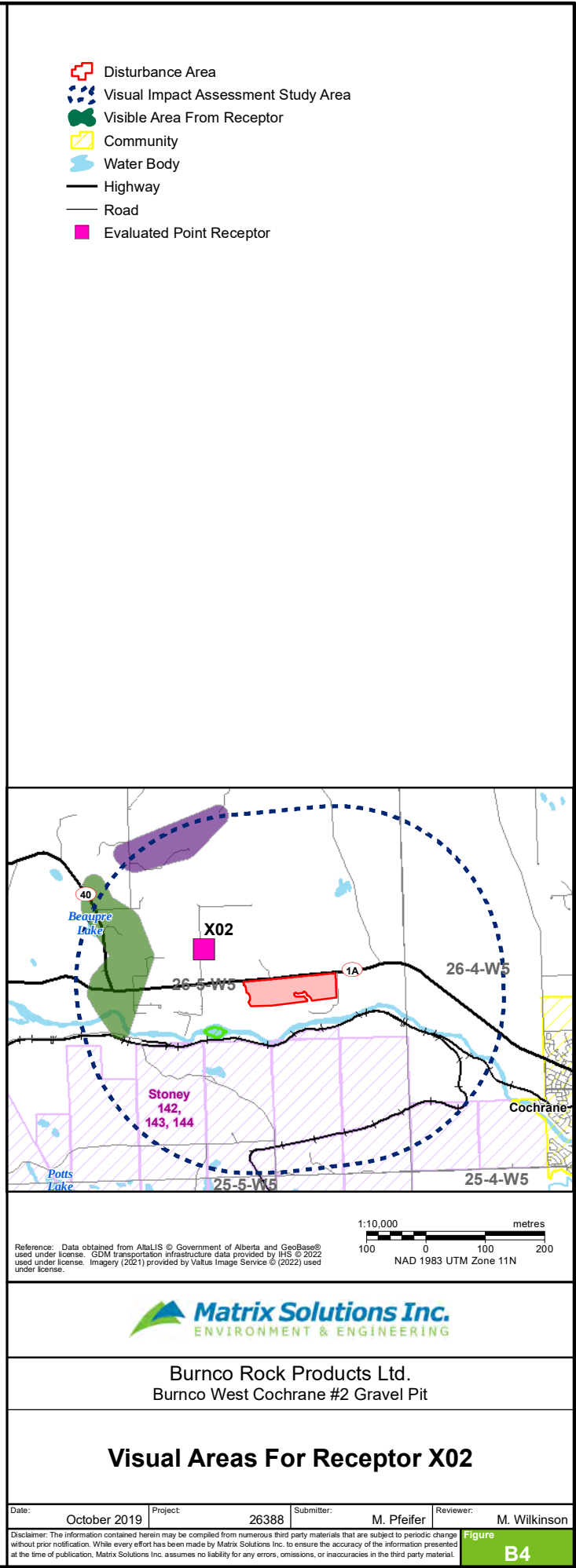
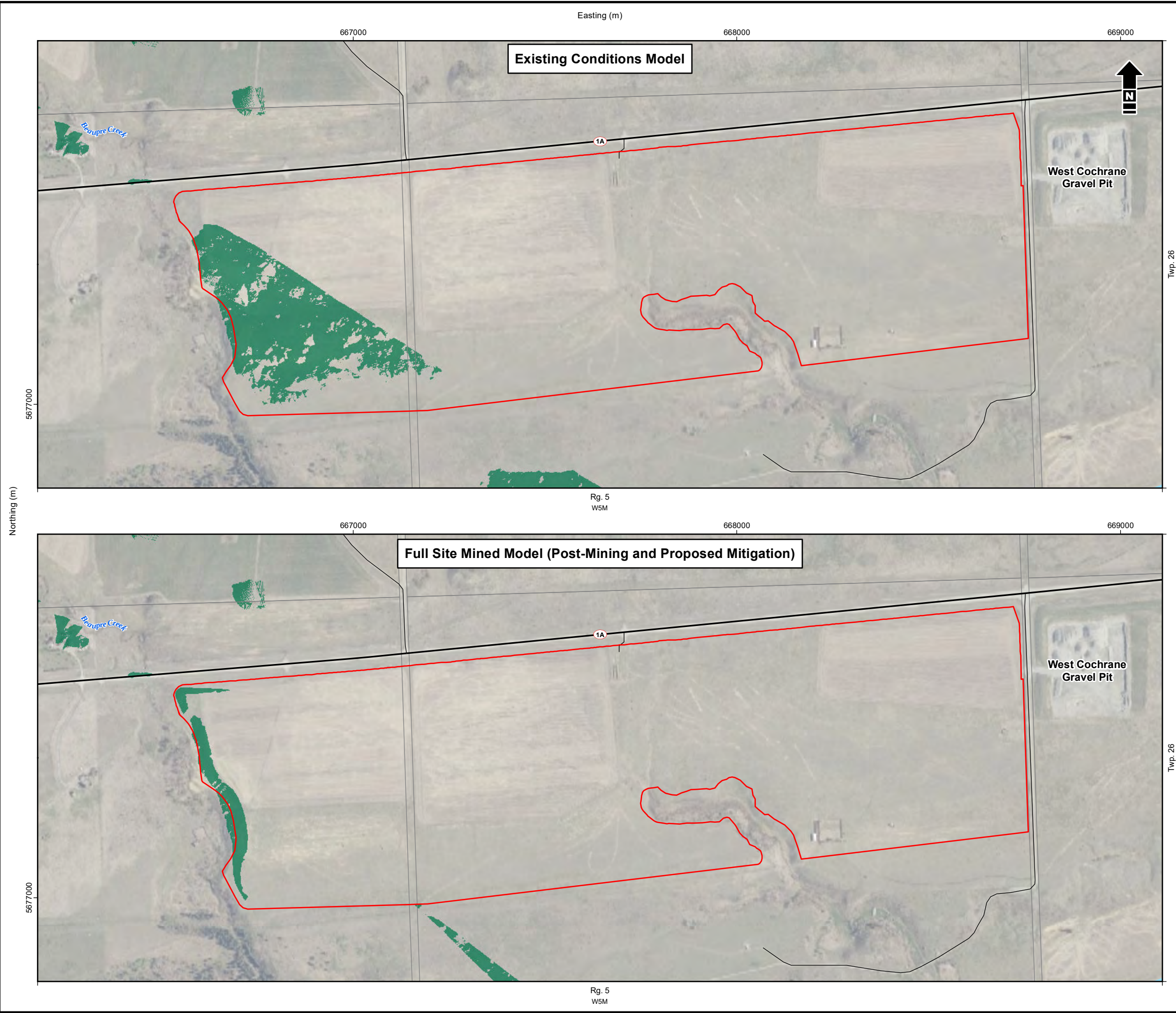
Burnco Rock Products Ltd.
Burnco West Cochrane #2 Gravel Pit

Visual Areas For Receptor X01

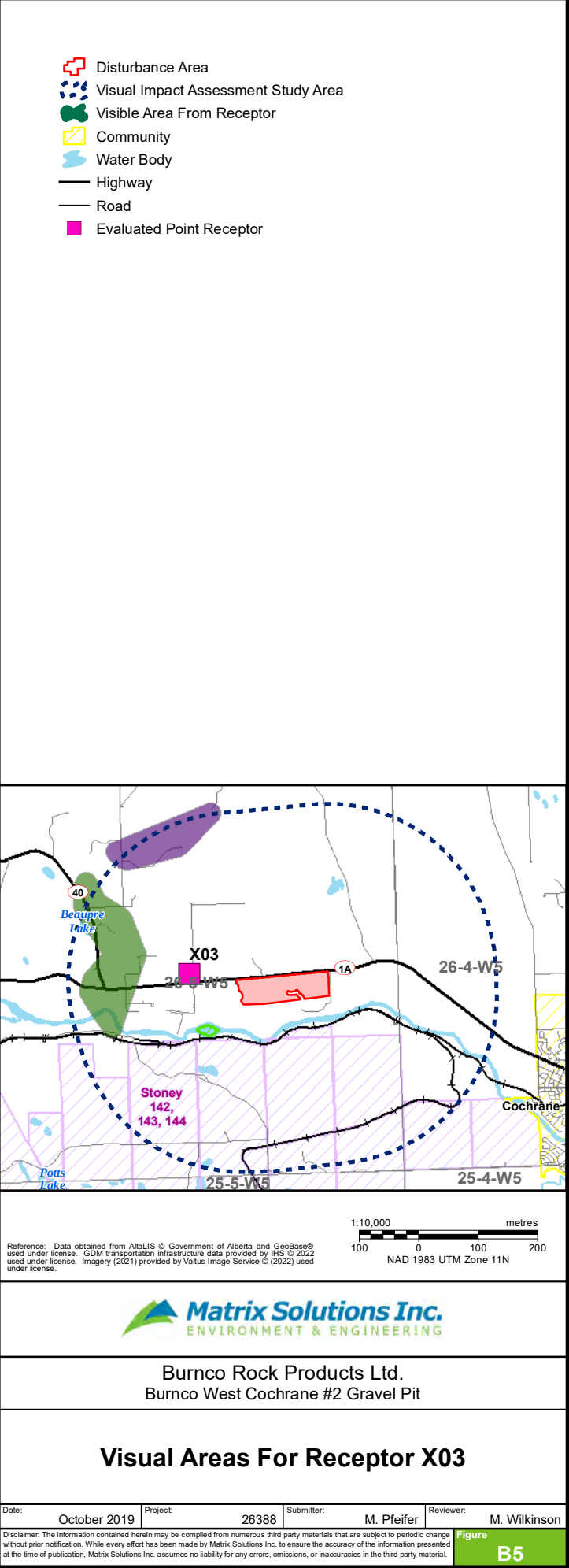
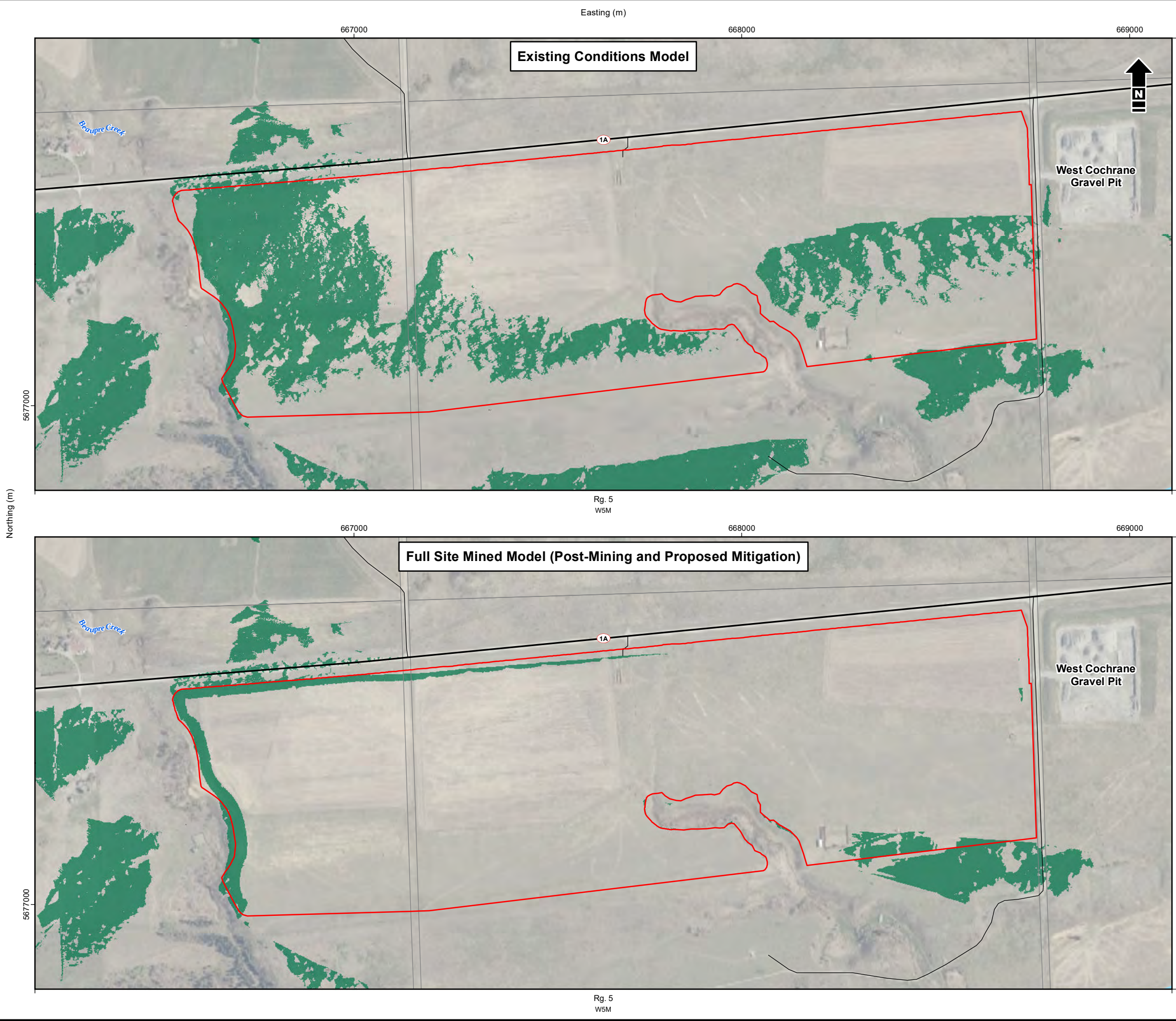
Date: October 2019 Project: 26388 Submitter: M. Pfeifer Reviewer: M. Wilkinson

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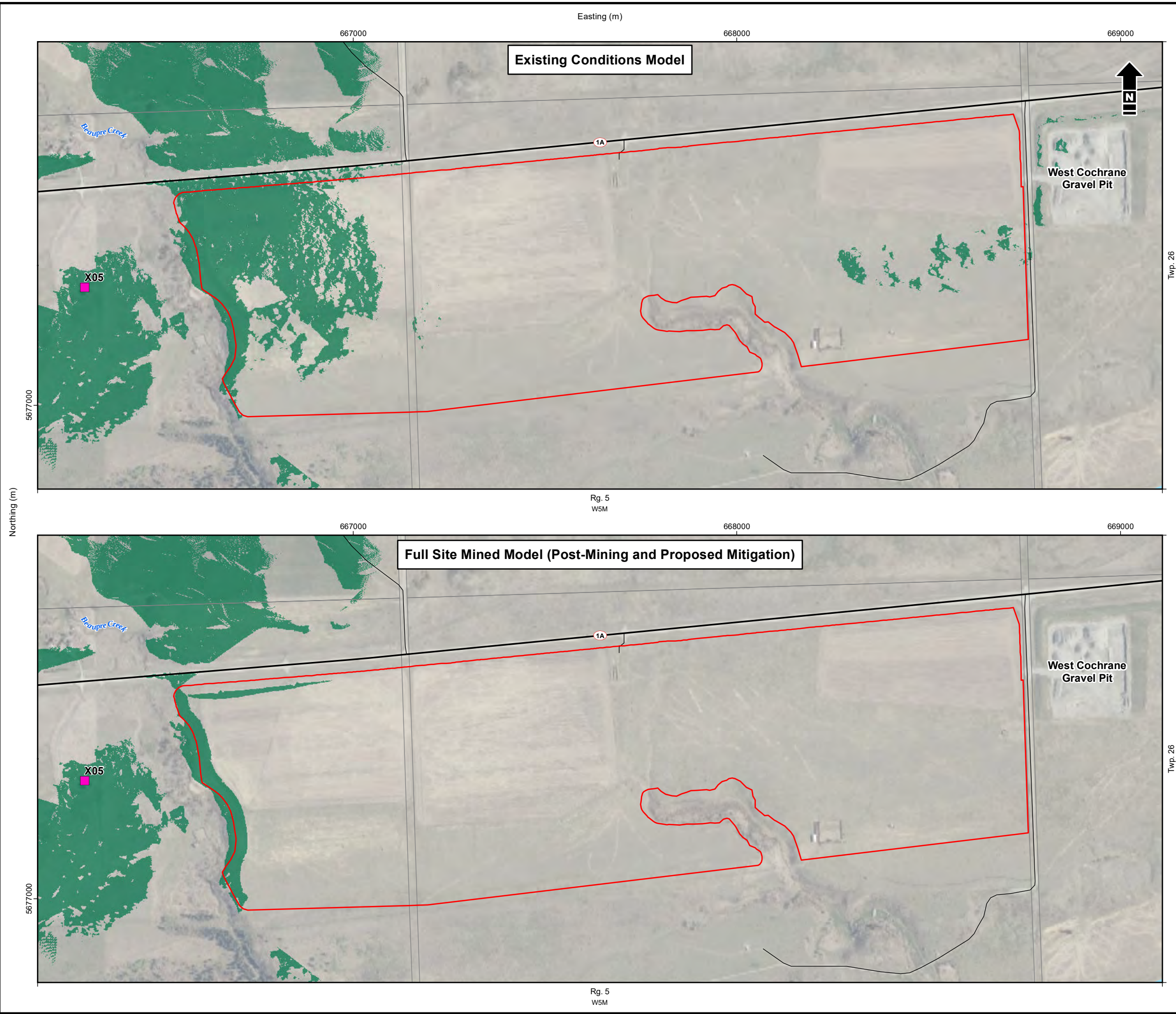
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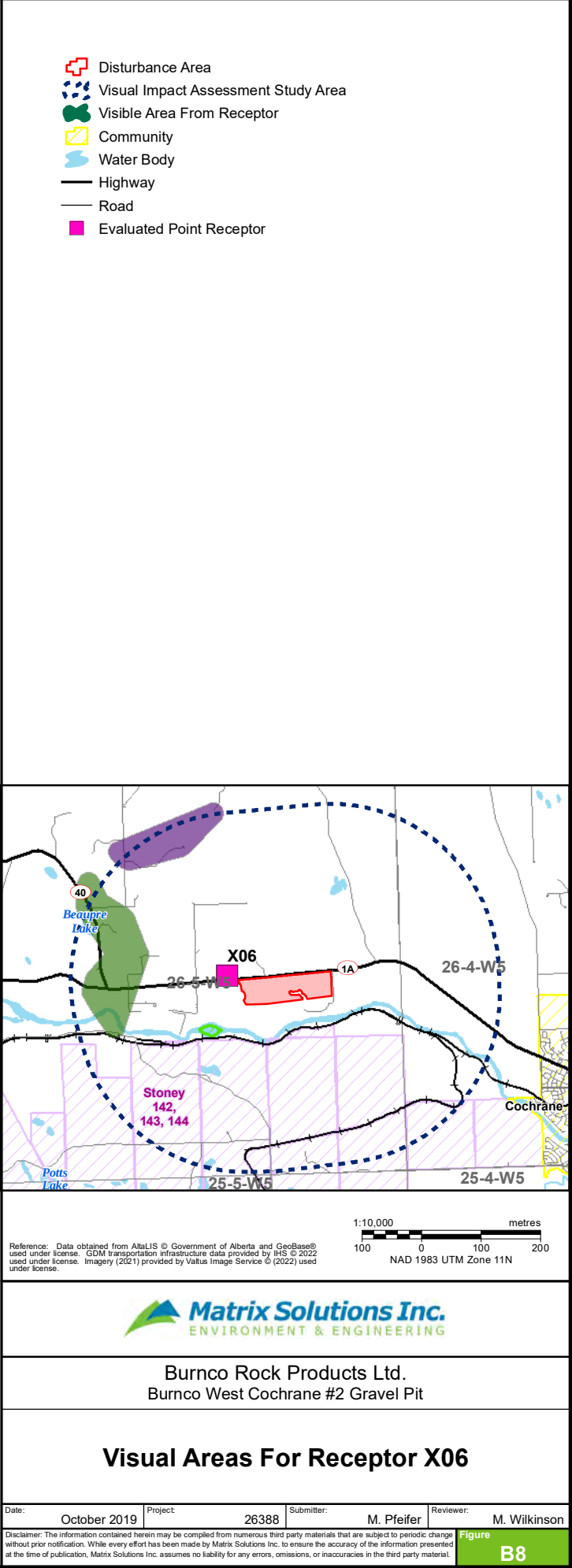
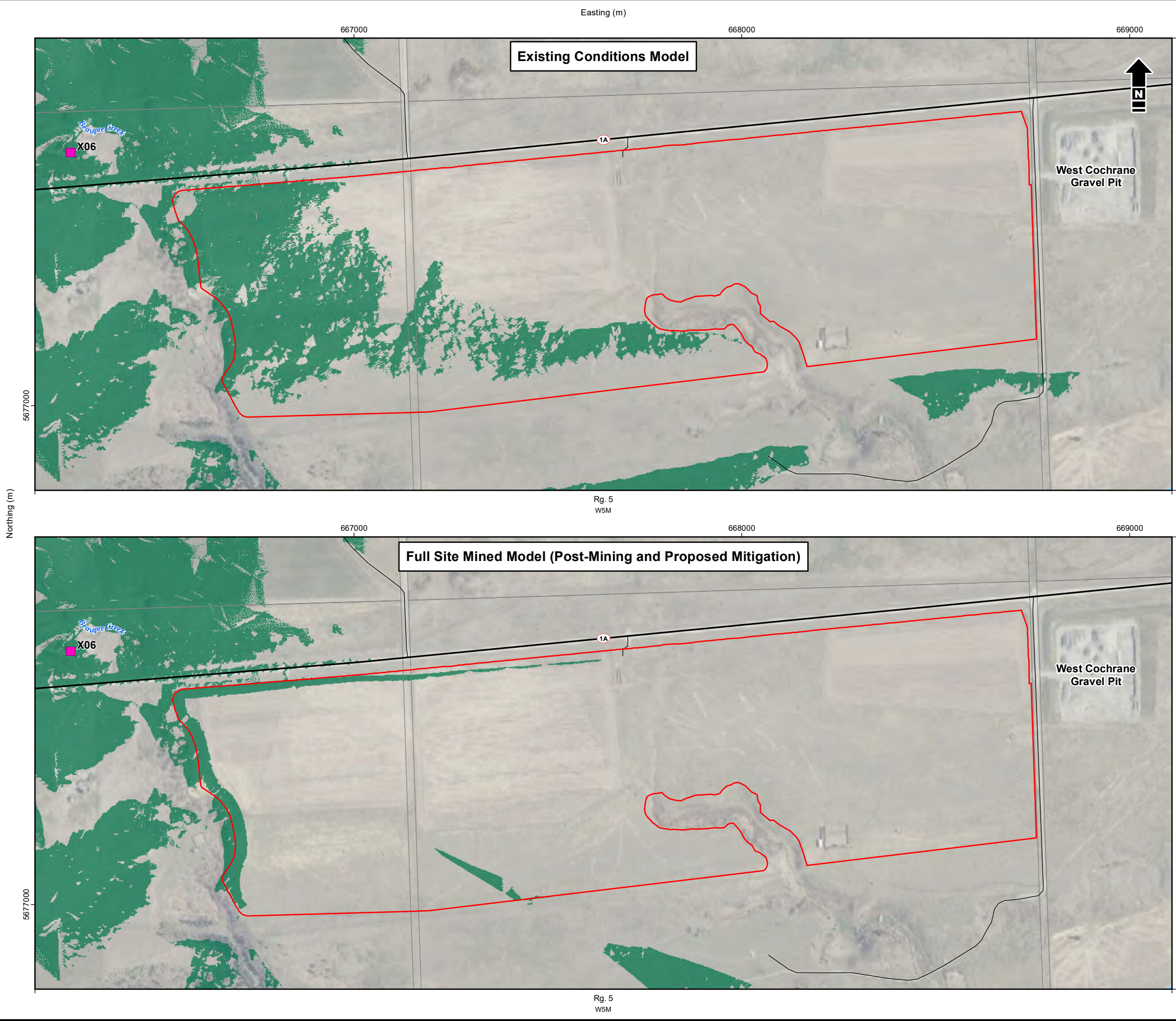
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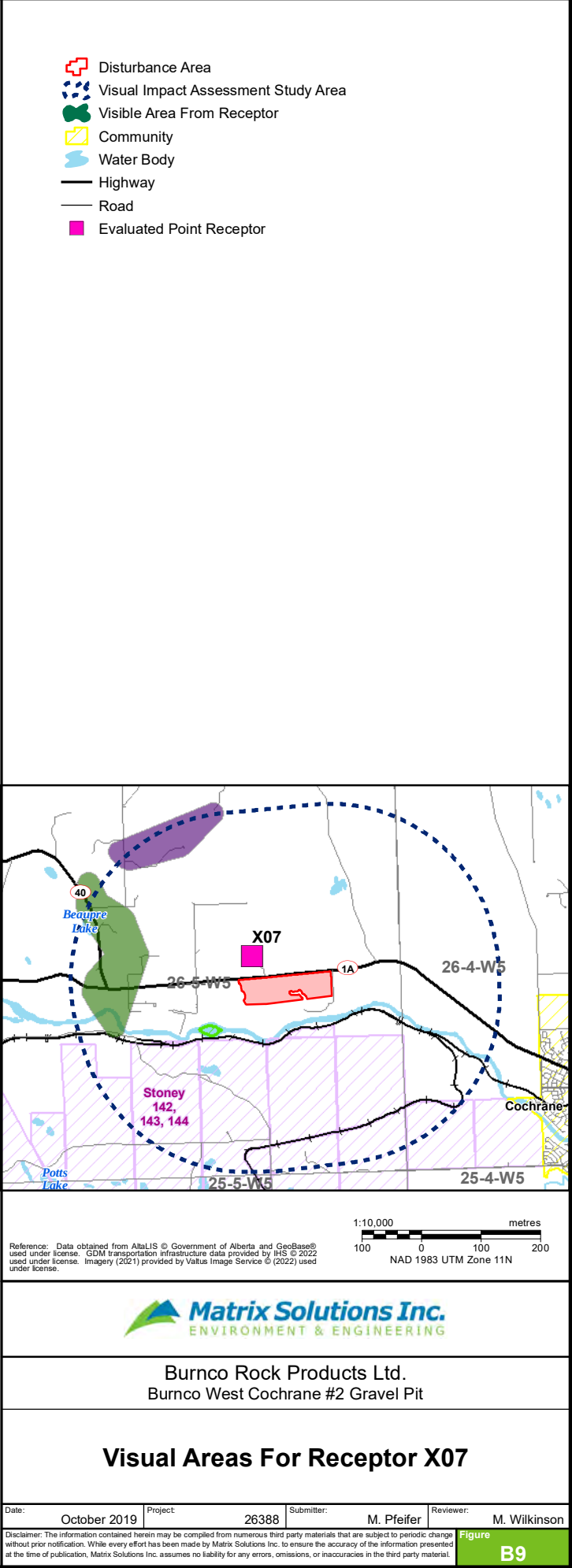
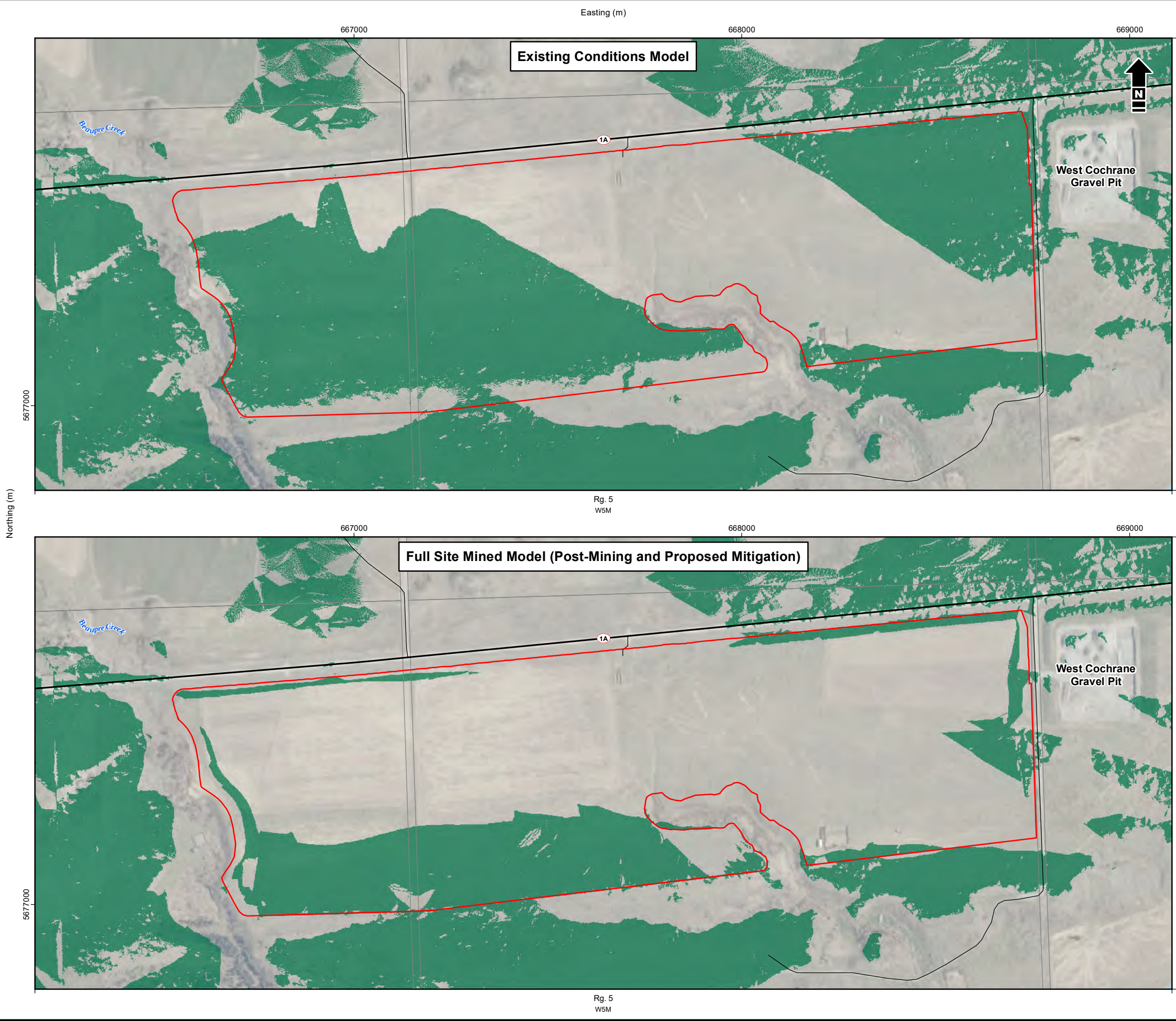
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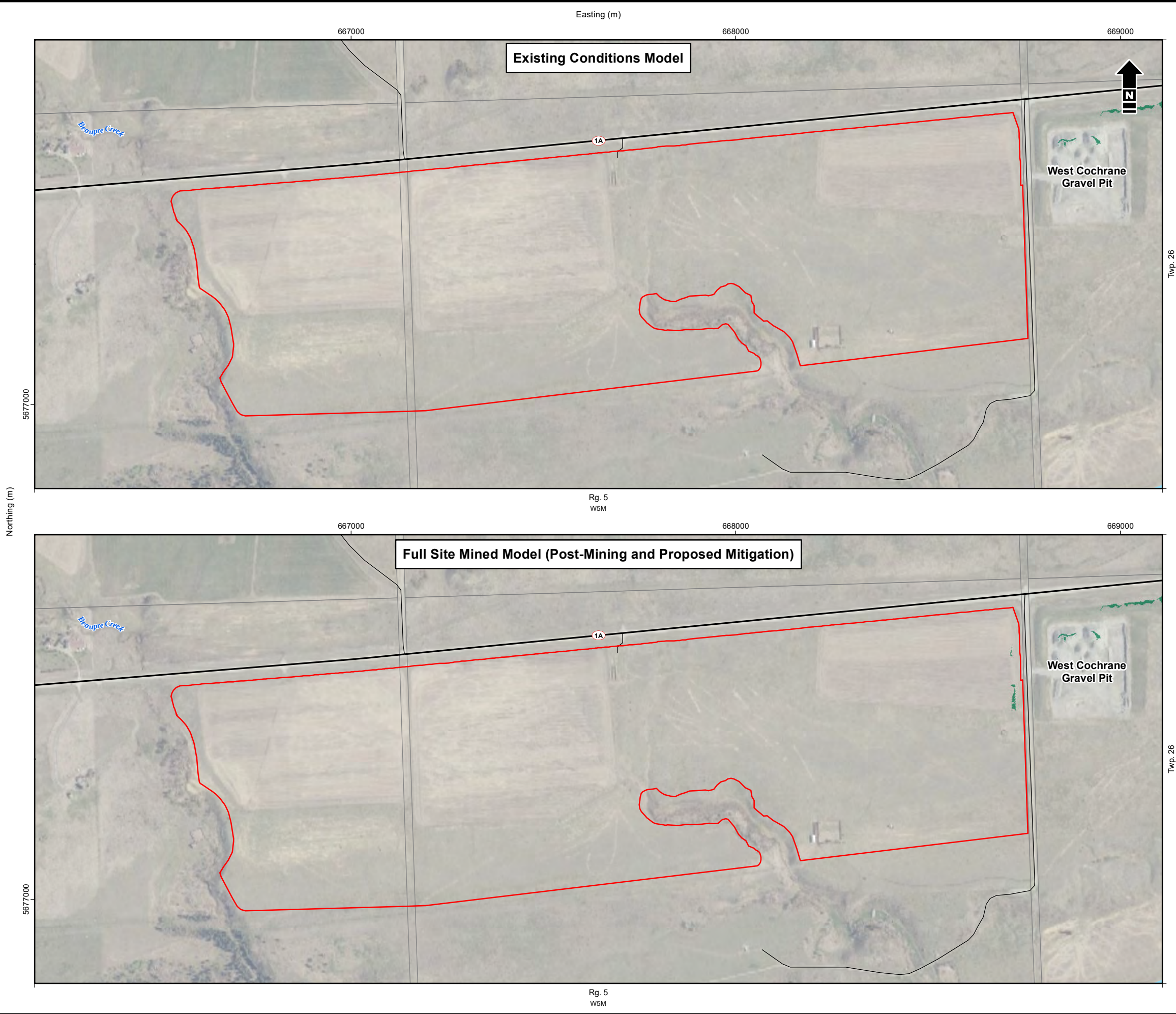
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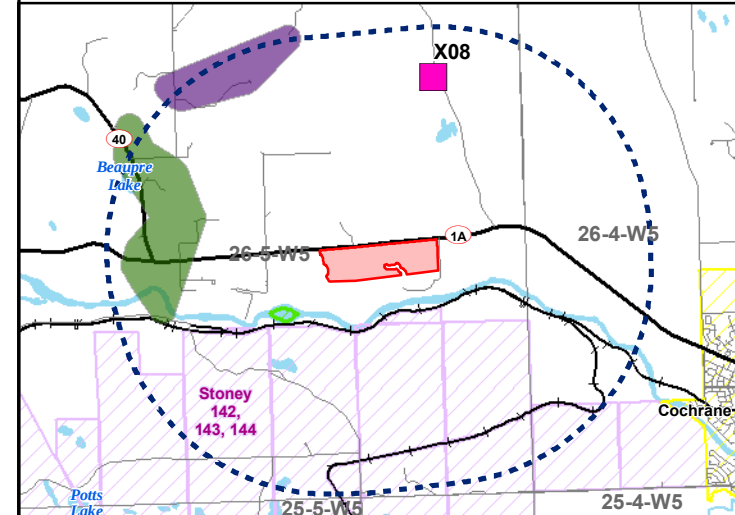
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- Disturbance Area
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- Community
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- Highway
- Road
- Evaluated Point Receptor



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Burnco Rock Products Ltd.
Burnco West Cochrane #2 Gravel Pit

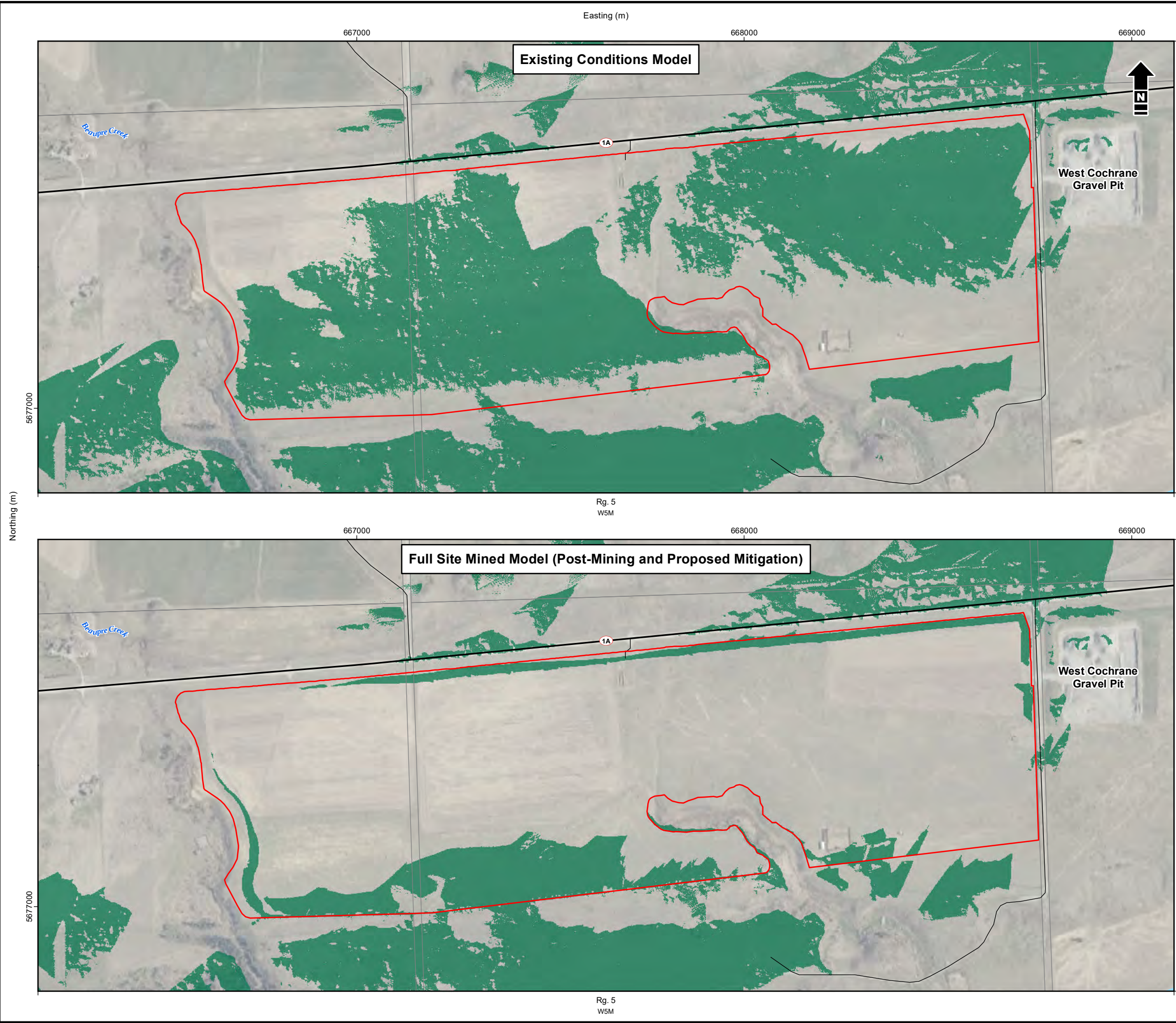
Visual Areas For Receptor X08

Date: October 2019 Project: 26388 Submitter: M. Pfeifer Reviewer: M. Wilkinson

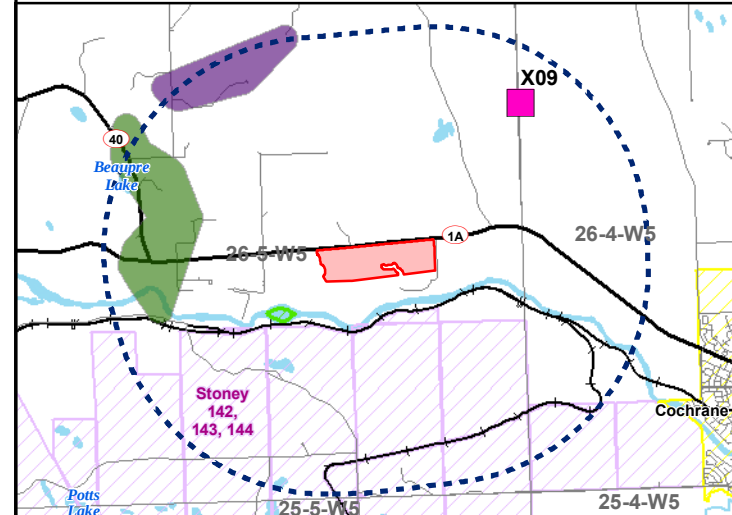
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Figure B10

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- Disturbance Area
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- Visible Area From Receptor
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metres
NAD 1983 UTM Zone 11N

Matrix Solutions Inc.
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Burnco Rock Products Ltd.
Burnco West Cochrane #2 Gravel Pit

Visual Areas For Receptor X09

Date: October 2019 Project: 26388 Submitter: M. Pfeifer Reviewer: M. Wilkinson

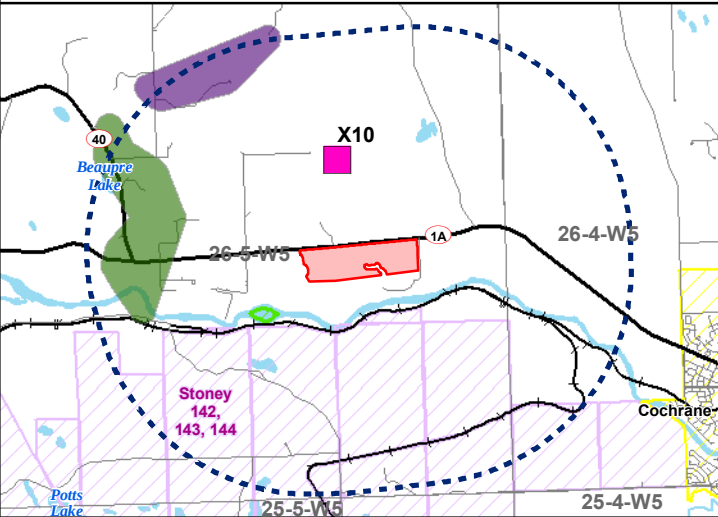
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Figure
B11

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1:10,000
100 0 100 200 metres
NAD 1983 UTM Zone 11N

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Burnco Rock Products Ltd.
Burnco West Cochrane #2 Gravel Pit

Visual Areas For Receptor X10

Date: October 2019 Project: 26388 Submitter: M. Pfeifer Reviewer: M. Wilkinson

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Figure
B12

APPENDIX C

Project Planting Plan



APPENDIX C– PLANTING PLAN

**BURNCO WEST COCHRANE #2 GRAVEL PIT
NE ¼ 14-026-05 W5M TO NE ¼ 15-026-05 W5M**

Prepared for:
BURNCO ROCK PRODUCTS LTD.

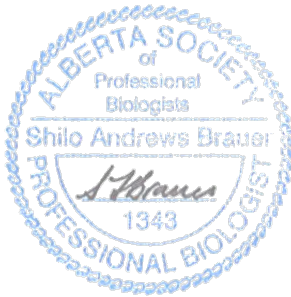
Prepared by:
MATRIX SOLUTIONS INC.

Version 1.0
September 2022
Calgary, Alberta

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APPENDIX C – PLANTING PLAN
BURNCO WEST COCHRANE #2 GRAVEL PIT
NE ¼ 14-026-05 W5M TO NE ¼ 15-026-05 W5M

Prepared for BURNCO Rock Products Ltd., September 2022



September 22, 2022

Shilo Brauer, M.Sc., P.Biol.
Senior Ecologist



reviewed by

Kelly Ostermann, M.Sc., P.Ag.
Principal Environmental Scientist

VERSION CONTROL

Version	Date	Issue Type	Filename	Description
V0.1	06-Sep-2022	Draft	26388-512 Planting R 2022-09-06 draft V0.1.docx	Issued to client for review
V1.0	22-Sep-2022	Final	26388-512 Planting R 2022-09-22 final V1.0.docx	Issued to client

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IN-TEXT TABLE

TABLE 1	Suggested Trees and Shrubs for Screening ¹	2
---------	---	---

FIGURES

FIGURE 1	Vegetation Plan
FIGURE 2	Vegetation Plan

1 INTRODUCTION

Matrix Solutions Inc. was retained by BURNCO Rock Products Ltd. (BURNCO) to create a planting and maintenance plan for the proposed BURNCO West Cochrane #2 Gravel Pit. The project area is located approximately 5 km west of Cochrane in NE ¼ 14-026-05 W5M to NE ¼ 15-026-05 W5M, south of Highway 1A. Land use is primarily agricultural with five residents north and west of the proposed gravel pit that could be visually impacted by the pit's location (see main report for locations).

Under *Section 26 Landscaping, Screening and Outdoor Display Area* of the *Rocky View County Land Use Bylaw* (Rocky View County 2019), the development authority, when considering a development permit application, may impose conditions requiring the use and maintenance of landscaping, berms, fencing, vegetation, or other screening of a location, length, thickness, type, height, and extent that is considered necessary to buffer the proposed development from adjacent or neighbouring land uses. BURNCO proposes to implement the combination of the earth berm with mixed landscaping, including trees and shrubs to minimize the proposed project's impacts on visual amenity and landscape character. The earth berm will be designed to support planted vegetation by allowing rainwater to collect and reducing the need for watering.

2 CONSTRUCTION OF SCREENING METHOD

2.1 Berm Specifications

The berm will be earthen construction, with topsoil dressing used for vegetation growth. Dimensions on the berm range from 20 to 70 m at the base (base width due to variability in topography), up to 8 m in height, and with 3:1 slopes.

2.2 Setback Distances

Under Section 42.1 of the *Rocky View County Land Use Bylaw*, all trees, hedges, and shrubs forming a shelterbelt will be located no closer than:

- (a) 15 m (49 ft.) from the right-of-way (RoW) of a *road, internal subdivision* in a *Country Residential District*;
- (b) 38 m (124 ft.) from the nearest limit of a *road, County RoW*; and
- (c) 41 m (134 ft.) from the nearest limit of a primary or secondary highway.

The berms and the tree placements are being proposed within the setbacks listed above. In discussion with BURNCO, the value of the berms and planting is often prioritized over other considerations and the County and Alberta Transportation will be able to comment on the setbacks when the plan is reviewed.

2.3 Planting Plan

2.3.1 Location of Planting Areas

Planting areas are located on the berm and will be positioned to reduce impacts on visual amenity (Figures 1 and 2 attached).

2.3.2 Trees and Shrubs

Trees and shrubs for screening have been selected based on if it is native to the area, plant hardiness, and moisture dependency. A plant hardiness zone demonstrates where certain vegetation is most likely to thrive based on average climatic conditions (Government of Canada 2019). The closest town to the project area is Cochrane, which has a hardiness zone of 3b (Government of Canada 2019).

Table 1 provides options for trees and shrubs suitable for screening purposes within the project area. All recommended species are native to Alberta and were found within the project area, which will maximize their drought tolerance and hardiness as well as suitability for the semi-natural setting in which they will be planted. Trembling aspen and wolf willow may also spread significantly once established; therefore, naturally increasing the visual screen and stabilizing the berm.

TABLE 1 Suggested Trees and Shrubs for Screening¹

Common Name	Scientific Name	Hardiness Zone	Mature Canopy Spread (m)	Mature Height (m)	Spacing ² (m)	Moisture Requirements
Trees						
Aspen	<i>Populus tremuloides</i>	1	3 to 6	9 to 12	3	Low to medium
White Spruce	<i>Picea glauca</i>	2	3 to 6	15 to 24	3	Low to medium
Shrubs						
Red Osier Dogwood	<i>Cornus stolonifera</i>	2	2 to 3	2 to 3	1	Medium to high
Buckbrush	<i>Symphoricarpos occidentalis</i>	2	1 to 2	1	1	Low to medium
Saskatoon	<i>Amelanchier alnifolia</i>	3	2 to 3	3 to 5	1	Medium to high
Wolf Willow	<i>Elaeagnus commutata</i>	2	1 to 2	2 to 3	1	Low to medium

Notes:

1. Williamson 2009

2. Recommended spacing for trees is equal to half the maximum spread at maturity, or 5 m, whichever is less, and for shrubs is 1 m.

Section 26 of the *Land Use Bylaw* indicates that all trees and shrub plantings shall be hardy to the Calgary region and shall be required to conform to the following:

- (a) Evergreen shrubs shall be at least 40 cm (15 in.) in height when planted. Deciduous shrubs shall be at least 60 cm (23 in.) in height when planted.
- (b) The proportion of deciduous to evergreen trees shall be approximately 60:40, unless the landscaping plan is designed by a registered professional landscape architect.
- (c) Trees required shall be at least 4 cm (1 in.) caliper for deciduous trees, and at least 2 m (6 ft.) in height for evergreen trees.

Plant material will be nursery grown and meet the requirements set out in the guide specifications for nursery stock by the Canadian Nursery Landscape Association (CNLA 2017) and International Society of Arboriculture. Shrubs will be a minimum #5 pot.

2.3.3 Planting Methodology

The planting should be carried out under the supervision of someone with horticultural expertise. To prepare for planting, the ground will be excavated using a tree spade, backhoe, or hand shovel. The excavation will be 450 mm greater on all sides than the width of the root ball. The subgrade will be to a depth of 75 mm under all tree pits and shrub beds. All planting beds will be mulched to a depth of 75 mm with material distanced 50 mm away from the trunks and stem to avoid rotting of bark. All roots and root balls will be watered prior to planting. The plant will be placed in the centre of the planting pit and bare root plants will be placed such that roots lie in a natural position. The excavated area will then be backfilled with topsoil and compacted to ensure plant retains its upright position. Trees may be temporarily staked if necessary.

Spacing requirements for planting trees and shrubs (Table 1) are recommended to provide maximum screening while allowing each plant adequate light and moisture to establish. Trees and shrubs will be planted in groups along the berm to meet screening objectives and mimic a more natural vegetation pattern (Figures 1 and 2).

2.3.4 Transplanting Existing Trees and Shrubs

BURNCO may transplant some established trees from potential disturbance areas within the project or from a nearby property in the Big Hill Springs region to the areas designated for visual screening. Transplanting should be completed by an experienced tree moving company with appropriately sized tree spades. Transplanting would save the trees and would allow enhanced screening by using larger caliper trees.

3 MAINTENANCE

3.1 Supplemental Planting

BURNCO will replace planted vegetation that does not survive with the species recommended in Table 1 to maintain the desired number of plants in each planted area.

3.2 Watering

The species chosen will be drought tolerant and limited watering will be required once the newly planted trees and shrubs are established. It is recommended that the trees and shrubs be watered immediately after planting, and a regular watering schedule be maintained during the first year of establishment if precipitation levels fall short of those deemed to allow the new stock to establish. Required precipitation and/or watering levels will be further defined in the detailed planting plan to be prepared once a development permit is received.

3.3 Weed Control

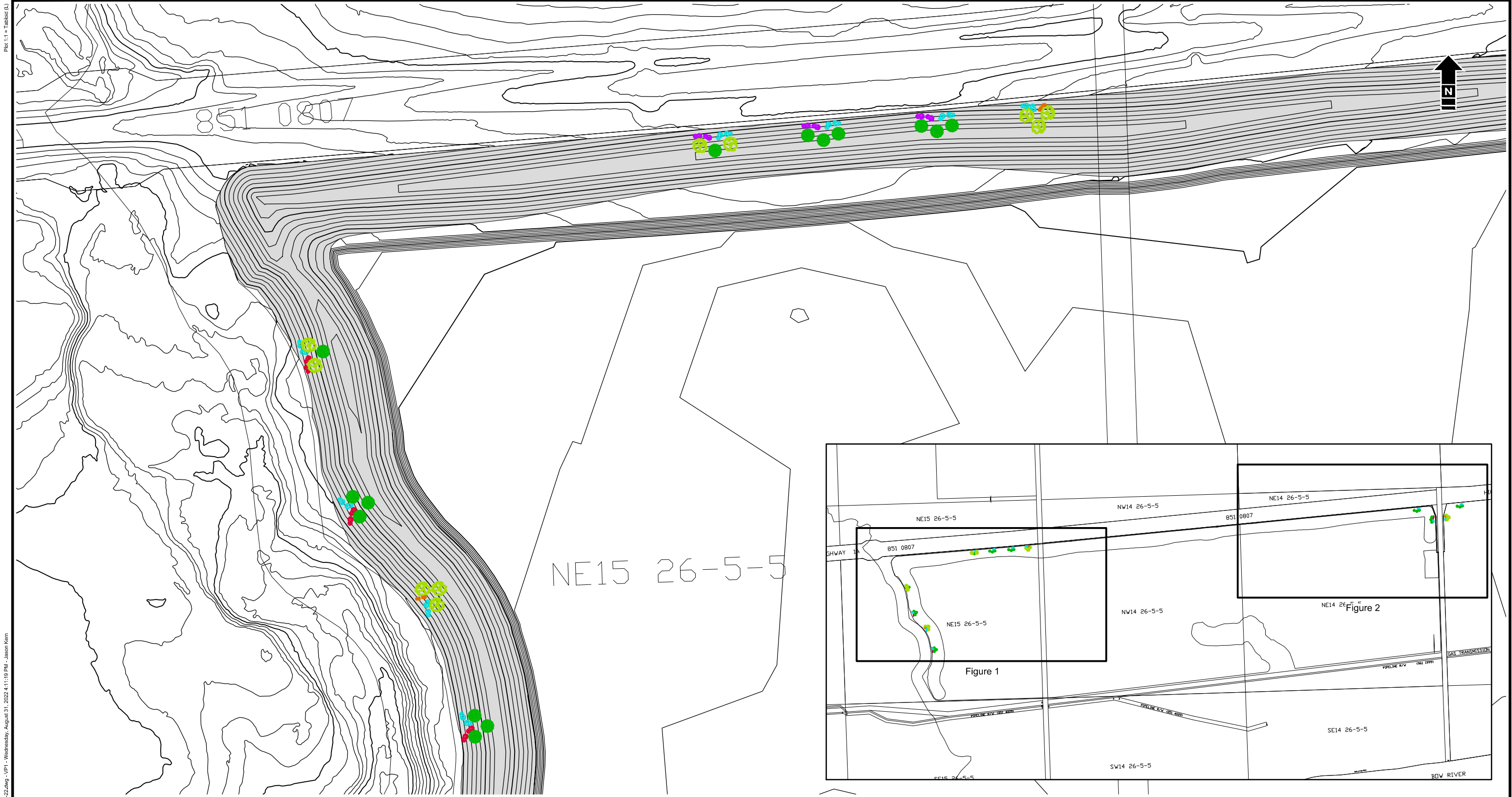
The vegetation surveys conducted as part of the Biophysical Impact Assessment in June and July 2018 indicated four noxious weed species within the project area (Matrix 2018). They included common toadflax (*Linaria vulgaris*), creeping/Canada thistle (*Cirsium arvense*), perennial sow-thistle (*Sonchus arvensis*), and hound's tongue (*Cynoglossum officinale*). Other non-native and agronomic species observed include smooth brome (*Bromus inermis*), timothy (*Phleum pratense*), dandelion (*Taraxacum officinale*), goat's-beard (*Tragopogon dubius*) and clover (*Trifolium* spp.). The berm and planting areas will be monitored for invasive species and appropriate weed control will be implemented as required.

4 CLOSURE

BURNCO will further refine the planting plan for the proposed visual screen and determine an appropriate maintenance plan to ensure the vegetation component of the visual screen remains effective during the operational life of the project.

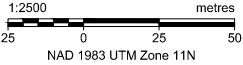
5 REFERENCES

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- Government of Canada. 2019. *Plant Hardiness Zones of Canada*. Accessed August 2019. 2019. <https://open.canada.ca/en/apps/plant-hardiness-zones-canada>
- Matrix Solutions Inc. (Matrix). 2018. *Biophysical Impact Assessment, BURSCO West Cochrane Gravel Pit, NE 15-26-05W5M to SE-17-0226-04W5M*. Version 0.1. Draft prepared for BURSCO Rock Products Ltd. Calgary, Alberta. December 2018.
- Rocky View County. 2019. *Land Use Bylaw C-4841-97*. Adopted by the County Council on September 29, 1998. Updated March 26, 2019. March 2019.
- Williamson D. 2009. *Tree and Shrub Gardening for Alberta*. Lone Pine Publishing. Edmonton, Alberta. 2009.



Vegetation Legend						
Common Name	Scientific Name	Canopy Spread (m)	Height (m)	Spacing (m)	Total Number	Symbol
Trees						
Aspen	<i>Populus tremuloides</i>	3-6	9-12	3	10	
White Spruce	<i>Picea glauca</i>	3-6	15-24	3	14	
Shrubs						
Buck Brush	<i>Symphoricarpus occidentalis</i>	1-2	1	1	6	
Red Osier Dogwood	<i>Cornus stolonifera</i>	2-3	2-3	1	6	
Saskatoon	<i>Amelanchier alnifolia</i>	2-3	3-5	1	14	
Wolf Willow	<i>Elaeagnus commutata</i>	1-2	2-3	1	4	

Reference:

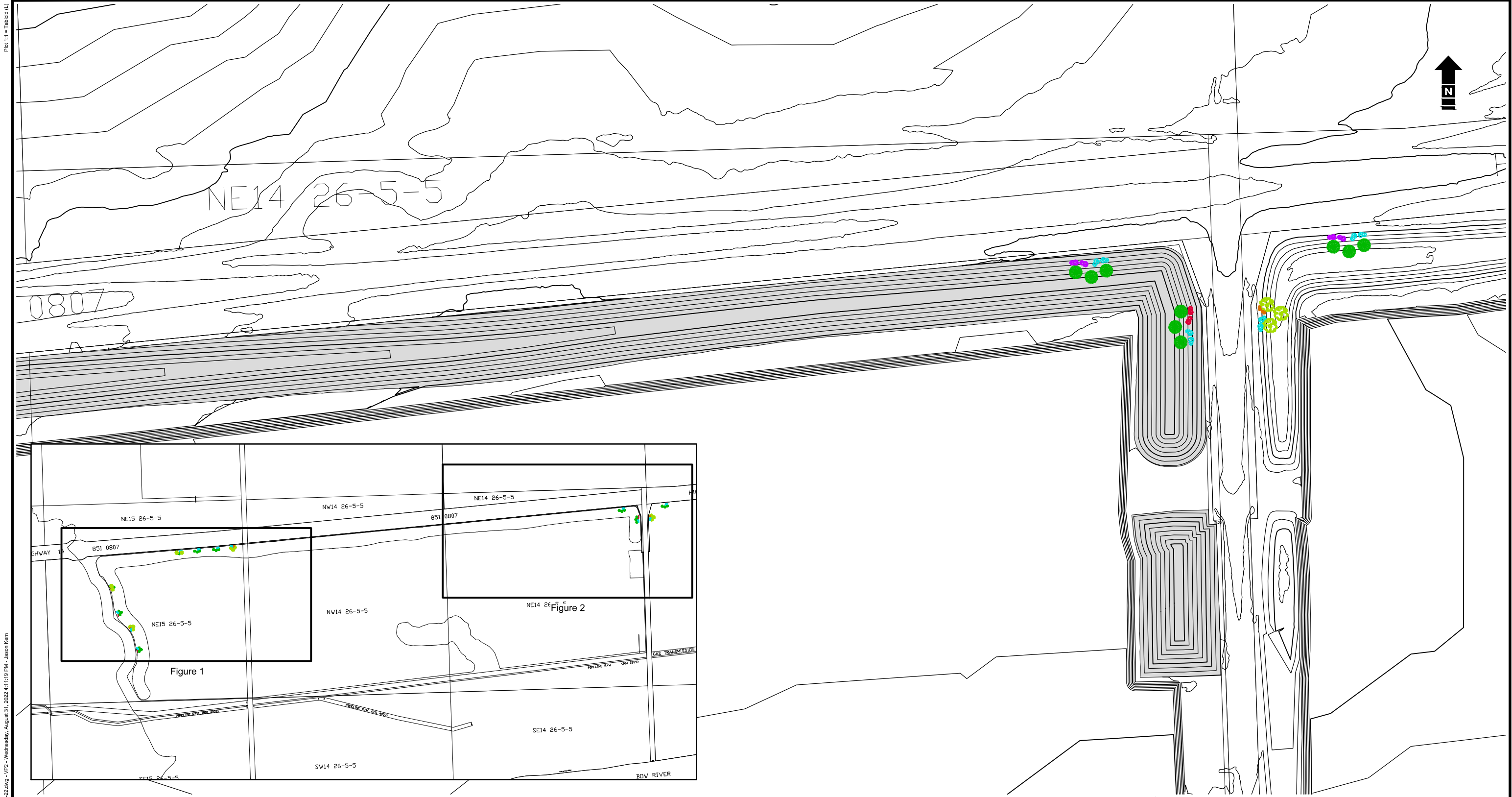


Burnco Rock Products Ltd.
West Cochrane Gravel Pit

Vegetation Plan

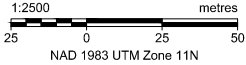
Date:	August 2022	Project:	26388-PP-22	Submitter:	S. Brauer	Reviewer:	K. Ostermann
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Vegetation Legend						
Common Name	Scientific Name	Canopy Spread (m)	Height (m)	Spacing (m)	Total Number	Symbol
Trees						
Aspen	<i>Populus tremuloides</i>	3-6	9-12	3	3	
White Spruce	<i>Picea glauca</i>	3-6	15-24	3	9	
Shrubs						
Buck Brush	<i>Symphoricarpus occidentalis</i>	1-2	1	1	4	
Red Osier Dogwood	<i>Cornus stolonifera</i>	2-3	2-3	1	2	
Saskatoon	<i>Amelanchier alnifolia</i>	2-3	3-5	1	8	
Wolf Willow	<i>Elaeagnus commutata</i>	1-2	2-3	1	2	

Reference:



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West Cochrane Gravel Pit

Vegetation Plan

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