May 27, 2026 Project No. CA0037598.0394

CBM Aggregates
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CBM CALEDON PIT AND QUARRY BELOW WATER, POPA 2022-006 AND RZ 2022-0010, ADDENDUM TO BLAST IMPACT ASSESSMENT REPORT.

In response to comments from the Caledon Aggregate Review Team (CAART) in April 2026, the following is an addendum letter to the Blast Impact Assessment Report prepared by WSP (July 2023). It should be noted that this addendum letter and the revisions outlined below do not change the outcomes of the blast impact assessment and the findings and recommendations of the July 2023 report remain valid.

The following addendum is made to the **Blast Impact Assessment Report**:

Section 1.1, Introduction - General, page 6, paragraph 2: *The overall goal of the final rehabilitation plan is to create a landform that represents an ecological and visual enhancement and provides future opportunities for conservation, recreational, tourism and water management. Overall, the progressive and final rehabilitation plan for the Site includes the creation of lakes, vegetated shorelines, hectares of islands, wetlands, upland forested areas, riparian plantings adjacent to the existing watercourse, nodal shrub and tree planting on upland areas, grassland meadows and specialized habitat features for bats and turtles. The proposed rehabilitation has been designed to use of all of the on-site topsoil and overburden and does not require the importation of additional soils.*

This is a duplicate of the preceding paragraph and is removed.

Section 4.1, Impact Identifications - **Ground and Air Vibrations, page 11:**

Bullet Point 1:

The bedrock in the area immediately adjacent to the explosive product is crushed. As the energy from the detonation radiates outward from the borehole, the bedrock between the borehole and quarried face becomes fragmented and is displaced while the bedrock behind the borehole is fractured.

Is revised to read:

The detonation of explosives within a borehole results in the development of very high gas and shock pressures. This causes crushing to occur around a blasthole wall when the pressure in the detonation front exceeds the

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dynamic compressive strength of the rock. The out-going strain pulse generated by the high-pressure detonation front disperses and loses energy rapidly. Crushing will cease when the strain level in the pulse drops below the elastic limit of the rock. This is usually very close to the blasthole wall (approximately 1 borehole radius).

The rock that forms the wall of the blasthole outside the crushed zone is subjected to very sudden compression due to the dispersing strain pulse. This compression (i.e. relative radial motion) results in tangential stresses which can cause cracks to develop radially from the blasthole. A zone of very high pressure and temperature gases occupies the blasthole behind the detonation front. These gases penetrate the crushed zone around the blasthole and flow into the radial or naturally occurring cracks. The gas pressure tends to wedge open the cracks and cause them to extend.

The radial cracks initially develop in all directions. permanently distorts the rock to several borehole diameters (5 - 25 hole diameters, depending on the rock type, prevalence of joint sets, etc.).

The intensity of this stress wave decays quickly so that there is no further permanent deformation of the rock mass. The remaining energy from the detonation travels through the unbroken material in the form of a pressure wave or shock front which, although it causes no plastic deformation of the rock mass, is transmitted in the form of vibrations. This energy attenuates rapidly from the blast site due to geometric spreading and natural damping and results in an attenuation of the vibrations with distance.

Section 4.1, Impact Identifications - Ground and Air Vibrations, page 11, paragraph 2: *Air vibrations, or airblast is a pressure wave travelling through the air produced by the direct action of the explosive on air or the indirect action of a confining material subjected to explosive loading. Air vibrations from surface blasting operations consist primarily of acoustic energy below 20 Hz, where human hearing is less acute (Siskind et al., 1980), while noise is that portion of the spectrum of the air vibration lying within the audible range from 20 to 20,000 Hz. It is the lower frequency component (below 20 Hz) of air vibration, that which is less audible, that is of interest as it is often the source of secondary rattling and shaking within a structure. Air vibration is measured in units of Peak Sound Pressure Level (PSPL). For the purposes of this report PSPL is measured as decibels in the Linear or Unweighted mode (dBL). This differs from noise (above 20 Hz) which is measured in dBA.*

Is revised to read:

Air overpressure is a pressure wave generated by a blast. There are three main causes of air overpressure are 1) direct rock displacement at the blast when there is insufficient burden is in front of the face, 2) vibrating ground some distance from the blast., and 3) venting at the hole caused by blowout from the rock face or at the top of the hole where there is inadequate stemming (Dowding 1985). Where there is insufficient confinement from the rock mass, there can be a release of high-pressure gases and the development of a pressure pulse. The air overpressure consists of audible "sounds" (> 20 Hz) and inaudible frequencies (< 20Hz). Air overpressure can cause residential structures to vibrate and make internal items rattle. Air vibration is measured in units of Peak Sound Pressure Level (PSPL). For the purposes of this report PSPL is measured as decibels in the Linear or Unweighted mode (dBL). This differs from noise (above 20 Hz) which is measured in dBA.

Humans can perceive air overpressure well below damage thresholds. While people can perceive air overpressure levels below 90 dBL (0.63 pa), levels would have to be as high as 148 dBL (500 pa) to have the potential to crack windows (which is the first damage noted from air overpressure).

Section 4.1, Impact Identifications - Ground and Air Vibrations, page 12, Figure 2: *POR080 at 1550 Charleston Sideroad has been added to Figure 2 and is attached to this addendum.*

Section 4.2, Flyrock, page 13, paragraph 1: *The movement of rock from a blast is a predictable and necessary component of any blast. The distinction must be made between 'flyrock' being the normal projection of broken rock from a blast and 'wild flyrock', the unplanned and unexpected violent projection of rock fragments at a great velocity from a blast. Wild flyrock can be considered as the ejection of rock fragments through the air or along the ground beyond the blast zone. It occurs when the explosive within the blasthole is either excessive or poorly confined and high-pressure gas propels broken rock fragments. Flyrock generally results from a mismatch between the available energy and the work to be done. This results from either too much energy for a fixed burden (rock mass in front of the explosive charge) or insufficient burden for a fixed charge. The movement of rock from a blast is a predictable and necessary component of that blast. As such, it requires that every blast have an exclusion zone established within which no persons or property which may be harmed are permitted. Numerous researchers have studied the mechanisms by which flyrock occurs, developed models to estimate the maximum range for a given site and blast design and provided suitable safety factors. Published empirical models have been employed to estimate the maximum flyrock for the proposed Quarry.*

Is revised to read:

Flyrock refers to rock that has been ejected outside the controlled blast area or blast zone. It occurs when the explosive within the blasthole is either excessive or poorly confined and high-pressure gas propels broken rock fragments. Flyrock generally results from a mismatch between the available energy and the work to be done. This results from either too much energy for a fixed burden (rock mass in front of the explosive charge) or insufficient burden for a fixed charge. The movement of rock from a blast is a predictable and necessary component of that blast. As such, it requires that every blast have an exclusion zone established within which no persons or property which may be harmed are permitted. Numerous researchers have studied the mechanisms by which flyrock occurs, developed models to estimate the maximum range for a given site and blast design and provided suitable safety factors. Published empirical models have been employed to estimate the maximum flyrock for the proposed Quarry.

Section 5.3, Vibration Attenuation Models – Air Vibration Model, page 19, paragraph 2: *The blasting operation will progress toward the extraction perimeter with the nearest sensitive receptors located behind the blast face.*

Is revised to read:

The blasting operation will progress toward the extraction perimeter with the nearest sensitive receptors located behind the blast face. While this is intended to reduce the overpressure level, there may be situations where quarry faces will not be oriented this way (e.g., open corners). In such cases, there may be an increase in overpressure and measures may be required to maintain compliance with the MECP guidelines. Measures include a reduction in maximum explosives charge weight per delay and appropriate changes in blast design parameters such as the burden and the stemming height.

Section 6.2, Flyrock Range Models, page 21: *In the equation for*

Rifling

$$R_1 = \frac{k^2}{g}\left(\frac{\sqrt{m}}{SH}\right)^{2.6} \sin 2\theta_{DH}$$

DH should be replaced with LA as follows:

Rifling

$$R_1 = \frac{k^2}{g}\left(\frac{\sqrt{m}}{SH}\right)^{2.6} \sin 2\theta_{LA}$$

where

θ_{LA}= launch angle from horizontal

Section 7.1.2.1, Air Vibration Prediction – In Front of the Blast, page 26, paragraph 1: *Assuming a single hole per delay, the MECP guideline limit of 128 dBL may be complied with for all blasting beyond the following estimated standoff distances from adjacent receptor residences:*

- *400 m - for a 12 m bench*
- *500 m - for a 20 m bench*
- *530 m - for a 25 m bench*

Is revised to read:

Assuming a single hole per delay, the MECP guideline limit of 128 dBL may be complied with for all blasting beyond the following estimated standoff distances from adjacent receptor residences:

- *400 m - for a 12 m bench*
- *500 m - for a 20 m bench*
- *530 m - for a 25 m bench*

The estimated standoff distances will be dependent on the weather conditions at the time of the blast.

Section 7.1.2.1, Air Vibration Prediction – In Front of the Blast, page 25, notes below Table 3:

1) Distance between the blast and the sensitive receptor.
2) Assuming the attenuation model proposed above.

Is revised to read:

1) Distance between the blast and the sensitive receptor.
2) Assuming the attenuation model proposed above.
3) Recorded levels will be dependent on the weather conditions.

Section 7.1.2.1, Air Vibration Prediction – Behind of the Blast, page 27, paragraph 1: *Assuming a single hole per delay, the MECP guideline limit of 128 dBL may be complied with for all blasting beyond the following estimated standoff distances from adjacent receptor residences:*

- *97 m - for a 12 m bench*
- *118 m - for a 20 m bench*
- *128 m - for a 25 m bench*

Is revised to read:

Assuming a single hole per delay, the MECP guideline limit of 128 dBL may be complied with for all blasting beyond the following estimated standoff distances from adjacent receptor residences:

- *97 m - for a 12 m bench*
- *118 m - for a 20 m bench*
- *128 m - for a 25 m bench*

The estimated standoff distances will be dependent on the weather conditions at the time of the blast.

Section 7.1.2.1, Air Vibration Prediction – Behind the Blast, page 27, notes below Table 4:

1) Distance between the blast and the sensitive receptor.
2) Assuming the attenuation model proposed above.

Is revised to read:

1) Distance between the blast and the sensitive receptor.
2) Assuming the attenuation model proposed above.
3) Recorded levels will be dependent on the weather conditions.

Section 7.1.3, Vibration Prediction Summary, page 28, Table 5:

Table 5: Summary of Maximum Explosive Loads to Comply with NPC-119

Distance [1] (m)	Max. Explosive Charge Weight (kg) [2]		
	PPV = 12.5 mm/s SD = 43.50 m/kg1/2	PSPLfront = 128 dBL SD = 86.42 m/kg1/3	PSPLbehind = 128 dBL SD = 86.42 m/kg1/3
150	12	5	389
200	21	12	922
300	48	42	3,111
400	85	99	7,375
500	132	194	14,404

Distance [1] (m)	Max. Explosive Charge Weight (kg) [2]		
	PPV = 12.5 mm/s SD = 43.50 m/kg1/2	PSPLfront = 128 dBL SD = 86.42 m/kg1/3	PSPLbehind = 128 dBL SD = 86.42 m/kg1/3
600	190	335	24,890
700	259	531	39,524
800	338	793	58,998
900	428	1,129	84,002
1,000	528	1,549	115,230

1) Distance between the blast and the sensitive receptor.

2) Assuming the attenuation models proposed above.

Table 5 has been revised to include a row for the Maximum Explosive Load to comply with NPC-119 at 100 m between the limit of extraction and the nearest POR. In the heading for Column 4, the SD has been revised to 20.55 m/kg$^{1/3}$:

Table 5: Summary of Maximum Explosive Loads to Comply with NPC-119

Distance [1] (m)	Max. Explosive Charge Weight (kg) [2]		
	PPV = 12.5 mm/s SD = 43.50 m/kg$^{1/2}$	PSPL$_{front}$ = 128 dBL SD = 86.42 m/kg$^{1/3}$	PSPL$_{behind}$ = 128 dBL SD = 20.55 m/kg$^{1/3}$
100	5	2	115
150	12	5	389
200	21	12	922
300	48	42	3,111
400	85	99	7,375
500	132	194	14,404
600	190	335	24,890
700	259	531	39,524
800	338	793	58,998
900	428	1,129	84,002
1,000	528	1,549	115,230

1) Distance between the blast and the sensitive receptor.

2) Assuming the attenuation models proposed above.

Section 7.8, Flyrock Estimates, page 33, Table 7:

Table 7: Estimated Maximum Flyrock Range for a Range of blast Designs for the Proposed Caledon Quarry

Blasthole Diameter (mm)	Burden (m)	Stemming (m)	Maximum Throw (m) [1]		Minimum [2] [3] Separation (m)
			Face Burst	Cratering	
102	3.3 [4]	2.1 [5]	36	115	330
102	3.3 [4]	2.5	36	73	146
102	3.3 [4]	3.0	36	46	92
102	3.3 [4]	3.5	36	31	62

The minimum separation in the first row has been revised to read 230 m:

Table 7: Estimated Maximum Flyrock Range for a Range of Blast Designs for the Proposed Caledon Quarry

Blasthole Diameter (mm)	Burden (m)	Stemming (m)	Maximum Throw (m) [1]		Minimum [2] [3] Separation (m)
			Face Burst	Cratering	
102	3.3 [4]	2.1 [5]	36	115	230
102	3.3 [4]	2.5	36	73	146
102	3.3 [4]	3.0	36	46	92
102	3.3 [4]	3.5	36	31	62

Section 8.0, Technical Recommendations, page 34, last bullet: *The first five regular production blasts in the Main Area of the Licence shall be monitored at a minimum of five locations at varying distances from each blast to better define the ground and air vibration attenuation characteristics at the nearest receptors to assist with future blast designs. This shall entail establishing monitoring stations between the blast site and neighbouring receptors (residences).*

Is revised to read:

The first five regular production blasts in the Main Area of the Licence shall be monitored at a minimum of five locations at varying distances from each blast to better define the ground and air vibration attenuation characteristics at the nearest receptors to assist with future blast designs. This shall entail establishing monitoring stations between the blast site and neighbouring receptors (residences). As sinking blast and ramp development

blasts tend to be more heavily confined, they often induce higher vibration levels than typical production blasts. Sinking blasts and ramp development blasts should be monitored but used to develop a separate model type.

Appendix B, Glossary of Terms:

Flyrock - Rocks propelled from the blast area by the force of an explosion.

Is revised to read:

Flyrock - Uncontrolled and unintended rock movement beyond the blast area.

The following glossary terms have been added:

Airborne Overpressure - The airborne shockwave or acoustic transient generated by an explosion.

Blast Area – This refers to an area where controlled blast effects, such as controlled and intended rock movement, take place.

Deck - A portion of a blast hole loaded with explosives that are separated from the main charge by stemming. Commonly, a deck can refer to inert material (stemming deck) or explosive material (explosive deck).

Appendix D, Nearest Receptors to the Proposed Caledon Pit / Quarry: *The receptor distance for the Receptor ID/Receptor Name/Distance shown in the Table extract shown below.*

NEAREST RECEPTORS TO THE PROPOSED CALEDON PIT / QUARRY

Receptor ID	Receptor Name	Distance (m) [1)]
POR001	18147 Mississauga Rd.	260
POR002	18189 Mississauga Rd.	180
POR003	18205 Mississauga Rd.	160
POR004	18221 Mississauga Rd (Inside project boundary)	180
POR005	18234 Mississauga Rd	280
POR006	18309 Mississauga Rd.	190
POR007	833 Charleston Sideroad (Hwy 24)	470
POR008	18615 Mississauga Rd.	150
POR009	18627 Mississauga Rd.	160
POR010	18682 Mississauga Rd.	320
POR011	18785 Mississauga Rd.	220

Receptor ID	Receptor Name	Distance (m) [1)]
POR012	18837 Mississauga Rd.	260
POR013	18906 Main St. (Hwy 136)	460
POR014	18942 Main St (Cultural Heritage)	580
POR015	18842 Main St	240
POR016	18810 Main St	240
POR017	18796 Main St	200
POR018	18775 Main St	320
POR019	18772 Main St (Owned by CBM) [2)]	100
POR020	18719 Main St	150
POR021	18659 Main St	150
POR022	18473 Main St	150
POR023	18471 Main St	150
POR024	1700 Charleston Sideroad (Hwy 24)	150
POR025	Cultural Heritage (remaining silo)	310
POR026	1626 Charleston Sideroad (Hwy 24)	150
POR027	1540 Charleston Sideroad (Hwy 24)	220
POR028	1522 Charleston Sideroad (Hwy 24)	150
POR029	1531 Charleston Sideroad (Hwy 24)	180
POR030	1529 Charleston Sideroad (Hwy 24)	150
POR031	1521 Charleston Sideroad (Hwy 24) [3)] (gas station not sensitive)	100
POR032	18217 Cataract Rd.	150
POR033	18201 Cataract Rd.	170
POR034	18198 Cataract Rd.	150

Receptor ID	Receptor Name	Distance (m) [1)]
POR035	18182 Cataract Rd.	160
POR036	18164 Cataract Rd.	160
POR037	18148 Cataract Rd.	190
POR038	18140 Cataract Rd.	240
POR039	18130 Cataract Rd.	260
POR040	18137 Cataract Rd.	290
POR041	18120 Cataract Rd.	290
POR042	10 Deagle Lane	210
POR043	38 Williams St.	280
POR044	42 Williams St.	290
POR045	48 William St.	260
POR046	1498 Cataract Rd.	380
POR047	33 William St.	340
POR048	47 William St.	320
POR049	61 William St.	330
POR050	71 William St.	340
POR051	77 William St.	340
POR052	89 William St.	330
POR053	26 Albert St.	340
POR054	1392 Cataract Rd.	380
POR055	18051 Cataract Rd.	440
POR056	1501 Cataract Rd.	440
POR057	1460 Cataract Rd.	400

Receptor ID	Receptor Name	Distance (m) [1)]
POR058	1446 Cataract Rd.	390
POR059	1463 Cataract Rd.	450
POR060	1453 Cataract Rd.	450
POR061	1437 Cataract Rd.	460
POR062	1434 Cataract Rd.	390
POR063	1432 Cataract Rd.	390
POR064	1404 Cataract Rd.	400
POR065	1425 Cataract Rd.	470
POR066	1411 Cataract Rd.	450
POR067	1391 Cataract Rd.	450
POR068	1375 Cataract Rd.	410
POR069	1369 Cataract Rd.	400
POR070	1357 Cataract Rd.	380
POR071	1341 Cataract Rd.	360
POR072	1327 Cataract Rd.	320
POR073	1342 Cataract Rd.	290
POR074	1311 Cataract Rd.	300
POR075	1297 Cataract Rd.	290
POR076	1275 Cataract Rd.	280
POR077	1195 Cataract Rd.	330
POR078	18667 Mississauga Rd. (heritage structure proposed relocation)	135 [4)]
POR079	18501 Mississauga Rd. (heritage structure proposed relocation)	110 [4)]

1) *Separation distance to the nearest point of extraction.*
2) *POR019 is owned by CBM to be used as an 'office and quality control lab' for the proposed CBM Caledon Pit / Quarry*
3) *POR 031 is a retail structure and is not considered a sensitive receptor.*
4) *The distances from the designed extraction boundary to the heritage structure POR assumed location after it has been moved.*

The table title has been changed to" Receptors within 500 m of the License Boundary" to align with that within the Site Plan. However, comment 1) indicates that the distance is the separation to the nearest point of extraction. POR019 will not be the 'office and quality control lab' and has been removed from comment 2). Charleston Sideroad has been included as POR080. The distances from the Extraction Boundary to each of the PORs has been re-estimated to the nearest metre. The table is revised to read:

RECEPTORS WITHIN 500 M OF THE LICENSE BOUNDARY

Receptor ID	Receptor Name	Distance (m) [1)]
POR001	18147 Mississauga Rd.	267
POR002	18189 Mississauga Rd.	188
POR003	18205 Mississauga Rd.	159
POR004	18221 Mississauga Rd (Inside project boundary)	150
POR005	18234 Mississauga Rd	255
POR006	18309 Mississauga Rd.	150
POR007	833 Charleston Sideroad (Hwy 24)	480
POR008	18615 Mississauga Rd.	150
POR009	18627 Mississauga Rd.	150
POR010	18682 Mississauga Rd.	307
POR011	18785 Mississauga Rd.	199
POR012	18837 Mississauga Rd.	257
POR013	18906 Main St. (Hwy 136)	437
POR014	18942 Main St (Cultural Heritage)	579
POR015	18842 Main St	235
POR016	18810 Main St	232

Receptor ID	Receptor Name	Distance (m) [1)]
POR017	18796 Main St	198
POR018	18775 Main St	218
POR019	18772 Main St (Controlled by CBM) [2)]	104
POR020	18719 Main St	150
POR021	18659 Main St	151
POR022	18473 Main St	150
POR023	18471 Main St	150
POR024	1700 Charleston Sideroad (Hwy 24)	150
POR025	Cultural Heritage (remaining silo)	308
POR026	1626 Charleston Sideroad (Hwy 24)	150
POR027	1540 Charleston Sideroad (Hwy 24)	207
POR028	1522 Charleston Sideroad (Hwy 24)	150
POR029	1531 Charleston Sideroad (Hwy 24)	175
POR030	1529 Charleston Sideroad (Hwy 24)	150
POR031	1521 Charleston Sideroad (Hwy 24) [3)] (gas station not sensitive)	103
POR032	18217 Cataract Rd.	150
POR033	18201 Cataract Rd.	168
POR034	18198 Cataract Rd.	150
POR035	18182 Cataract Rd.	154
POR036	18164 Cataract Rd.	161
POR037	18148 Cataract Rd.	193
POR038	18140 Cataract Rd.	236
POR039	18130 Cataract Rd.	260

Receptor ID	Receptor Name	Distance (m) [1)]
POR040	18137 Cataract Rd.	296
POR041	18120 Cataract Rd.	286
POR042	10 Deagle Lane	208
POR043	38 Williams St.	280
POR044	42 Williams St.	288
POR045	48 William St.	257
POR046	1498 Cataract Rd.	381
POR047	33 William St.	336
POR048	47 William St.	320
POR049	61 William St.	334
POR050	71 William St.	338
POR051	77 William St.	338
POR052	89 William St.	337
POR053	26 Albert St.	339
POR054	1392 Cataract Rd.	381
POR055	18051 Cataract Rd.	439
POR056	1501 Cataract Rd.	436
POR057	1460 Cataract Rd.	395
POR058	1446 Cataract Rd.	386
POR059	1463 Cataract Rd.	458
POR060	1453 Cataract Rd.	452
POR061	1437 Cataract Rd.	460
POR062	1434 Cataract Rd.	389

Receptor ID	Receptor Name	Distance (m) [1)]
POR063	1432 Cataract Rd.	394
POR064	1404 Cataract Rd.	400
POR065	1425 Cataract Rd.	480
POR066	1411 Cataract Rd.	451
POR067	1391 Cataract Rd.	451
POR068	1375 Cataract Rd.	438
POR069	1369 Cataract Rd.	424
POR070	1357 Cataract Rd.	407
POR071	1341 Cataract Rd.	385
POR072	1327 Cataract Rd.	347
POR073	1342 Cataract Rd.	318
POR074	1311 Cataract Rd.	335
POR075	1297 Cataract Rd.	322
POR076	1275 Cataract Rd.	320
POR077	1195 Cataract Rd.	366
POR078	18667 Mississauga Rd. (heritage structure proposed relocation)	135 [4)]
POR079	18501 Mississauga Rd. (heritage structure proposed relocation)	110 [4)]
POR080	1550 Charleston Sideroad	150

1) *Separation distance to the nearest point of extraction.*
2) *POR019 is controlled by CBM.*
3) *POR 031 is a retail structure and is not considered a sensitive receptor.*
4) *The distances from the designed extraction boundary to the heritage structure POR assumed location after it has been moved.*

Appendix E, Enbridge Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard: *Enbridge Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard, ST-1E-30A8-8E30.V1.1.1, 2021-09-29*

Is replaced by the following, which is attached to this Addendum:

Enbridge Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard, ST-1E-30A8-8E30.1.2.1, 2024-01-31

Aggregate Resources Act Site Plan: WSP blasting recommendations are included on the proposed CBM Caledon Pit / Quarry Aggregate Resources Act Site Plans dated May 2026. Based on this addendum, WSP recommends the following updates be made to the Aggregate Resources Act Site Plans:

a) Blasting recommendation O.2.n on drawing 3 of 5 of the Site Plan shall be revised to read: “The first five regular production blasts in the Main Area of the Licence shall be monitored at a minimum of five locations at varying distances from each blast to better define the ground and air vibration attenuation characteristics at the nearest receptors to assist with future blast designs. This shall entail establishing monitoring stations between the blast site and neighbouring receptors (residences).

   As sinking blast and ramp development blasts tend to be more heavily confined, they often induce higher vibration levels than typical production blasts. Sinking blasts and ramp development blasts shall be monitored but used to develop a separate model type.”

b) Blasting recommendation O.2.p on drawing 3 of 5 of the Site Plan shall be revised to read: "The Licensee shall take all reasonable measures to prevent fly rock from leaving the site during blasting if a sensitive receptor is located within 500 metres of the boundary of the site. All blasts will be located and designed to mitigate flyrock from leaving the Site"

c) Table 3 on drawing 2 of 5 of the Site Plan shall be revised to read:

Table 3: Receptors Within 500 m of Licence Boundaries

Receptor	Address	Distance [1)]	Receptor	Address	Distance [1)]
POR001	18147 Mississauga Rd.	267	POR040	18137 Cataract Rd.	296
POR002	18189 Mississauga Rd.	188	POR041	18120 Cataract Rd.	286
POR003	18205 Mississauga Rd.	159	POR042	10 Deagle Lane	208
POR004	18221 Mississauga Rd	150	POR043	38 Williams St.	280
POR005	18234 Mississauga Rd	255	POR044	42 Williams St.	288
POR006	18309 Mississauga Rd.	150	POR045	48 William St.	257
POR007	833 Charleston Sideroad	480	POR046	1498 Cataract Rd.	381
POR008	18615 Mississauga Rd.	150	POR047	33 William St.	336

Receptor	Address	Distance [1)]	Receptor	Address	Distance [1)]
POR009	18627 Mississauga Rd.	150	POR048	47 William St.	320
POR010	18682 Mississauga Rd.	307	POR049	61 William St.	334
POR011	18785 Mississauga Rd.	199	POR050	71 William St.	338
POR012	18837 Mississauga Rd.	257	POR051	77 William St.	338
POR013	18906 Main St.	437	POR052	89 William St.	337
POR014	18942 Main St	579	POR053	26 Albert St.	339
POR015	18842 Main St	235	POR054	1392 Cataract Rd.	381
POR016	18810 Main St	232	POR055	18051 Cataract Rd.	439
POR017	18796 Main St	198	POR056	1501 Cataract Rd.	436
POR018	18775 Main St	218	POR057	1460 Cataract Rd.	395
POR019	18772 Main St	104	POR058	1446 Cataract Rd.	386
POR020	18719 Main St	150	POR059	1463 Cataract Rd.	458
POR021	18659 Main St	151	POR060	1453 Cataract Rd.	452
POR022	18473 Main St	150	POR061	1437 Cataract Rd.	460
POR023	18471 Main St	150	POR062	1434 Cataract Rd.	389
POR024	1700 Charleston Sideroad	150	POR063	1432 Cataract Rd.	394
POR025	PIN 142710181	308	POR064	1404 Cataract Rd.	400
POR026	1626 Charleston Sideroad	150	POR065	1425 Cataract Rd.	480
POR027	1540 Charleston Sideroad	207	POR066	1411 Cataract Rd.	451
POR028	1522 Charleston Sideroad	150	POR067	1391 Cataract Rd.	451
POR029	1531 Charleston Sideroad	175	POR068	1375 Cataract Rd.	438
POR030	1529 Charleston Sideroad	150	POR069	1369 Cataract Rd.	424
POR031	1521 Charleston Sideroad	103	POR070	1357 Cataract Rd.	407
POR032	18217 Cataract Rd.	150	POR071	1341 Cataract Rd.	385
POR033	18201 Cataract Rd.	168	POR072	1327 Cataract Rd.	347
POR034	18198 Cataract Rd.	150	POR073	1342 Cataract Rd.	318

Receptor	Address	Distance [1)]	Receptor	Address	Distance [1)]
POR035	18182 Cataract Rd.	154	POR074	1311 Cataract Rd.	335
POR036	18164 Cataract Rd.	161	POR075	1297 Cataract Rd.	322
POR037	18148 Cataract Rd.	193	POR076	1275 Cataract Rd.	320
POR038	18140 Cataract Rd.	236	POR077	1195 Cataract Rd.	366
POR039	18130 Cataract Rd.	260	POR080	1550 Charleston Sideroad	150

1) Distance from the receptor to the Limit of Extraction

This addendum letter in combination with the Blast Impact Assessment Report prepared by WSP (July 2023) represents the final Blast impact Assessment Report. As noted above, this addendum letter does not change the conclusions on whether there are impacts resulting from the blasting, and the findings and conclusions of the July 2023 report remain valid.

If you have any questions, please do not hesitate to contact the undersigned.

WSP Canada Inc.

Daniel Corkery
Principal Blasting Consultant

DC/SM/DE/jl

Attachments: *Figure 6, Blast Impact Assessment Report*

Enbridge Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard, ST-1E-30A8-8E30.1.2.1, 2024-01-31

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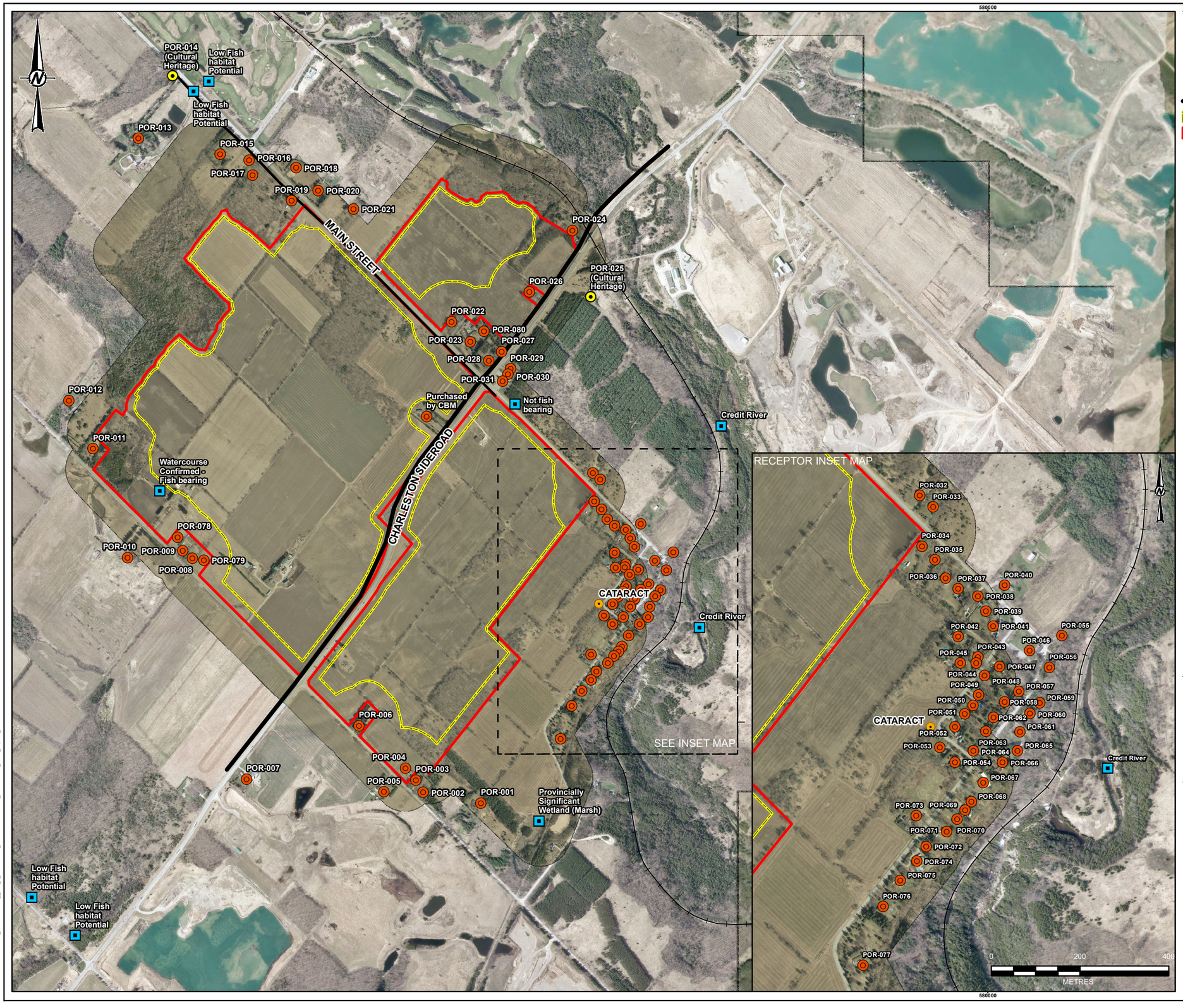


LEGEND

- TOWN/VILLAGE
- RESIDENTIAL RECEPTOR
- CULTURAL HERITAGE RECEPTOR
- FISH HABITAT RECEPTOR
- NATURAL GAS PIPELINE
- LIMIT OF EXTRACTION
- LICENCE BOUNDARY

0 500 1,000
1:15,000 METRES

REFERENCE(S)

1. BASE DATA MNRF LIO OBTAINED 2020
2. IMAGERY FIRSTBASE SOLUTIONS SPRING 2021, SPRING 2019 (15CM RESOLUTION) AND SOURCE: ESRI, VANTOR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. SITE TOPOGRAPHIC DATA - SPRING 2021, FIRSTBASE SOLUTIONS, 2021
4. LICENSE AND EXTRACTION LIMIT PROVIDED BY MHBC IN JULY 2023
5. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA).

PROJECT
CALEDON PIT / QUARRY

TITLE
IDENTIFIED VIBRATION SENSITIVE RECEPTORS

CONSULTANT

wsp

YYYY-MM-DD	2026-05-27
DESIGNED	CGE
PREPARED	CGE
REVIEWED	DC
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
CA0037598.7018	0034	1.0	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

PATH: S:\Clients\Votoranim_Cimentos\Long_Pur_5_Caledon\99_PRO_A\1912915\0440_PRO\0034_Blast_Impact_Assessment\1912915\0034-REN-0006.mxd PRINTED ON: 2026-05-27 AT: 11:24:21 AM

Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard

STANDARD

2024-01-31
ST-1E-30A8-8E30.1.2.1
Enbridge Inc.

Table of Contents

Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard

1 Introduction

This document is intended for anyone involved in planning or carrying out work in the vicinity of Enbridge Gas Distribution and Storage's (GDS) network. It summarizes the requirements to be followed and specifies the technical requirements aimed at protecting GDS's facilities, and by extension, ensuring public and worker safety.

Within this document, "third party" refers to an individual or organization that is not employed by, or performing work under, contract to GDS. These requirements are applicable to work done by individuals such as homeowners, landowners, other utility companies, excavators, constructors, and contractors.

Third parties must follow the regulations and legislation applicable to their work in addition to these requirements. It is understood that all legal provisions applicable to work carried out around natural gas facilities take precedence over this document.

The terms "gas lines", "gas pipelines", and "mains" used throughout this document apply equally to natural gas mains and service lines, as well as any other component of GDS's natural gas systems found on public or private land.

All work in the vicinity of gas facilities must adhere to the requirements set forth in this document. Work includes, but is not limited to, any ground disturbance in the vicinity of facilities or equipment crossing. Ground disturbance includes, but is not limited to, activities associated with excavation, directional drilling, blasting, piling, compaction, boring, ploughing, grading, backfilling, and hand digging.

A locate of the facilities must be requested at least five business days prior to beginning any work. Locates are required before ground disturbance takes place.

2 Terms and Definitions

The following is a list of terms found in this document and their definitions.

applicant: The owner of the proposed work.

blaster: The person or persons responsible for setting the charges and performing the blast.

blasting, surface: An operation involving the excavation of rock foundations for various types of structures, grade construction for highways or railroads, or canals (trenches) for water supply or collection purposes.

blasting, tunnel: Operations involving the piercing of below-ground (generally horizontal) opening in rock.

compaction: Any vibration-generating operation that will result in a potential increase of the density of soils or controlled backfill materials. The means to increase the density may be static or dynamic.

constructor: A person who undertakes a project for an owner and includes an owner who undertakes all or part of a project by himself or by more than one employer (as defined by Occupational Health & Safety Act).

contractor or excavator: Any individual, partnership, corporation, public agency, or other entity that intends to dig, bore, trench, grade, excavate, hammer into, or break ground with mechanical equipment or explosives in the vicinity of a gas pipeline or related facility.

EGI: Enbridge Gas Inc.

facility: Any Enbridge Gas Distribution, Transmission, Storage pipeline, main, service, regulator station or storage facility and its related components.

Gas Distribution and Storage (GDS): Enbridge Gas Distribution and Storage, Gazifère Inc., Niagara Gas Transmissions Limited, 2193914 Canada Limited.

ground disturbance: Any work, operation, or activity on or under the existing surface resulting in a disturbance or displacement of the soil or ground cover. Ground disturbance can include, but is not limited to: activities associated with excavation, directional drilling, blasting, piling, compaction, boring, ploughing, grading, backfilling, and hand digging.

hand dig: To excavate using either a shovel with a wooden or fiberglass handle, or using hydro vacuum excavation equipment. The use of picks, bars, stakes, or other earth piercing devices are not considered hand digging.

independent engineering consultant: A professional engineer who is registered with the provincial or state professional engineering association and a holder of a certificate of authorization (C of A).

locate service provider: Any entity that performs locates under the terms of a locate service agreement.

pile: Any vertical or slightly slanted structural member introduced or constructed in the soil in order to transmit loads and forces from the superstructure to the subsoil; the structural member can also be used as a component of a retaining wall system.

pile driving: The placement of piles carried out by gravity hammer, vibratory hammer, auger, pressing, screwing, or any combinations of the above methods.

positive identification: Visually locating (daylighting, exposing, digging test holes to determine) the location, depth, and size of a below-grade facility by using either vacuum excavating or hand digging. This includes elevation or alignment changes that can alter the depth or direction of the pipe (e.g., 45° and 90° elbows, fittings, plugs, weldolets, flanges, branch piping, known abandoned facilities, etc.).

pre-Engineering review: A process by which third parties can request a pre-engineering review for any potential conflict analysis.

professional engineer: An engineer registered and licensed with the provincial professional engineering association in the jurisdiction in which the engineer is practicing.

rural: All areas outside urban areas.

temporary support: The support of gas pipelines before or during an excavation to protect the pipeline from its own weight and to minimize deflection stresses.

third party: An individual or organization that is not employed by or performing work under contract to GDS (e.g., homeowners, other utility companies, contractor, excavators, constructors, etc.).

urban: An area with a population of at least 1,000 and a density of 400 or more people per square kilometer.

vital pipeline: A subset of pipelines that are critical to the safe and reliable operation of the natural gas system. Damages to vital mains could result in significant negative impact to public and worker safety or significant customer outages. This subset of mains consists of CER-regulated (Canada Energy Regulator) pipelines, transmission pipelines, and select distribution pipelines.

3 General Requirements

3.1 CER-Regulated Pipelines and Vital Pipelines

The CER regulates natural gas, oil, and commodity pipelines that extend beyond provincial, territorial, or national boundaries. All work in the prescribed area (within 30 m [100 ft] from each side of the CER-regulated pipeline) must be reviewed by the applicable CER-regulated operating company prior to commencing. This review is a regulatory requirement of the CER.

Mains are designated as vital pipelines by GDS. These include, but are not limited to, any pipeline NPS 16 or larger, transmission pipelines, CER-regulated pipelines, all pipelines operated by Storage and Transmission Operations (STO), and select distribution pipelines. The designation of a vital pipeline may change at the discretion of GDS. Vital Pipelines will be identified through locates. In these requirements, special considerations for CER-regulated pipelines and vital pipelines will be highlighted.

All work within 5 m (16 ft) from either side of lines operated by STO must be approved by GDS prior to commencing. For all other vital pipelines, all ground disturbance work within 3 m (10 ft) from either side of the vital pipeline must be approved by GDS prior to commencing. Approval by GDS may include specific conditions that third parties must follow. GDS may require representation on site for any ground disturbance work within the vicinity of vital pipelines and CER-regulated pipelines.

3.2 When Observation Is Required

A GDS representative is required to be on site to ensure the excavation or third-party activity is being safely completed near a pipeline when:

- Excavation with mechanical equipment will occur within 5 m (16 ft) of CER-regulated pipelines and all lines operated by STO.
- Excavation with mechanical equipment may take place within 3 m (10 ft) of vital pipelines and pipeline segments.
  Once the pipeline is exposed, mechanical excavation is then permitted up to 1 m (3.3 ft) from the pipeline.
- It is anticipated that blasting will take place within 30 m (100 ft) of any pipeline.
- Any other situations which requires observation, as deemed necessary by EGI.

3.3 Safe Excavation

Mechanical excavation is not permitted within 5 m (16 ft) of CER-regulated pipelines and 3 m (10 ft) of vital pipelines, unless verified visually. After the exact location of the main is verified visually, mechanical excavation is allowed up to 1.0 m (3.3 ft) from the pipeline. Within 1 m (3.3 ft) of the CER-regulated or vital pipeline, only hand digging or hydro-excavation is allowed.

Mechanical excavation may not begin within 3 m (10 ft) of the pipe until:

- The pipe has been exposed by the excavator, under the supervision of GDS, by hand at the point of crossing, or the pipeline company has located the pipe and confirmed that it is at least 0.6 m deeper than the proposed excavation.
- The excavation is parallel, or the pipe has been exposed by handto confirm the location of the pipe.

For all non-vital pipelines, mechanical excavation is not allowed within 1 m (3.3 ft) of the locate marks of the pipeline, until the exact location of the pipeline has been visually verified. The excavator must expose the pipeline by hand digging or hydro-excavation. Once the pipeline is exposed, mechanical excavation is then permitted up to 0.3 m (1 ft) from the pipeline. Within 0.3 m (1 ft) of any pipeline, only hand digging or hydro-excavation is permitted.

Only handheld compaction equipment may be used within 1 m (3.3 ft) of the sides or top of all gas pipelines. When ground conditions make hand excavation impractical (e.g., frost), the pipeline company may permit excavation to within 1 m (3.3 ft) of the pipeline if the pipeline company considers it safe to do so and directly supervises the excavation.

Spoil from excavation must not be piled on the pipeline or its easement.

3.4 Minimum Cover Requirements

Table 3-1: Minimum Cover Requirements on page 8 defines mains and services cover requirements. In all cases where the depth of cover requirements cannot be met, contact GDS to review depth of the cover requirements.

Table 3-1: Minimum Cover Requirements

Pipeline	Location	Minum Cover m (ft)
Mains	Under traveled surfaces (roads), road crossings	1.2 m (4 ft)
	Right-of-ways	1 m (3.3 ft)
	Highways	1.5 m (5 ft)
	Water crossings, and below drainage and irrigation ditches	1.2 m (4 ft)
Services	Private property	0.5 m (1.6 ft)
	Road crossings	0.9 m (2.9 ft)

3.5 Points of Thrust

Additional precautions may need to be taken when working in the vicinity of points of thrust. Points of thrust occur at pipeline fittings such as elbows (45° or 90°), end caps, weld tees, reducers, closed valves, and reduced port valves. If a point of thrust is identified through the locate process, GDS may require additional time to review the proposed work area. In the event that the excavation involves exposing a point of thrust or exposing an area near a point of thrust, GDS may provide written specific instructions that are to be followed. Failure to follow these instructions can result in significant harm to persons, property, or the environment.

3.6 Repair of Damaged Pipe and Pipe Coating

In all cases where the pipeline or the pipeline coating is damaged by construction activities, GDS must be contacted immediately and the excavation left open until GDS personnel have made the necessary repairs.

3.7 Encroachment

Permanent awnings and roof structures are prohibited above GDS's facilities within public rights-of-way or GDS's rights-of-way. GDS will not accept responsibility for any damages resulting from maintenance or operation of its facilities to encroaching structures within the public or GDS rights-of-way. Examples of encroaching structures include: bus shelters, street benches, and garbage bins.

GDS requires approval for all permanent structures to be built within 7 m (22.9 ft) of GDS's vital pipelines. This requirement is in place to allow GDS sufficient access and working space should an inspection or repair be needed.

3.8 Tree Planting

When planting trees, the gas pipeline in and near the area of excavation must be located to ensure enough clearance is maintained between the pipeline and the tree.

For all vital pipelines (including CER and transmission pipelines), trees or large shrubs must maintain a horizontal clearance between the edge of the root ball or open bottom container to the adjacent edge of the existing pipelines of not less than 3.0 m (10 ft), or as specified in any applicable easement agreement.

For all other pipelines, a minimum horizontal clearance of 1.2 m (4 ft) is recommended between the edge of the root ball or open bottom container and adjacent edge of the existing gas pipeline.

In cases where the recommended clearance cannot be achieved, GDS may specify the installation of a root deflector.

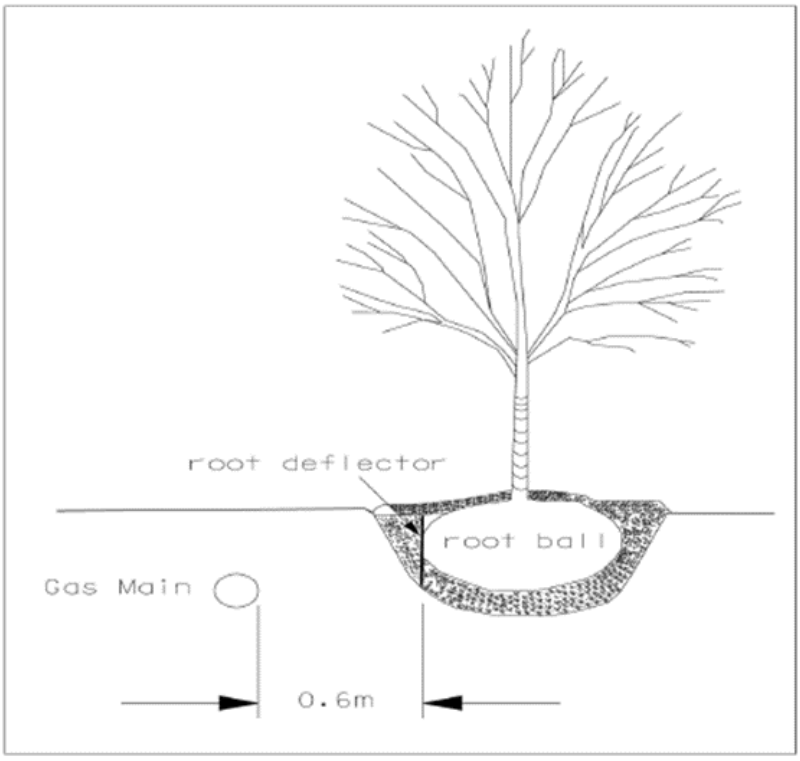
3.8.1 Root Deflectors

A root deflector is a physical barrier placed between tree roots and pipelines to prevent damage to the pipelines. A root deflector can be made from 1/4 in thick rigid plastic, fiberglass, or other non-degradable material. The root deflector is intended to prevent the root tips from attaching to the gas main.

Typically, root deflectors are straight barriers or encircle the tree. If installed as a straight barrier, the root deflector should be installed at a minimum 0.6 m (2 ft) from the pipeline on the tree-side of the pipeline. Also, it should extend parallel to the pipeline in both directions for 1.2 m (4 ft) measured from the centre of the tree trunk.

Root deflectors usually have a collar to keep the top of the deflector at ground level, and extend down to the bottom of the root-ball as shown in Figure 1: Example of a Root Deflector.

Figure 3-1: Example of a Root Deflector



3.9 Sewer and Drain Cleaning

Prior to sewer clearing activity using mechanical cutting or high pressure jetting equipment, the third party should call into Ontario One Call at 1-800-400-2255 for a

cross bore sewer safety inspection. An EGI employee or contractor will attempt to attend the site within two hours to complete the inspection.

4 Minimum Clearance from Other Structures

The following clearances must be maintained between the circumference of the gas pipeline and other underground structures:

Table 4-1: Minimum Clearance Between Gas Pipelines (Less than NPS 16) and Other Underground Structures

Direction	Minimum Clearance m (ft)
Horizontal	0.6 m (2 ft)
Vertical	0.3 m (1 ft)

Table 4-2: Minimum Clearance Between CER-regulated Pipelines and Vital Pipelines and Other Underground Structures

Direction	Minimum Clearance m (ft)
Horizontal	1 m (3.3 ft)
Vertical	0.6 m (2 ft)

Additional clearance or mitigation may be required for installations (such as transit systems or power transformers) that will introduce DC stray current interference or AC fault hazards.

Note

For all pipelines (including vital pipelines), when drilling parallel to the pipeline, a minimum horizontal clearance measured from the edge of the pipeline to the edge of the final bore hole of 1 m (3.3 ft) is required.

5 Pipeline Location Verification

5.1 Surface Road Work

Surface road work applies to ground disturbance on travelled roadways related to the removal of hard-surfaces only. For any ground disturbance work, locates must be obtained prior to commencing and the excavator must ensure accuracy of the locate by reviewing the locate paperwork with the physical locate markings. Surface road work can be completed without the requirement to positively identify EGI pipelines, provided no mechanical equipment will be used within 1 m (3.3 ft) horizontally of the located pipelines. If mechanical excavation is required within 1 m (3.3 ft) of the locate during any surface road work or work that will take place deeper than removal of the hard surface, the excavator must follow rules outlined in 5.2 Subgrade Road Work on page 11 for positive identification requirements.

5.2 Subgrade Road Work

Subgrade road work is any road work exceeding the depth required for removal of the hard surface that enters the sub-surface. The boundary area for the pipeline is the distance that is identified off the locate marks of the pipeline and applicable boundary areas are highlighted in Table 5-1: Boundary Areas on page 11.

Table 5-1: Boundary Areas

Pipeline	Boundary Area
Vital pipelines (≥ NPS 24)	3 m (10 ft)
Vital pipelines (< NPS 24)	2 m (6 ft)
Non-vital pipelines (all sizes)	1 m (3 ft)

Note

Work within the boundary areas must comply with the positive identification requirements set in Table 8-2: Pipeline Location Verification Requirements for Vital Pipelines on page 21 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21.

If these guidelines cannot be complied with, the excavator must submit a variance request work package. No variance will be provided for work within 1 m (3.3 ft) of any pipeline. The variance work package must include, at a minimum, the following information:

- Pre-Engineering design.
- Location of EGI facilities with respect to proposed excavation area (vertical and horizontal offsets).
- Location of proposed excavation area (vertical and horizontal offsets off permanent landmarks).
- Pipeline protection plan.

If a variance is requested, the excavator must also provide a physical barrier (e.g., silt fence), which would denote the boundary of the pipeline, where possible.

8.2 Drilling Parallel to Pipelines on page 20 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21 indicate GDS's minimum requirements for the verification of the pipeline location based on the nature of the work. The frequency and location of test holes may change at the discretion of GDS. Additional test holes may be required to sufficiently confirm the location of the pipeline (e.g., regulator stations).

Note

Non-mechanical equipment must be used when working within 1 m (3.3 ft) of any pipeline. If mechanical equipment is required for use around non-vitals, the pipeline must be positively identified using hand tools or hydro-excavation. Once the non-vital pipeline location has been visually identified through positive identification requirements listed in the 8.2 Drilling Parallel to Pipelines on page 20 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21, mechanical equipment can be used up to 0.3 m (1 ft) of the non-vital pipeline and 1 m (3.3 ft) of a vital pipeline.

When using hydro-vacuum excavation as an alternative to hand digging, see 9 Hydro-Excavation on page 24 for safe operating practices.

6 Operation of Heavy Equipment

6.1 General

Additional precautions are necessary when equipment in excess of the weights listed in Table 5: Vehicle Load Restrictions is operated in the vicinity of buried facilities where no pavement exists or where grading operations are taking place.

Table 6-1: Vehicle Load Restrictions

Pipe Material	Weight/Axle Maximum Allowable Load kg (lb)
Plastic	7,000 kg (15,400 lb)
Steel	10,000 kg (22,046 lb)

Prior to any crossing, the location of the gas main must first be staked out by a GDS representative.

The excavator is responsible for confirming the location and depth of the main. Test hole spacing must not exceed 50 m (160 ft).

6.2 Equipment Moving Across the Pipeline

Crossing locations for heavy equipment must be kept to a minimum.

The crossing locations must be determined by GDS after reviewing:

- The nature of the construction operation.
- The types and number of equipment involved.
- The line and depth of the existing gas main.

The use of equipment is contingent upon the review by GDS. Once the crossing locations have been established, heavy equipment is restricted to crossing at these locations only. It is the responsibility of the third party to inform their personnel of the crossing location restrictions.

Pipelines may require additional protection at crossing locations by constructing berms or installing steel plates over the pipeline.

Unless expressly allowed by the temporary crossing consent, equipment that crosses pipelines must be subject to the following conditions:

- The numbers of crossings back and forth must be kept to a minimum.
- Equipment must not remain stationary on top of a pipeline.
- Equipment must not cross with loaded side boom or other unbalanced loads.
- Equipment must cross perpendicular (not parallel) to the pipeline. The crossing angle for installations must be within 45° to 90° (with preference for as close to perpendicular as possible).
- Equipment must operate at slow speeds when crossing a pipeline in order to minimize loading impact.
- Existing cover over a pipeline must not be reduced; any loss of cover (e.g., due to rutting) must be promptly restored prior to crossing.
- Vibratory compaction equipment must not operate within 1.2 m (4 ft) of a pipeline.

6.3 Equipment Moving Along the Pipeline

Heavy equipment can be operated parallel to existing pipelines provided that a minimum offset of both:

- 1 m (3.3 ft) is maintained on pipeline sizes less than NPS 16.
- 2 m (6.6 ft) on pipeline sizes NPS 16 and larger, unless otherwise directed by GDS.

Only lightweight, rubber-tired equipment may be operated directly over the existing gas pipelines, unless a minimum pipe cover of twice the pipe diameter or 1 m (3.3 ft) (whichever is greater) can be verified. The use of all other equipment is contingent upon review and approval by GDS.

Unless expressly allowed by the temporary crossing consent, equipment moving along pipelines is subject to the following conditions:

- Equipment must operate at slow speeds when moving along a pipeline.
- Existing cover over a pipeline must not be reduced; any loss of cover (e.g., due to rutting) must be promptly restored prior to moving along the pipeline.
- Vibratory compaction equipment must not operate within 1.2 m (4 ft) of a pipeline.

Note

When crossing perpendicular to a pipeline that is smaller than NPS 16 (excluding vital pipelines), the vertical clearance outlined in Table 4-1: Minimum Clearance Between Gas Pipelines (Less than NPS 16) and Other Underground Structures on page 10 may be used as long as all positive identification requirements are also followed.

Note

When crossing perpendicular to a pipeline that is NPS 16 or larger, or crossing any CER-regulated pipelines or vital pipelines, a minimum vertical clearance of 1 m (3.3 ft) is required; 8 Horizontal Directional Drilling on page 19.

7 Support of Gas Pipelines

7.1 General

The support requirements specified in this section are the minimum requirements. GDS must be notified regarding the support of any gas main. GDS has complete discretion in the approval of any support system. Additionally, if a pipeline is to be exposed for longer than one month, approval must be sought from GDS and work must follow the requirements outlined in 3 General Requirements on page 6. Third parties must not depart from these support requirements unless a professional engineer working for or on behalf of the third party has designed an alternative method. Any alternative method must be comparable to these specifications and be, in the opinion of the professional engineer, consistent with good engineering practices. The alternative specification must be documented, approved by a professional engineer and provided to GDS for review prior to the commencement of work. The third party is responsible for the adequate support of the buried gas pipelines exposed during excavation according to this section.

Prior to any crossing, the location of the gas main must first be staked out by a GDS representative.

7.2 Support of Gas Pipelines Perpendicular to Excavation

Temporary support refers to the support of gas pipelines prior to or at the time of excavation to protect the pipeline from deflection due to its own weight while it is exposed. Temporary support must remain in place until the backfill material underneath the pipeline is compacted adequately to restore support of the pipeline.

Before trenching beneath a main or service, temporary support must be erected for pipelines if the unsupported span of pipe in the trench exceeds the length indicated in Table 7-1: Maximum Span without Support Beam on page 15.

Note

For pipelines larger than NPS 16, GDS must be contacted. Contact information can be found in the 12 Contact Information on page 31.

When temporary support is required, Table 7-2: Support Beam Sizes and Maximum Span Between Beam Supports on page 15 indicates the required beam for a given span. The beam must be a continuous length grade No. 1 Spruce-Pine-Fir (S-P-F) or equivalent. For spans exceeding 4.5 m (15 ft), a continuous length timber

beam may not be available. In that case, steel I-beams (or equivalents) can be used as the support beam. Steel beam selection must be certified by a professional engineer and submitted to GDS for review.

Table 7-1: Maximum Span without Support Beam

Pipe Size (NPS)	Steel m (ft)	PE (polyethylene) m (ft)
1/2	2 m (6.6 ft)	1 m (3.3 ft)
3/4 to 1-1/4	2.5 m (8.2 ft)	1.25 m (4.1 ft)
2	3 m (10 ft)	1.5 m (5 ft)
3 to 4	4.5 m (15 ft)	1.75 m (6 ft)
6	6 m (20 ft)	2 m (7 ft)
8	7 m (23 ft)	2 m (7ft)
10	8.5 m (28 ft)	-
12	10 m (33 ft)	-
16	11.5 m (38 ft)	-

Table 7-2: Support Beam Sizes and Maximum Span Between Beam Supports

	Steel	Plastic	
Pipe Size (NPS)	≤ 4.5 m	≤ 2 m	≤ 4.5 m
1/2 to 2	4 × 6	4 × 6	6 × 8
3 to 6	-	6 × 6	8 × 8

Note

In all cases where the support beam size requirements cannot be met, GDS must be contacted to review support beam requirements.

The beam must be placed above the pipe with the ends of the beam resting on firm undisturbed soil. The beam must not bear directly on the gas pipeline. The pipe must be supported from the beam with rope, canvas sling, or equivalent in a manner that will prevent damage to the pipe and coating and eliminate sag. The spacing between the ropes must not exceed 1 m (3.3 ft); see Figure 7-1: Support of Gas Pipelines Crossing Excavations on page 17.

Backfill material underneath the exposed pipeline must be compacted to a minimum of 95% compaction. Sand padding must be placed to a level 150 mm (6 in) below and above the main. For additional details, see 10 Backfilling on page 25.

Perform compaction with the loose lift height not exceeding 200 mm (8 in) or one-quarter of the trench width, whichever is less. Injecting water into the backfill beneath the pipe is not an acceptable method of compaction.

All temporary support on pipelines must be removed before backfilling. Adequate support must remain in place until the backfill material has restored support.

7.3 Support of Pipelines Parallel to Excavation

Two cases exist for pipelines parallel to an excavation:

- Trench < 1.2 m deep
- Trench > 1.2 m deep

In either instance, the pipeline must not be exposed unless it is necessary to provide direct support.

Trench wall support may not be required for excavations provided the pipeline meets all of the following criteria:

- Depth is less than 1.2 m (4 ft).
- the pipeline is at least 0.6 m (2 ft) from the edge of the excavation or outside the 45° line projected upward from the trench bottom; see Figure 7-3: Influence Lines for Gas Pipelines Adjacent to Excavations on page 19.
- Soil is stable (type 1 or 2, see Table 15-1: Soil Types on page 33)

If the pipe does not meet these requirements and the soil is soft clay or sand (soil types 3 and 4), then the excavation must be suitably shored to prevent movement of the pipe. The shoring must remain in place until the backfill material has restored support.

Trench wall support is required for excavations if any one of the following conditions exist:

- Depth is ≥ 1.2 m (4 ft).
- The pipeline is closer to the edge of the excavation than the minimum allowed distance indicated Table 7-3: Minimum Allowed Distance from Main to Excavation on page 16.
- Depth is < 1.2 m (4 ft) and the soil is unstable (type 3 or 4, see Table 15-1: Soil Types on page 33).

Note

Adequate support must remain in place until the backfill material has restored support.

Minimum distances from the edge of the trench to the pipeline in which the excavation influences pipelines are shown in Table 7-3: Minimum Allowed Distance from Main to Excavation on page 16. The pipeline must be supported if these minimum distances cannot be met.

Table 7-3: Minimum Allowed Distance from Main to Excavation

Trench Depth (m)	Soil[a] Type 1 and 2	Soil[a] Type 3 and 4
1.2 m (3.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
1.5 m (4.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
1.8 m (5.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
2.1 m (6.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
2.4 m (7.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
2.7 m (8.9 ft)	0.9 m (3 ft)	1 m (3.3 ft)
3 m (9.8 ft)	0.9 m (3 ft)	1.5 m (4.9 ft)
3.3 m (10.8 ft)	0.9 m (3 ft)	1.8 m (5.9 ft)
3.6 m (11.8 ft)	0.9 m (3 ft)	2.2 m (7.2 ft)
3.9 m (12.8 ft)	0.9 m (3 ft)	2.5 m (8.2 ft)
4.2 m (13.8 ft)	0.9 m (3 ft)	3 m (9.8 ft)
4.5 m (14.8 ft)	1 m (3.3 ft)	3.4 m (11.2 ft)

Trench Depth (m)	Soil[a] Type 1 and 2	Soil[a] Type 3 and 4
4.8 m (15.7 ft)	1.5 m (4.9 ft)	3.8 m (12.5 ft)
5.1 m (16.7 ft)	2 m (6.6 ft)	4.1 m (13.5 ft)
5.4 m (17.7 ft)	2.5 m (8.2 ft)	4.6 m (15.1 ft)
5.7 m (18.7 ft)	3 m (9.8 ft)	5 m (16.4 ft)
6 m (19.7 ft)	3.4 m (11.2 ft)	5.5 m (18 ft)

a. As defined in the Occupational Health and Safety Act.

For pipelines where the trench bottom is below the water table, the trench must be suitably shored as per the trench wall support requirements.

Any pipeline that is exposed for a length greater than indicated in Table 7-1: Maximum Span without Support Beam on page 15 requires a field assessment.

For steel and polyethylene pipelines within the minimum distances given in Table 7-3: Minimum Allowed Distance from Main to Excavation on page 16, support must remain in place until backfill material restores support.

Figure 7-1: Support of Gas Pipelines Crossing Excavations

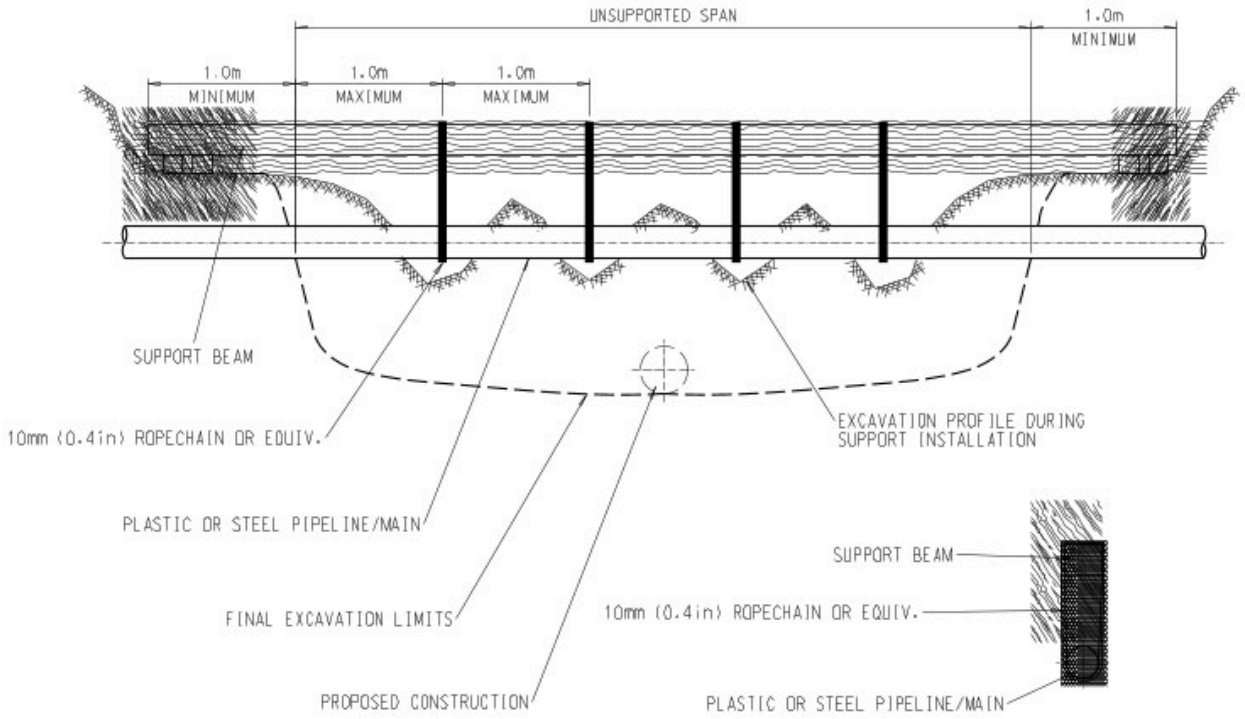
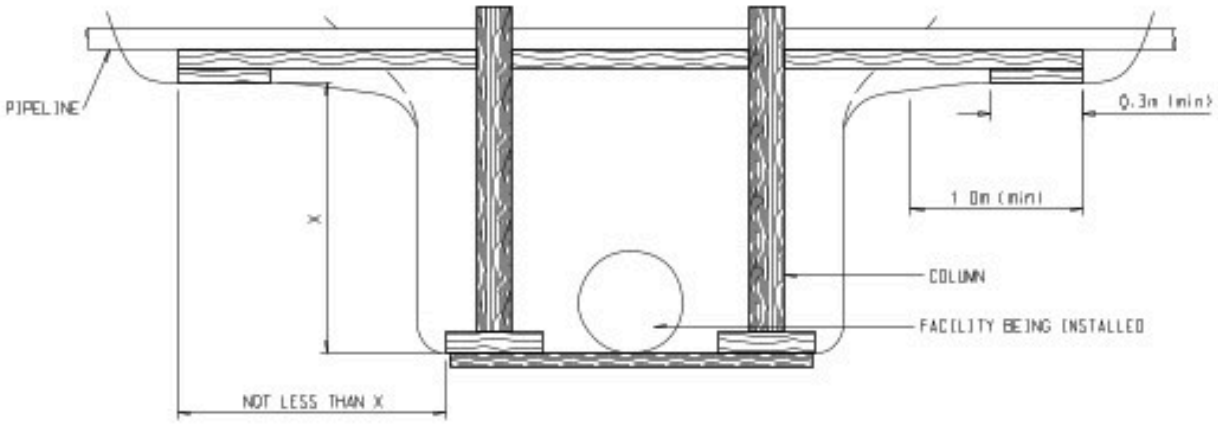


Figure 7-2: Typical Temporary Supports for Pipelines Crossing the Trench – Span Exceeds 4.5 m



NOTES:
1. LAMINATED 4X6 TIMBER BEAM REQUIRED BENEATH ALL NPS 1/2 - NPS 2.
2. LAMINATED 6X6 TIMBER BEAM REQUIRED BENEATH ALL NPS 3 - NPS 6.
3. LAMINATED 8X8 TIMBER BEAM REQUIRED BENEATH ALL NPS 8 - NPS 12.
4. COLUMN SIZE SHALL MATCH LAMINATED TIMBER BEAM REQUIREMENT.
5. COLUMN TO BE SPACED AS SPECIFIED BY PIPELINES AND STATIONS OPERATIONS ENGINEERING.
6. PLASTIC PIPE AND COATING ON STEEL PIPE TO BE PROTECTED FROM SUPPORTS AND STRAPPINGS WITH A PIECE OF RUBBER TIRE OR EQUIVALENT.
7. PLASTIC PIPE MUST BE SUITABLY STRAPPED O PREVENT MOVEMENT OFF THE BEAM.
8. ADDITIONAL SUPPORTS WILL BE REQUIRED AT MECHANICAL COUPLINGS OR VALVES.

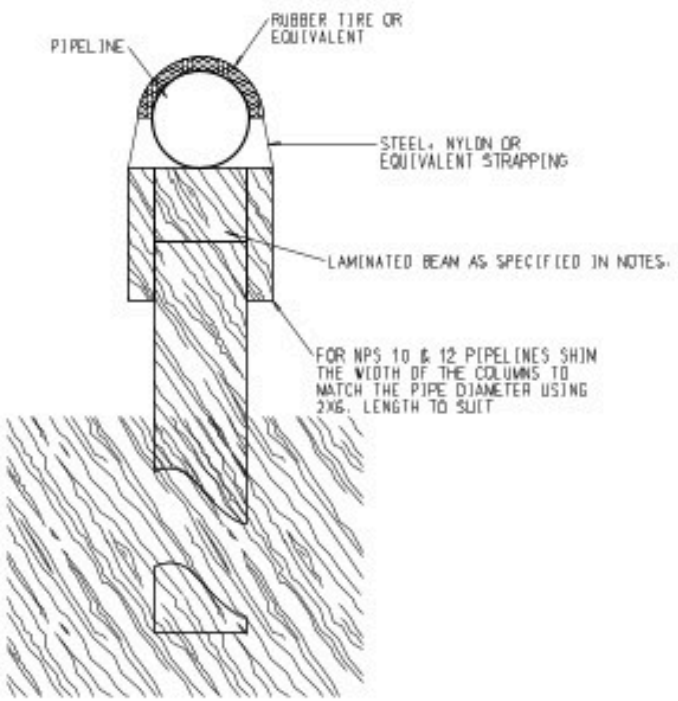
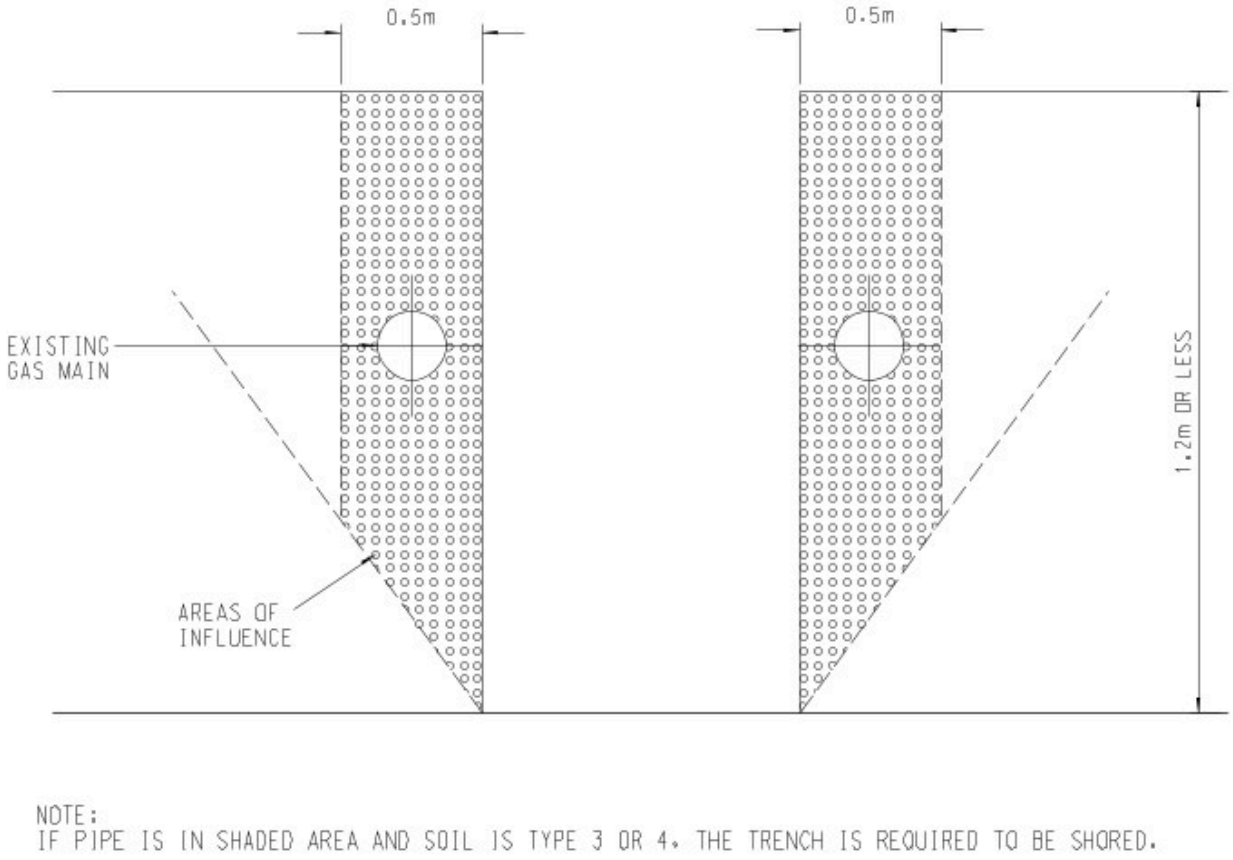


Figure 7-3: Influence Lines for Gas Pipelines Adjacent to Excavations



8 Horizontal Directional Drilling

8.1 General

Horizontal directional drilling (HDD) or directional boring is a steerable trenchless method of installing underground facilities. Trenchless technology is used where utilities being crossed are positively identified to confirm location.

For installations using any other type of drilling or augering equipment in the vicinity of gas facilities, GDS must be contacted.

In all cases, positive identification holes are required to visually verify the drill head's location (including depth) relative to the measurement of the tracking equipment. For positive identification hole requirements, see Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines) on page 24. For pipeline location verification and clearance requirements for all horizontal directional drilling see Table 8-1: Pipeline Location Verification and Clearance Requirements for HDD for all Pipelines (including Vital Pipelines) on page 20.

If these guidelines cannot be complied with, a variance request work package must be submitted. No variance will be provided for work within 1 m (3.3 ft) of any pipeline. The variance work package must include, at a minimum, the following information:

- Pre-Engineering design.
- Location of EGI facilities with respect to proposed installation area (vertical and horizontal offsets).
- Location of proposed installation area (vertical and horizontal offsets off permanent landmarks).
- Pipeline protection plan.

If a variance is requested, a physical barrier (e.g., silt fence) must also be provided, which would denote the boundary of the pipeline, where possible.

Table 8-1: Pipeline Location Verification and Clearance Requirements for HDD for all Pipelines (including Vital Pipelines)

Location of Work Relative to Pipeline[a]	Required Verification of Pipe Location by Hand Digging or Hydro-Excavation
Crossing below pipeline (HDD)	All sides of pipeline (including below pipeline) exposed to 1.0 m (3.3 ft) from the pipeline's sidewalls. Additional positive identification hole at 2.0 m to 4.0 m (6.6 ft to 13.1 ft) prior to the daylight hole at the crossing, to verify depth and trajectory of drill head and backreamer.
Crossing above pipeline (HDD)	Top of pipeline and all sides exposed to 1.0 m (3.3 ft) or 1.0 m (3.3 ft) below the proposed installation. Additional positive identification hole at 2.0 m to 4.0 m (6.6 ft to 13.1 ft) prior to the positive identification hole at the crossing, to verify depth and trajectory of drill head and backreamer.

a. See Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines) on page 24.

8.2 Drilling Parallel to Pipelines

When the proposed route is parallel to a natural gas pipeline at a perpendicular distance of 3 m (10 ft) or less, positive identification must be performed at intervals

of no more than 10 m (33 ft) along the drilling path so that the precise location of the drilling head and backreamers (if any) can be verified visually. These excavations must be sufficiently wide to see the entire width of the drilling head, backreamers, and structures from entry point to exit point.

Note

The location of the pipeline must be visually confirmed as per the requirements set out in Table 8-2: Pipeline Location Verification Requirements for Vital Pipelines on page 21 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21.

Note

For all pipelines (including vital pipelines), when drilling parallel to the pipeline, a minimum horizontal clearance of 1 m (3.3 ft) is required.

Table 8-2: Pipeline Location Verification Requirements for Vital Pipelines

Location of Work Relative to Pipeline[a]	Required Verification of Pipe Location by Hand Digging or Hydro-excavation
Work parallel to pipe, within 1 m (3.3 ft)	Spacing of test holes must not exceed 4.5 m (15 ft)
Work parallel to pipe, between 1 m (3.3 ft) and boundary area of pipeline based on size	Spacing of test holes must not exceed 4.5 m (15 ft)[b]
Crossing below pipeline (open excavation)	Top and sides of pipeline, and 0.6 m (2 ft) below the pipeline
Crossing above pipeline (open excavation)	Top and sides of pipeline, or 0.6 m (2 ft) below the proposed installation

a. Test holes must expose top and sides of pipeline

b. For work parallel to pipe, between 1 m (3.3 ft) and boundary area of pipeline based on size, for rural applications, test holes must be completed for any change in direction of the pipeline every 23 m (75 ft).

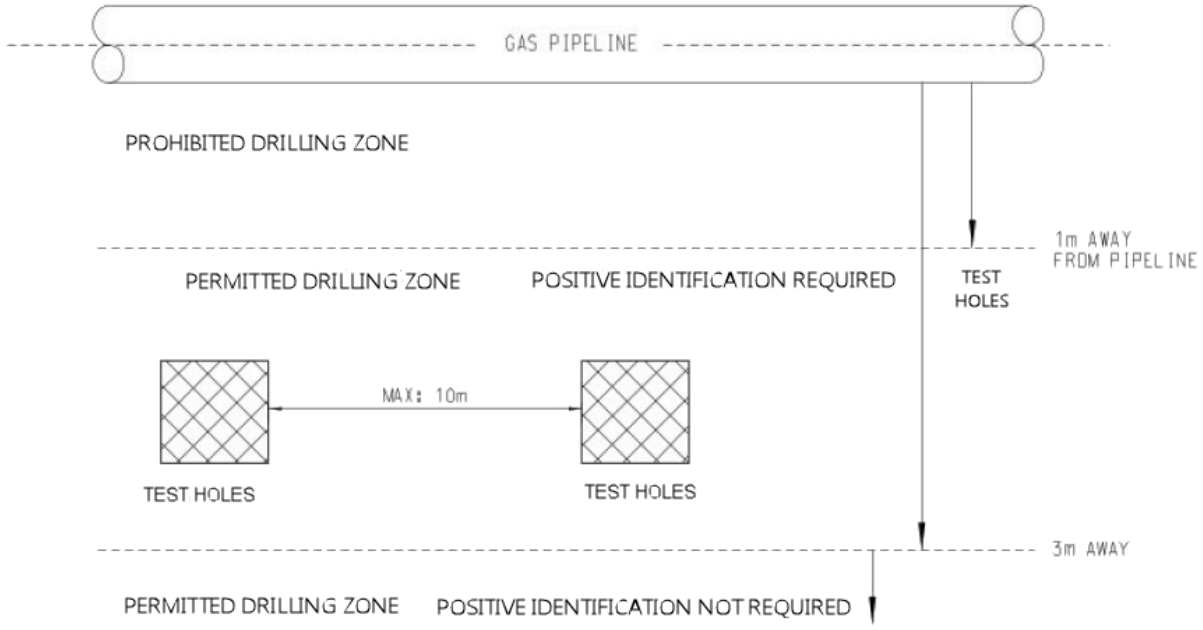
Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines

Location of Work Relative to Pipeline	Required Verification of Pipe location by hand digging or hydro-excavation
Work parallel to pipe, inside of boundary area (1 m [3.3 ft])	Spacing of test holes must not exceed 4.5 m (15 ft)
Crossing below pipeline (open excavation)	For less than NPS 12: Top of pipeline and all sides of the pipeline, or 0.3 m (1 ft) below the pipeline For NPS 12 and larger: Top of pipeline and all sides of the pipeline, or 0.6 m (2 ft) below the pipeline
Crossing above pipeline (open excavation)	For less than NPS 12: Top of pipeline and all sides of the pipeline,or 0.3 m (1 ft) below the proposed installation For NPS 12 and larger: Top of pipeline and all sides of the pipeline, or 0.6 m (2 ft) below the proposed installation

No drilling installation may be performed within a distance of 1 m (3.3 ft) or less from either side of the pipeline. This buffer zone must be clearly designated and

marked off around the work area. This prohibited zone may be widened in some cases.

Figure 8-1: Drilling Parallel to Pipelines



8.3 Drilling Across Pipelines

When the proposed drill path crosses a GDS pipeline, the pipeline must be exposed to the desired depth of the crossing to ensure that the natural gas pipeline is not affected and that the required clearance is maintained during all drilling operations. All minimum clearances must be measured from the outer edge of the drill, including backreamers (if any), to the outer circumference of the pipeline.

To ensure that the directional drilling operation will not result in damage to the pipeline, the following positive identification hole requirements must be followed:

- A positive identification hole must be created that is sufficiently wide enough to see the drill head and backreamer entering the excavation at a minimum of 1 m (3.3 ft) before crossing the pipeline. See Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines) on page 24 positive identification hole 1.
- A second positive identification hole must be created prior to reaching the pipeline such that the precise location of the drill head and backreamer (if any) can be verified visually. The positive identification hole must be sufficiently wide to measure the depth and trajectory of the drill head and backreamer.

See Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines) on page 24 positive identification hole 2.

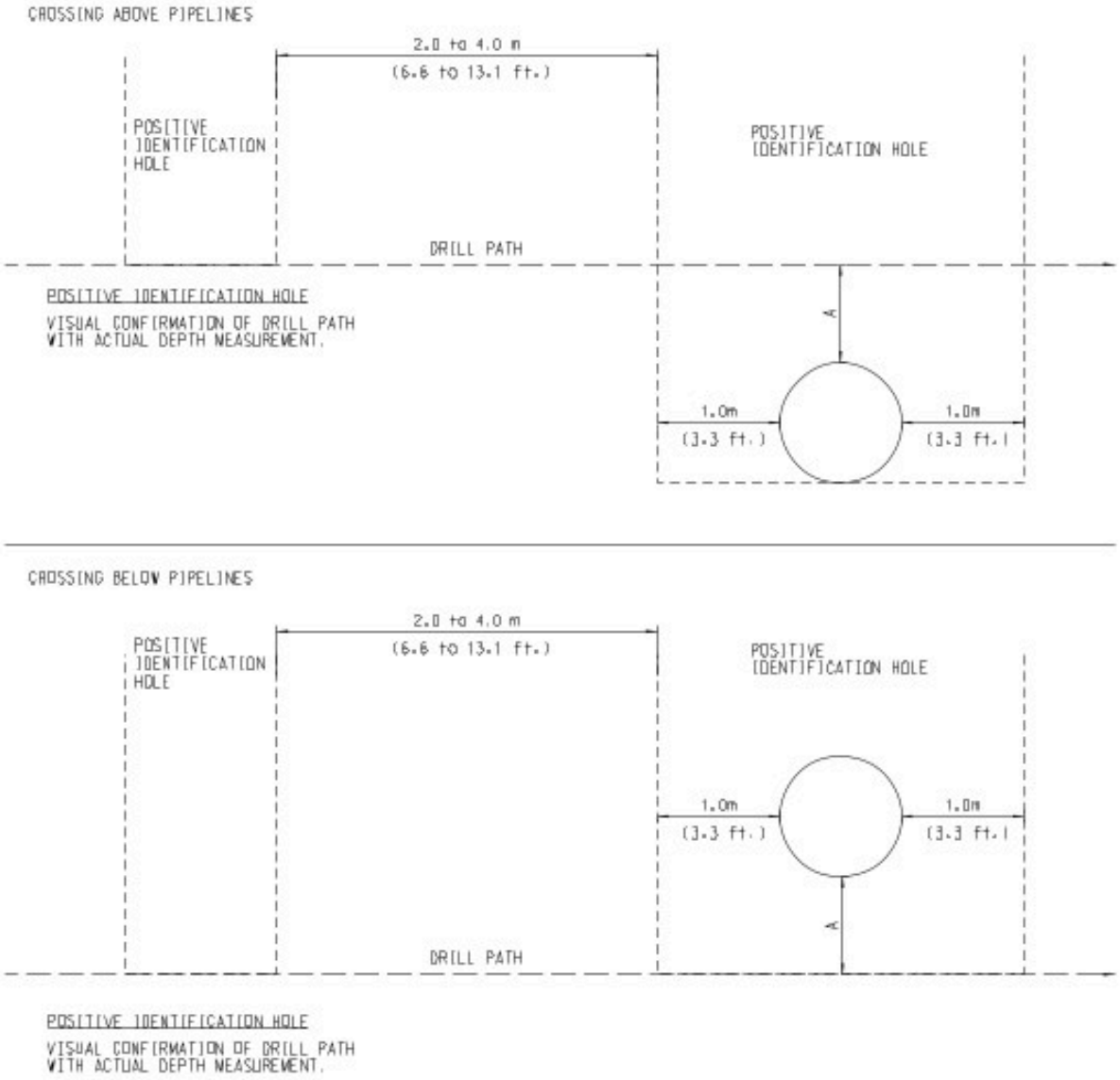
When drilling across pipelines that are smaller than NPS 16 (excluding vital pipelines), the vertical clearance, measured from the edge of the pipeline to the edge of the final bore hole, may follow the vertical clearance outlined in Table 4-1: Minimum Clearance Between Gas Pipelines (Less than NPS 16) and Other Underground Structures on page 10 as long as all positive identification requirements are also followed.

When drilling across pipelines that are NPS 16 or larger, or crossing any CER-regulated pipelines or vital pipelines, a minimum vertical clearance, measured from the edge of the pipeline to the edge of the final bore hole, of 1 m (3.3 ft.) is required.

Note

The location of the pipeline must be visually confirmed as per the requirements set out in Table 8-2: Pipeline Location Verification Requirements for Vital Pipelines on page 21 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21. For specified minimum clearances, see 4 Minimum Clearance from Other Structures on page 10.

Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines)



9 Hydro-Excavation

9.1 General

Hydro-excavation, also known as hydrovac, is the non-destructive process in which pressurized water is utilized as a method of excavation through loosening and suction of soil, rocks, and other earth materials. Hydro-excavation machines are an alternative to hand digging to locate and expose pipelines.

9.2 Hydro-Excavation Requirements

The following requirements must be met at all times when excavating with hydro-excavation technology:

- Spinning tip nozzles must be used for hydrovac excavations with water pressures that must not exceed the maximum water pressure of 17,236 kPa (2,500 psi) during excavation. Pressure measures must be permanently monitored using a calibrated device mounted on either the hydro-excavation machine (truck and pump), or the wand when using a spinning tip nozzle.
- The wand must never remain motionless during excavation. The wand must never point to the plant at any time.
- A distance of 20 cm (8 in) between the end of the pressure wand nozzle and the plant or subsoil must be maintained. The nozzle must never be inserted into the subsoil while excavating above the plant.
- Hydro-excavation equipment and nozzles must have been specifically designed for use above buried gas lines or other reasonably expected underground gas plants.
- A device capable of stopping the excavation on demand must be installed, such as an approved automatic electronic shut-off or valve on the wand.
- If heated water is used during excavation, the temperature and pressure of the water must not exceed 100 °F (38 °C) and 17,250 kPa (2,500 psi), respectively.
- The excavator must contact the gas utility if any damage to a gas plant occurs while using hydro-excavation technology or any other method of excavation.

10 Backfilling

The gas pipeline must be inspected by GDS for damages before backfilling the excavation. It is the third party's responsibility to ensure that the gas pipeline is not undermined or endangered in any way. If any damage occurs, GDS must be contacted immediately.

The following principles must be followed:

- The backfill does not harm the pipe or coating throughout the installation process and while in service.
- The use of native material (especially with respect to anode installation) and minimize haul out must be maximized.
- A reliable and stable installation must be created and the use of dams included when appropriate.

The Company permits the use of any compacting device that:

- Will compact backfill sufficiently to eliminate any settlement of the pipe or ground surface.
- Will not cause any deformation or damage to the pipe or coating.
- Will not cause any damage to any adjacent building, structure or utility.
- Will not cause any damage to any tree, shrub, tended lawn, or ground cover.

When backfilling where the finished grade has not been established, sufficient soil must be placed over the trench to allow for settlement.

Backfilling must be done in such a manner as to prevent any rocks from being placed at or near the surface of the pipe. Native excavated material must be used

as backfill unless otherwise directed by GDS. Where native material is unsuitable, 150 mm (6 in) of approved earth or sand padding must be placed over the pipe for protection, to a minimum depth of 300 mm (12 in). Each layer must be compacted thoroughly by manual tamping. Topsoil must not be used for backfilling.

Aggregate backfill must be replaced in 200 mm (8 in) layers. Each layer must be thoroughly compacted by pneumatic tampers or an equivalent method acceptable to GDS to ensure no settlement. The final layer must be smoothed down with a grader (or a rake for small scale projects) and must be tamped flush or slightly higher than the surrounding ground surface in order to prevent ponding of water and accommodate any future soil subsidence over the trench line.

Backfilling a flooded trench is not allowed. The third party is responsible for the removal of water from the trench, before backfilling. If backfilling on a slope, the backfill must first be placed from the bottom of the slope, then the filling should continue by building upwards. This prevents large voids in the backfill that can occur when the backfill is dumped from the top of a slope.

Backfill and compaction within road allowances must be completed in accordance with the local governing authority.

Unshrinkable fill or other engineered backfill material must be installed only when requested by the municipalities, local governing authority, or as directed by GDS. The approved unshrinkable fill must be batched at a ready-mix plant with a specified maximum compressive strength of 0.7 MPa at 28 days and minimum slump of 150 mm (6 in). After curing, it must be excavatable using hand tools and must meet any governing agency requirements. The pipe and valve assemblies must be sand padded before placement of unshrinkable fill. The third party must ensure that placement of the unshrinkable fill does not displace sand padding or directly contact the pipeline.

If the bulk backfill material contains rocks, stones, or frozen material, pipelines must be padded with padding material to a minimum depth of 150 mm (6 in) over the pipe and fittings. If the location requires the backfill material to be tamped, the padding material must also be tamped.

The final covering of gas pipelines must adhere to municipal requirements.

11 Blasting and Pile Driving

11.1 General

Blasting and pile driving activities in the vicinity of GDS facilities require prior approval by GDS. The Blasting and Pile Driving Form, provided by GDS, must be submitted by the owner of the proposed work for all blasting and pile-driving operations. The request must be submitted a minimum of four weeks prior to the beginning work to allow sufficient time for review.

11.2 Blasting

Before any blasting operation in the vicinity of a gas pipeline can occur, the hazards to the GDS facility must be evaluated. Responsibility for the design of the blast and any resultant damage is borne entirely by the party using the explosives.

A recognized independent blasting consultant must be retained at the applicant's expense to perform an evaluation of the blast design. The independent blasting consultant must be an independent engineering consultant specialized in blasting. A copy of the stamped consultant's validation report must be submitted to GDS for review if blasting is to occur within 30 m (100 ft) of GDS facilities.

If in the opinion of GDS or an independent blasting consultant, blasting cannot be carried out without affecting the facility's integrity, alternatives must be considered, including the replacement or relocation of the affected facility at the applicant's expense. In these situations, additional time must be allowed to obtain the necessary permits and to complete the necessary construction work. In the event a third party is affected as a result of the blasting operations, all expenses associated therewith incurred by GDS must also be at the applicant's expense.

Ontario: The third party must comply with the Ontario Provincial Standard Specification (OPSS 120 – General Specification for the Use of Explosives) in addition to GDS's blasting requirements.

Quebec: The third party must comply with Quebec's Acts regarding explosives (CQLR c E-22 and CQLR c E-22, r 1) and Safety Code (CQLR c S-2.1, r 4), in addition to GDS's blasting requirements.

11.2.1 Surface and Tunnel Blasting Application Process

For subsurface blasting application requirements, refer to the Surface Blasting section of the Blasting and Pile Driving Form.

For tunnel blasting application requirements, refer to the Surface Blasting section of the Blasting and Pile Driving Form in addition to the Tunnel Blasting section.

To assist with the preparation of the form, locates must be requested to determine the location of the facilities.

11.2.2 Guidelines for Blasting

The information provided in this section is not to be construed as an exhaustive list of performance specifications, but rather a guide for conducting blasting in the vicinity of GDS's facilities. The third party is responsible for ensuring that all blasting work is performed in a good and workmanlike manner in accordance with all applicable laws, codes, by-laws, and regulations.

The third party will be held liable for and indemnify GDS in relation to any and all damage directly or indirectly caused or arising as a result of blasting operations carried out by the applicant, its employees, contractors, or those for whom the applicant is responsible by law. Prior to blasting operations, a site meeting must be arranged with an authorized representative of the applicant and a GDS representative to confirm the location of GDS's facilities and details of the proposed blast.

GDS's pipelines must not be excavated prior to blasting. If excavation is unavoidable, then the pipeline must be properly supported according to GDS's requirements as stated in 7 Support of Gas Pipelines on page 14.

The third party must take suitable precautions to protect the exposed pipeline from fly-rock .

Explosives must be of a type that cannot propagate between holes or be desensitized due to compression pressures. Explosives must not be left in the drill hole overnight.

If a surface blast islocated less than 10 m (33 ft) from pipeline; creates its first blast hole at a depth equal to the top of the pipeline; andthe depth of subsequent blast holes exceeds one half of the horizontal distance to the closest portion of the pipeline, then the required independent blasting consultant's report must specifically address the impact of these conditions. This is not applicable for tunnel blasting operations. The blasting consultant is responsible for the monitoring of blasting vibrations with a portable seismograph capable of transmitting data instantaneously (e.g., via email or cellular) to the required reviewer in the vicinity of GDS's facilities is mandatory to confirm that predicted vibration levels are respected. On a daily basis, a copy of the seismographic report must be provided to GDS.

Peak particle velocity (PPV) must be limited to 50 mm/s (2 in/s) and maximum amplitude must be limited to 0.15 mm (0.006 in).

11.2.3 Post Blasting

A leak survey must be completed at the end of each day of blasting. Upon completion of daily blasting operations and within 30 days after the final blasting, GDS will conduct a leak survey of the pipeline at the third party's expense. Leak surveys will also be completed at the end of each day of blasting. Damage that has resulted from the blasting will be repaired at the third party's expense. A summary of all blasting operations including blasting logs, vibration control, seismograph reports, and other pertinent information must be provided to GDS by the third party daily and at the completion of blasting operations.

11.3 Pile Driving

General pile installation or compaction activities in the vicinity of GDS's facilities must be evaluated by GDS prior to beginning. Any resultant damage as a result of these activities will be borne entirely by the third party undertaking the proposed work.

If in the opinion of GDS, the particular pile installation or compaction operation cannot be carried out without affecting the pipeline or facility integrity, the following must be considered:

- Risk analysis or mitigation program for the proposed operation.
- Alternative construction methods.
- Relocation or replacement of the facility.

All costs incurred will be covered by the third party undertaking the proposed work and final approval for the work will be granted by GDS.

Piles installed using an auger must satisfy the locating and clearance requirements listed in 5 Pipeline Location Verification on page 10 and 4 Minimum Clearance from Other Structures on page 10, respectively. GDS must provide approval for the installation of piles within 3 m (10 ft) of a vital pipeline.

The third party is responsible for all costs related to customer interruption as well as costs incurred because of work delays. In the event a third party is affected as a result of the pile installation or compaction operations, all expenses associated therewith incurred by GDS will be passed to the third party.

11.3.1 Pile Driving Application Process

The application to pile drive or do compaction work must be sent to GDS via the Blasting and Pile Driving Form.

This work must be completed under the supervisor of qualified personnel. Vibration results must be provided to GDS on a daily basis.

11.3.2 Pile Installation and Compaction Work

The information provided in this section is not to be construed as an exhaustive list of performance specifications, but rather a guide for conducting pile installation and compaction work in the vicinity of GDS's facilities. The third party is responsible for ensuring that all pile installation and compaction work is performed in accordance with all applicable laws, codes, by-laws, and regulations.

Operations must not be permitted within a standoff distance of 3.0 m (10 ft) from the pipeline or other natural gas facility, unless approved by GDS.

Prior to pile installation or compaction work, a site meeting with an authorized representative of the third party and a GDS representative (for the Damage Prevention contact, see 12 Contact Information on page 31) must be arranged by the third party, to confirm the location of GDS's facilities and the details of the proposed work.

It is recommended that during the design phase, pile installation or compaction work drawings be sent to Markups for review (see 12 Contact Information on page 31).

The pipeline should not be excavated prior to the piling or compaction operation. If excavation of the pipeline is necessary, then it must be properly supported in accordance with 7 Support of Gas Pipelines on page 14.

The following situations require the opinion of an independent professional engineer:

- Compaction of soils or backfill rated at 10,000 ft-lbs (13,600 Nm) or higher at a stand-off distance of 6 m (20 ft) or less from the pipeline.
- Pile driving at a stand-off distance of 10 m (33 ft) or less from the pipeline facility.
- High-energy dynamic compaction for the rehabilitation of soils at a stand-off distance of 30 m (100 ft) or less from the pipeline.

- Type 4 soil as defined in Article 226 of the Occupational Health and Safety Act and Regulations for Construction Projects (see Table 15-1: Soil Types on page 33).

For these situations, the appropriate number of seismographs to monitor vibrations is mandatory. The seismographs must be portable with the capability of transmitting data instantaneously (e.g., via email or cellular). This control will confirm the intensity of the vibrations generated by the pile installation or compaction work as projected. Furthermore, reports of recorded intensities must be provided on a regular basis or at the request of GDS.

The peak particle velocity (PPV) measured on the pipeline, or at the closest point of the related structure with respect to the work, must not exceed 50 mm/s (2 in/s). Furthermore, the maximum displacement for the vertical or horizontal component corresponding to the above stated vibration intensity must not exceed 50 mm (2 in) at any given length of the pipeline in question.

If the PPV or displacement limit is surpassed, all operations must stop notwithstanding any delays or costs incurred by the third party or owner of the proposed work. GDS requires that the cause of these higher vibrations or displacements be investigated. GDS may arrange for a leak survey to be conducted. GDS Engineering must approve resumption of operations. Should a situation with low energy compaction operations with a soil cover of less than 1.5 m (5 ft) above the pipeline at a stand-off distance of 3 m (10 ft) or less from a pipeline be encountered, GDS may require the opinion of an independent engineering consultant.

In addition, if a Type 3 soil (see Table 15-1: Soil Types on page 33) is present on site, GDS may require the opinion of an independent engineering consultant.

The use of an auger may be required in order to avoid the use of piles.

All operations must comply with the Provincial Occupational Health and Safety Act and Regulations for Construction Projects, other applicable laws and regulations, as well as all applicable GDS specifications, standards, and guidelines.

11.3.3 Post Pile Driving Process

The third party must send GDS the items that follow within five business days of the completion of the pile installation via pile driving or compaction operations:

- A summary of all operations.
- Pile driving and compaction logs.
- Vibration control records.
- Seismograph records.

On completion of each day’s work, and approximately 30 days after all work is completed, GDS will arrange to conduct a leak survey of the facility. If damage to GDS’s facilities is found, it will be repaired by the third party. An invoice will be sent to the third party responsible for the work.

12 Contact Information

Location	Contact
Enbridge Gas Inc 500 Consumers Road North York, ON M2J 1P8	Markups: Mark-Ups@enbridge.com Ontario One Call Locates: 1-800-400-2255 Damage Prevention: 1-866-922-3622 Emergency: 1-866-763-5427 and 1-877-969-0999
Enbridge Gas Inc Storage and Transmission Operations Locates (Dawn) 3332 Bentpath Line P.O. Box 1180 Dresden, ON N0P 1M0	Ontario One Call Locates: 1 (800) 400-2255 Locates: 1-800-265-5260 ext 5102236 Stacey.Smith@enbridge.com Locates: 1-800-265-5260 ext 5102184 Janice.Langstaff@enbridge.com
Enbridge Gas Inc Storage and Transmission Operations Locates (Tecumseh) 3501 Tecumseh Road, Mooretown, Ontario N0N 1M0	Field Operations: 519-312-0176 jay.moore@enbridge.com Field Operations: 519-862- 6004 jason.japp@enbridge.com Tecumseh Control Room: 519-862-6012 Emergency: 1-800-255-1431
Gazifère 706 Boulevard Greber Gatineau, QC J8V 3P8	Locates: 1-800-663-9228 Planning Dept.: 1-819-776-8804 Emergency: 1-819-771- 8321, press 1

Note

The website www.clickbeforeyoudig.com gives access to the damage prevention centres in Canada, and allows locate requests to be made for each province.

13 References

- IS_F_172 Blasting and Pile Driving Form

14 Document Governance

For document control and maintenance purposes, the following tables capture important information related to this document.

Control and Maintenance

Category	Value
Owned By	Pipeline Engineering
Review Interval	Every three years
MOC-Related	No

Revision History

Table 14-1: January 2024 Release

Release Date	Version	Project Number	RFC Number	Prepared By	Approved By
2024-01-31	1.2.1	n/a	5399	Derek Brecht, Engineer Pipeline Engineering	Todd Piercey, Manager, Pipeline Engineering
Doc ID		**Scope**	**Document & Section**		**Summary of Changes**
ST-1E-30A8-8E30		GDS	Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard		Revised Figure 8-1.

Table 14-2: September 2021 Release

Release Date	Version	Project Number	RFC Number	Prepared By	Approved By
2021-09-29	1.1.1	n/a	4983	Hooman Zahedi, Supervisor, Pipeline Engineering	Todd Piercey, Manager, Pipeline Engineering
Doc ID		**Scope**	**Document & Section**		**Summary of Changes**
ST-1E-30A8-8E30		GDS	Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard		Corrected typo in 11.2 Blasting

Table 14-3: June 2021 Release

Release Date	Version	Project Number	RFC Number	Prepared By	Approved By
2021-06-30	1.1.0	n/a	4922	Hooman Zahedi, Supervisor, Pipeline Engineering	Todd Piercey, Manager, Pipeline Engineering
Doc ID		**Scope**	**Document & Section**		**Summary of Changes**
ST-1E-30A8-8E30		GDS	Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard		Revise tree clearance restrictions in section 3.8.

Table 14-4: April 2021 Release

Release Date	Version	Project Number	RFC Number	Prepared By	Approved By
2021-04-28	1.0.0	6513-20	None	Emily Varga, EIT I, Pipeline Engineering	Todd Piercey, Manager Pipeline Engineering

Doc ID	Scope	Document & Section	Summary of Changes
ST-1E-30A8-8E30	GDS	Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard	Initial version.

15 Soil Types

Table 15-1: Soil Types

Type	Definition
Type 1	• Hard, very dense, and only able to be penetrated with difficulty by a small sharp object. • Low natural moisture content and a high degree of internal strength. • No signs of water seepage. • Can be excavated only by mechanical equipment.
Type 2	• Very stiff, dense, and can be penetrated with moderate difficulty by a small sharp object. • Low to medium natural moisture content and a medium degree of internal strength. • Damp appearance after it is excavated.
Type 3	• Stiff-to-firm and compact-to-loose in consistency or is previously-excavated soil. • Exhibits signs of surface cracking. • Exhibits signs of water seepage. • If dry, may run easily into a well-defined conical pile. • Low degree of internal strength.
Type 4	• Soft to very soft and very loose in consistency, very sensitive, and upon disturbance is significantly reduced in natural strength. • Runs easily or flows, unless it is completely supported before excavating procedures. • Almost no internal strength. • Wet or muddy. • Exerts substantial fluid pressure on its supporting system.