

PROPOSED FACILITIES, OPERATION AND SYSTEM BENEFITS

Note: Elements of this evidence have been updated through the submission of Exhibit A, Tab 3, Schedule 9 (filed on July 22, 2013).

1. The purpose of this evidence is to describe the proposed GTA Project facilities, the intended operation of the facilities, and the operational benefits achieved once in-service.

Proposed Facilities

2. Enbridge is proposing two segments of natural gas pipelines and associated facilities, referred to as “Segment A” and “Segment B”, that will enhance and reinforce the XHP system within the GTA. The pipelines and associated facilities are described below with references to Figures 1 and 2. Figure 1 is a map overview of the proposed facilities in its entirety. Due to the larger map scale in Figure 1, Figure 2 is an expanded overview of the Parkway Bypass and NPS 36 tie-in.
3. Segment A consists of:
 - A new NPS 42¹ pipeline, approximately 20.9 km in length, that will originate at the proposed interconnection with TransCanada’s Mainline transmission system, the “Bram West Interconnect” (Reference 1 in Figure 1) and terminate at the existing Enbridge Albion Road Station (Reference 2 in Figure 1);
 - An expansion to the existing Albion Road Station (Reference 3 in Figure 1); and
 - A tie-in to the existing XHP system via:
 - A new connection to Union Gas’ Dawn to Parkway system, known as the Parkway West Gate Station, adjacent to Union Gas’ proposed Parkway West compressor station, and approximately 315 m of NPS 36 pipe to tie into the existing Enbridge NPS 36 Parkway North pipeline (Reference 4 in Figure 1, also expanded in Figure 2); and

¹ Or NPS 36. Further detail is provided at Exhibit E, Tab 1, Schedule 2.

- An upgrade to the current valve manifold at the existing Parkway Bypass to include pressure regulation between the existing NPS 36 Parkway North pipeline and the existing NPS 36 Mississauga Southern Link (“MSL”) pipeline that currently operate at different pressures (Reference 5 in Figure 1, also expanded in Figure 2).

4. Segment B consists of:

- A modification of the existing Keele/CNR Station (Reference 6 in Figure 1);
- 23 km of NPS 36 XHP pipe that consists of a west-east portion and a north-south portion:
 - The west-east portion will originate from the existing Keele/CNR Station, proceed east to intersect with the existing NPS 30 Don Valley pipeline (Reference 7a on Figure 1); and
 - The north-south portion will then proceed south to the tie-in point with the existing NPS 36 pipeline north of Sheppard Avenue East (Reference 7b on Figure 1);
- A new pressure regulation facility, known as “Buttonville Station”, located in the Parkway Belt corridor east of Woodbine Avenue, will tie the new NPS 36 pipeline into the existing NPS 30 Don Valley pipeline in the area of the intersection of the two pipelines (Reference 8 on Figure 1); and
- An expansion to the existing pressure regulation facility at Jonesville Station, located just north of Eglinton Avenue East near Jonesville Crescent that will support the existing NPS 36 pipeline feed to the existing NPS 30 Don Valley pipeline running south from the Jonesville Station (Reference 9 on Figure 1) to Station B.

Safety Considerations for Design of New Pipeline Segments A & B

5. Segments A and Segment B were designed to exceed the most stringent standard according to CSA Z662-11². Segments A and B exceed Class 4 design by 18% and 68% due to the use of thicker wall pipe for the NPS 42 and NPS 36 pipe designs, respectively.
6. Canadian design standard CSA Z662-11 specifies the calculation of hoop stress, which for a given diameter of pipe is a function of both the maximum operating pressure and wall thickness. The hoop stress as a percentage of the specified Minimum Yield Strength (“SMYS”) of the pipe (i.e., pipe grade), typically referred to as % SMYS is limited based on Class Location. Subject to certain setback limitations prescribed in the Technical Standard and Safety Authority’s (“TSSA”) PI-98/01 “Guideline for Locating New Oil and Gas Pipeline Facilities”, pipelines in a Class 4 location can be designed to operate up to a pressure equal to 44% SMYS.
7. The % SMYS that a pipeline operates at can be reduced either by increasing the pipe grade and/or by increasing the wall thickness. While the CSA Z662-11 is not prescriptive in terms of these design “trade-offs”, the Company’s design is consistent with U.K. design practices that emphasize the importance of wall thickness in reducing third party damage, which is a predominant threat in urban areas. Thicker wall pipe also has the benefit of increased resistance to corrosion - another threat to pipeline integrity.
8. Segments A and B have been designed with wall thickness of 19.05 mm and 17.5 mm for the NPS 42 and NPS 36 pipe designs, respectively, in order to ensure a very high level of resistance to both third party damage and corrosion.

² The CSA Z662-11 is the Canadian Standards Association’s Oil & Gas Pipeline System standard (2011 edition).

9. The design was validated using U.K. Pipeline Risk Assessment Code IGEM TD/2, which quantifies the benefits to be achieved by reduced hoop stress (i.e., % SMYS) and increased wall thickness. For pipelines operating below 50% SMYS, IGEM TD/2 attributes a safety factor of almost 100% for pipelines designed with wall thickness of 16 mm or greater.

10. The Segment A pipeline from Bram West to Albion is designed to operate at 37% SMYS based on the NPS 42 design. With a wall thickness of 19.05 mm, it achieves a near maximum safety benefit attributable to wall thickness, therefore there is very little incremental benefit to be achieved by designing to operate to below 30% SMYS.

11. The NPS 36 pipelines (the 315 m tie-in and Segment B) are designed to operate at 20% SMYS at a normal operating pressure of 3344 kPa (485 psi), or 26% SMYS at maximum operating pressure of 4482 kPa (650 psi). The pipeline was designed to operate at lower stress levels due to its proximity to the NPS 30 Don Valley line and adjacent development.

12. Both Segment A and B will be hydrostatically tested to 100% SMYS and all welds will be non-destructively tested. Once complete, the pipelines will also be inspected internally, using a caliper tool, to check for dents or buckles caused by construction. These measures will ensure the integrity of the pipe material and construction practices prior to commissioning.

13. Once in service, the pipeline pressures and flows will be monitored remotely by Gas Control, who will also have the capability to isolate segments of the pipeline by remotely closing strategically located valves in the event of an incident.

Safety Benefits for Existing Pipelines

14. As described in Exhibit A, Tab 3, Schedule 3, the NPS 26 and NPS 30 Don Valley lines were installed in the late 1960's/early 1970's and operate above 30% SYMS.
15. With existing pipelines, design parameters are pre-determined so achieving relative safety benefits typically focuses on operational parameters. One effective method of obtaining a safety benefit is to lower the operating pressure, provided that the system supply demands can still be met. This was the case in the early 1990's, when the installation of Parkway Phase 2 allowed the operating pressure in the NPS 30 pipeline, that runs along Derry Road and Finch Avenue, to be lowered.
16. As explained in Exhibit A, Tab 3 Schedule 3, page 17, 30% SMYS is the generally accepted boundary below which pipelines subjected to excavation damage are more likely to fail by leak rather than by rupture. The TSSA has endorsed this boundary by limiting the requirements of the recently passed Code Amendment FS-196-12 to pipelines operating at or above 30% SMYS.
17. Once the new facilities are in operation, the operating pressure for the NPS 26 and the NPS 30 Don Valley lines will be reduced to 1896 kPa (275 psi) and 2585 kPa (375 psi) respectively, which will lower the hoop stress levels to below 30% SMYS.
18. Even though these pipelines will be operating below 30% SMYS, the Company intends to continue to perform in-line inspections on them as part of its integrity management program.

Additional Safety Features

19. Both the new and existing pipelines associated with the GTA Project are primarily located in existing utility or rail corridors, not on road allowances. These defined corridors can provide a natural buffer against third party damage.
20. The Company plans to Horizontal Directionally Drill (“HDD”) several major road crossings and environmentally sensitive water crossings, totaling approximately 8 km of the 44 km pipeline route. HDD pipeline segments will be at depths much greater than 1.2 m offering additional protection against third party damage.
21. Location specific measures to further reduce the threat of third party damage will be considered during the detailed pipeline design phase, to be completed following Board approval of the project. Such measures will improve the awareness of the pipelines, and may include the installation of buried marker tape, concrete slabs, extra pipeline markers, or other pipeline identifiers. The determination of these additional measures cannot be completed until final design because they are dependent on site specific factors such as pipeline depth, separation from other infrastructure, likelihood of construction activity in the area, etc.
22. The Company believes that with the aggregate design and operational measures described above, the overall safety in the area of influence of the GTA Project will be enhanced.

Operation of the Proposed Facilities

Segment A

23. The Bram West Interconnect will provide a new entry point into the GTA XHP system. It will supply gas at 6447 kPa (935 psi) to the new 20.9 km pipeline for delivery at Albion Road Station. Albion Road Station is central to the distribution system and will provide tie-in points to two other XHP networks, the NPS 36 Parkway North line and the NPS 30 line (that runs along Derry Road and Finch Avenue).
24. The pipeline from the Bram West Interconnect to Albion Road Station will be a shared usage pipeline. TransCanada will share usage of the pipeline to transport gas volumes from the Bram West to Albion. At the Albion Road Station, Enbridge gas volumes will be distributed into the existing XHP distribution system.
25. TransCanada will provide a connection for Enbridge at the Bram West Interconnect which will also have provisions for in-line inspection. Albion Road Station will be expanded to accommodate odourization, metering, regulation, and other ancillary equipment.
26. The GTA Project also includes a tie-in from proposed Parkway West Gate Station to the existing NPS 36 Parkway North line via a pipeline approximately 315 m in length. Also, Enbridge proposes to install pressure regulation at the Parkway Bypass. This short pipeline and facilities will provide another supply source to the NPS 36 Parkway North pipeline at 3344 kPa (485 psi) and MSL pipeline at 2413 kPa (350 psi).

Segment B

27. The 23 km of pipeline that runs east from Keele/CNR Station to the Buttonville corridor, then south to Sheppard Avenue East, will provide 3344 kPa (485 psi) to Buttonville and Jonesville Stations. The regulation facilities at Buttonville and Jonesville Stations allow the NPS 30 Don Valley line to be fed from both Victoria Square and Parkway West Gate Stations.

System Benefits of the Proposed Facilities

28. The proposed pipelines and facilities in Segment A and Segment B will result in the following operational benefits:
- a. Ability to meet customer growth, and particularly the ability to maintain minimum system pressures at Station B and the downtown Toronto core;
 - b. Operational flexibility through improved connectivity between the western and eastern parts of the GTA XHP system through the elimination of the west-east bottleneck and the improved ability to accommodate system work provided by the second source of supply to the major XHP supply lines³;
 - c. Diversification of supply pathways for two critical distribution lines, NPS 26 and NPS 30 Don Valley pipelines;
 - d. Mitigation of operational risk through the lowering of operating pressures of the NPS 26 and NPS 30 Don Valley line and the addition of another major supply point into the XHP distribution system capable of supporting Parkway Gate Station; and
 - e. Improved reliability of upstream arrangements by replacing less secure (short term firm and interruptible) long haul transportation from Western

³ The major XHP supply lines include the NPS 36 Parkway North, NPS 36 MSL, NPS 30 Don Valley, and NPS 26 lines.

Canada with more secure short haul firm transportation from emerging U.S. North East and Dawn supply.

29. The proposed pipelines and facilities will only meet the full set of objectives outlined in Exhibit A, Tab 3, Schedule 1 if constructed and operated together.

Downstream Distribution System

30. The proposed pipelines will add the XHP pipeline capacity required to meet forecast customer growth. System pressures are forecast to be maintained above minimum requirements until 2025 with the proposed pipelines and facilities in place.
31. The pipeline from the Bram West Interconnect will deliver gas to Albion Road Station. This point is central in the distribution area, a preferred location to further distribute gas to downstream HP and IP networks and to back-feed other XHP networks. Given its central location, once the proposed pipelines and facilities are in place, Albion Road Station can help offset a shortfall at either Parkway or Victoria Square Gate Stations, provided the proposed pipelines and facilities are in place.
32. The 315 m tie-in and added pressure regulation at Parkway Bypass will diversify supplies by adding another supply point into the system, capable of supporting Parkway Gate Station. It will provide a second source of supply to the NPS 36 Parkway North and NPS 36 MSL lines. This will enhance operational flexibility by providing a back-feed to manage maintenance and integrity management activities and abnormal operating conditions. It will also allow for shutdown of the Parkway Gate Station, if required.

33. Segment B will alleviate the XHP restriction across the existing NPS 26 pipeline and provide a secondary pathway in the transportation of gas from west to east, and vice versa. The direction of gas flow depends on the supply source, use of gas storage volumes, load balancing, and maintenance activities at the time. The improved connectivity between the western and eastern parts of the GTA Influence Area will provide flexibility to balance flows that are increasingly “peakier” based on recent and forecasted customer growth. The capability will aid in the effort to stay within contractual limits.
34. Segment B creates a continuous NPS 36 line at 3344 kPa (485 psi) from Parkway to Jonesville Station, providing a secondary source as far south as Eglinton Avenue to feed the downtown Toronto core. With the proposed Segment A, this major feed would be normally sourced from Albion Road Station via the proposed Bram West Interconnect. It could also be fed from the existing Parkway Gate Station or through the proposed 315 m tie-in via Parkway West Gate Station providing diversity of supply sources. This pipeline will act as an express lane to move gas volumes to the downtown core and to maintain pressures at Station B, while the existing NPS 30 Don Valley line acts like collector lanes by supplying the flows to the more local district stations. In the case of winter maintenance requirements, the twinning along these two routes will mitigate a significant impact on the supply chain and improve the Company’s ability to provide reliable service.
35. The new Buttonville Station, modified Keele/CNR Station, and expanded Jonesville Station and Albion Road Stations includes regulation facilities and tie-ins to adjacent XHP networks which provides enhanced operational flexibility to the existing distribution system and will support maintenance, integrity, and abnormal

operating conditions. Buttonville Station will provide a second source of supply to the NPS 30 Don Valley line.

36. The new pipelines will add the capacity needed to support the reduction in operating pressures in the NPS 26 and NPS 30 Don Valley lines. Lowering the operating pressure of these lines will reduce the risk of an event causing a prolonged outage of the line, and reduce the probability of significant supply chain impacts and the disruption impact to the community.
37. As the anticipated growth materializes over the 2015 to 2025 period considered by this project, it is expected that additional localized HP reinforcement will occur to further support this growth. These reinforcements are included in the Company's 10-year Asset Plan, and are included in the Economic Analysis in Exhibit E, Tab 1, Schedule 1. These reinforcements are not being proposed in this application and will be filed at a later date in parallel with system need.

Entry Points into the Distribution System

38. As demonstrated in Exhibit A, Tab 3, Schedule 3, system risks presently exist where upwards of 270,000 residential customer outages, plus the loss of PEC, may result from a complete station failure at Parkway Gate Station. Parkway West Gate Station will provide diversity to the existing Parkway Gate Station and provide a back-up feed to this station. This means that Parkway West would be able to maintain the reliable supply of natural gas to downstream customers in circumstances that warrant a full or partial shutdown of Parkway Gate Station. In addition, the Bram West Interconnect, along with Segment B, could mitigate the impacts of a capacity shortfall at Victoria Square Gate Station. The additional

capacity supplied by the proposed entry points would be immediately available to compensate for lost capacity in the downstream networks.

39. Parkway West Gate Station will have the ability to displace gas supply flows currently delivered to the GTA through Lisgar Gate Station. As mentioned in Exhibit A, Tab 3, Schedule 3, Lisgar, the oldest gate station in all Enbridge franchise areas, is operated on cold winter days approaching peak day demand. Otherwise, Lisgar is typically operated as a district station. Similar to the decommissioning of Union Gas' Trafalgar Compressor Station one block west, Enbridge expects to downgrade this site to a district station to re-purpose the asset and extend its asset life. This will be possible once the Parkway West facility is in place. The re-purposing of Lisgar Gate Station is not included in this application; however, it is anticipated that it will be included in the Asset Management Plan at a future date.
40. Bram West Interconnect will provide another major interconnection with the upstream system to access supplies from Dawn or other sources, for example, supplies sourced at Niagara Falls. In conjunction with the Segment A pipeline from Bram West to Albion, it will be capable of delivering additional gas supply volumes, up to 800 TJ/d, to Albion Road Station for further delivery downstream which is further described below.
41. In combination, the proposed facilities provide alternate supply sources for all of the major XHP supply lines within the GTA, increasing the diversity of path and reliability of the supply chain.

Upstream Transportation

42. Segment A will provide a means to reduce the Company's reliance on discretionary services and facilitate greater flexibility in procuring gas supply and distributing it to key locations in the distribution system. It will have the capacity to bring an additional 800 TJ/d into the system to support customer growth. As described in Exhibit A, Tab 3, Schedule 5, the Company will be able to reduce its reliance on less secure (short term and interruptible) long haul transportation from Western Canada with more secure short haul firm transportation from emerging U.S. North East and Dawn supplies.

43. Beyond the GTA, it is expected that the addition of the proposed pipelines and facilities will assist in system reliability in other parts of the Enbridge franchise. The GTA has the only distribution system connected to both Union Gas and TransCanada systems. The flexibility and diversity provided by the new major entry point, pipelines, and associated facilities could provide the Company the ability to accept delivery shortfalls within the GTA and free up gas supply required in other areas, such as other regions within the Central Distribution Area ("CDA") and Eastern Distribution Area ("EDA") that do not have diversified upstream supplies.

44. Throughout this application, the Company has described how the proposed pipelines and facilities are required to support the customer growth forecast to 2025, enhance the diversity and flexibility of the gas supply chain, and support the operational risk management challenges in maintaining safe and reliable delivery to customers.