# Appendix 1: Membrane Replacement Report (Stantec)

**PORTAGE + MAIN - CONCOURSE MEMBRANE RENEWAL**
Final Draft Submission

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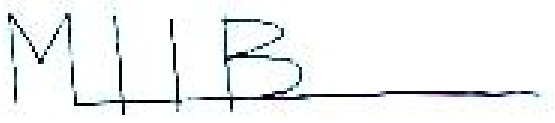
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# EXECUTIVE SUMMARY

In 2017, the City of Winnipeg (The City) identified Portage Avenue and Main Street as a priority for renewal to improve walkability, safety, and connectivity. In 2021, HTFC Planning & Design together with Stantec Consulting Ltd., Stantec Architecture Ltd, and Brook McIlroy, were commissioned by the City to conduct a "vision report". or conceptual study, to renew the concourse membrane and re-imagine how this historic intersection could once again enhance and contribute to the quality of life of the surrounding community and downtown. The purpose of this report is to provide an overview of existing conditions based on information provided by the City, outline the scope of below-grade work to renew the concourse membrane including the waterproofing membrane and associated structural, geotechnical, and mechanical considerations, impacts on existing underground municipal utilities and proposed solutions, traffic management and staging plan and a Class 4 cost estimate (hereinafter referred to as the "project"), below the iconic historic intersection – Portage and Main.

Stantec's multi-disciplinary team attended meetings, reviewed the available documents, and conducted a conceptual study to recommend a preliminary extent of scope, and explore construction methods, stages, and potential impacts during construction.

**Defining the Extents of Work:**

Together with the City of Winnipeg, the conceptual working limits of the project were developed to establish the extent of the project scope with the intent to renew or upgrade the underground utilities in accordance with the City of Winnipeg renewal requirements for sewer assets based on pipe condition ratings for watermain and sewer works within and adjacent the extents of the concourse membrane renewal. These conceptual working limits are defined as Area 1 and Area 2 (see Appendix A). Area 1 outlines the watermain and sewer works that fall within and/or within reasonable distance of the concourse membrane renewal while Area 2 defines the watermain and sewer works that extend beyond Area 1 where street surface work is planned to be completed.

Stantec recommends that closed-circuit television (CCTV) inspections be conducted prior to pavement work to understand the condition of manholes and sewer lines and define the scope of work in terms of repairs, replacements, or cured-in-place pipe (CIPP) treatments.

**Soil Considerations**:

Considering Winnipeg's typical soil conditions, moderate to heavy groundwater seepage and soil sloughing are expected during the excavation and construction works. Given these soil conditions, open excavation is not recommended as it is susceptible to short- and long-term issues related to soil disturbance, backfilling, and slope failures. A shoring system for the excavation is recommended. Various shoring options including soldier pile and timber lagging, sheet pile wall and rakers, tangent piles, and secant piles were briefly explored. The original shoring might in the ground, but re-use is unlikely as its condition might be unusable.

To meet the long-term performance requirements this project must consider high groundwater, swelling/heaving clays, corrosion, and sulphates in the clay. A comprehensive geotechnical report is recommended to identify the fully extent of geotechnical challenges and address them in the next design phase.

**Structural Considerations:**

It is recommended that the waterproofing system be selected and designed to have a long service life to match the remaining service life of the existing underground structure. It is recommended that a lifecycle study of existing underground concrete structure be developed to guide the final design of the new waterproofing system. The structural lifecycle study should be completed prior to commencing with the next design phase to confirm its viability, more fully understand the existing structural conditions and identify any additional necessary repairs to the structure prior. If the roof is determined to be in good condition, repairs would be anticipated and confirmed when the roof is excavated. Further exploration of keeping or replacing the existing concrete floors is discussed in section 3.3.2. Based on the site photos of recent investigations, the concrete floor is typically built on a metal deck, exhibiting corrosion at various sections. It is recommended that the existing concrete slabs be removed and replaced in both membrane renewal options described below but differ in the extent of the replacement and the corresponding expected remaining service life.

**Membrane Renewal Considerations:**

Two membrane renewal options (i.e., Option 1 – positive side waterproofing and Option 2 – negative side waterproofing) were explored, and the recommended roof, wall and floor assemblies are summarized within section 3. Based on the long-term objectives of this project and the detailed discussion of the waterproofing work (e.g., scope and extent, substrate preparation, membrane application, and water management strategies, etc.) on roofs and walls, it is Stantec's opinion that the overall viability and long-term performance of Option 1 outweighs Option 2 in several critical aspects. Further considerations including work within the crawl space below the floor assembly are also included.

**Transportation Considerations:**

The Portage Avenue and Main Street intersection and below grade concourse are critical infrastructure for transportation through the downtown and a busy crosstown link for pedestrians, motor vehicles, public transit, and bikes. Disruption of the traffic flow through the intersection will have far reaching impacts. A Traffic Management Plan (TMP) which keeps Main Street traffic flowing through the work site through the use of temporary bridging of the work site has been proposed. This proposal maintains traffic flow along the Main Street Corridor and provides alternate routing for traffic approaching and passing across Main Street. The TMP requires refinement to provide a schedule for rerouting traffic flows and maintenance of pedestrian traffic that supports the detailed work plan for membrane replacement and utility work to develop a detailed staging schedule.

To ensure that designs for traffic accommodation are based on and support expected changes in traffic flow, the TMP requires the development of a comprehensive simulation model that will inform stakeholders of expected impacts and to inform the city of required supporting infrastructure improvements. It is recommended that this model will be built on the existing models developed for the city through the Transit Master Plan. It is further recommended that this model include analysis for AM and PM peak periods.

Rerouting of existing Transit service will be required, and any temporary revisions should consider the final revised routing proposed in the Transit Master Plan.

**Cost Summary:**

A cost summary table is provided in Section 6 including the opinion of probable costs for below-grade watermain and sewer utilities, budget implication for transportation management plan, and class 4 cost estimate of the option 1 (recommended) waterproofing replacement work. Detailed costs are included in Appendix B and Appendix C.

# 1 INTRODUCTION

Winnipeg's iconic historic intersection, one of the most famous in Canada – Portage and Main (Figure 1), has long been part of our City's narrative, playing a key role in both the physical and cultural landscapes. In October of 2017, City Council identified Portage Avenue and Main Street as a priority for renewed purpose and investment that allows for full use by everyone, pedestrian (both at and below grade) and vehicle, to increase walkability, safety and connectivity throughout the entire downtown. While the results of the subsequent 2018 plebiscite set aside plans for pedestrian crossings at grade, the City is proceeding with planning other enhancements and asset renewals at this landmark location.

The most significant aspect of the infrastructure renewal at this intersection is the concourse membrane renewal separating the underground concourse from its surroundings. The 40-year-old membrane is located two to three metres below the street level, and is at the end of its useful service life. The membrane below the street can only be accessed from above, therefore access for renewals presents a significant challenge. It is desired that any investment in streetscape design enhancements, as well as renewals of aged and buried utilities be coordinated with membrane renewal work.

This report provides an overview of the existing conditions based on information provided by the City, conceptual solutions for membrane renewals, impacts on existing underground utilities and proposed solutions, traffic management and staging plan, and the Class 4 cost estimate.




**Figure 1. Aerial view of Portage & Main, Source: Google Earth**

# 2 EXISTING CONDITIONS

## 2.1 DOCUMENT REVIEWS

The following documentation in Table 1 was made available to Stantec to assist with the review:

**Table 1. Summary of Existing Documents**

| Document Name | Date | Description |
|---|---|---|
| Architectural Drawings | Circa 1976 | PDFs with scanned drawings of original architectural partial set |
| City of Winnipeg Synchro Model | 2019 traffic volumes | Existing traffic volumes for AM, PM and Average traffic flows on streets in Downtown Winnipeg. |
| Structural Drawings | Circa 1977 | PDFs with scanned drawings of original structural partial set |
| City of Winnipeg Hydrogeological Investigations | April 15, 2020 | PDFs with pages extracted from a report |

## 2.2 THE CONCOURSE

The concourse is located below street-level at Portage and Main and provides pedestrian access between sidewalks and buildings adjacent to the intersection. Refer to Figure 2 for plan view of the concourse level. The concourse contains below-grade commercial spaces, as well as an interconnected ring tunnel with a square cross section (Figure 3). The structural components of the concourse are a hybrid of cast-in-place concrete and steel construction.

The existing drawings indicate that the cross section of the concourse is constructed of cast-in-place concrete on concrete piles, including concrete for the roof, wall, and floor assemblies. Based on previous on-site investigations by Stantec, the floor structure is constructed of concrete topping on steel decking on concrete beams, which does not reflect the original architectural drawings. The existing water management and waterproofing strategy of the concourse is unclear. However, we assume that a waterproofing membrane was provided at the exterior (excavation side) of walls and roofs. Therefore, the concourse tunnel is exposed to below-grade loading and ground moisture from all four directions.

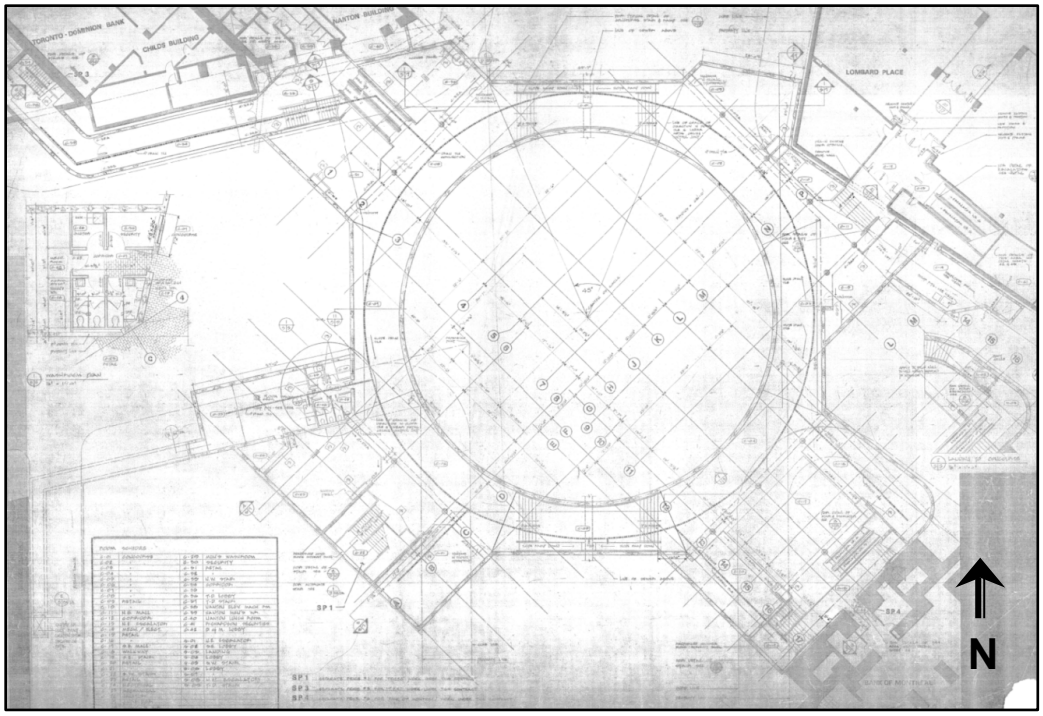



**Figure 2. Plan view of concourse level at Portage and Main, excerpted from Arch. Dwg A5**

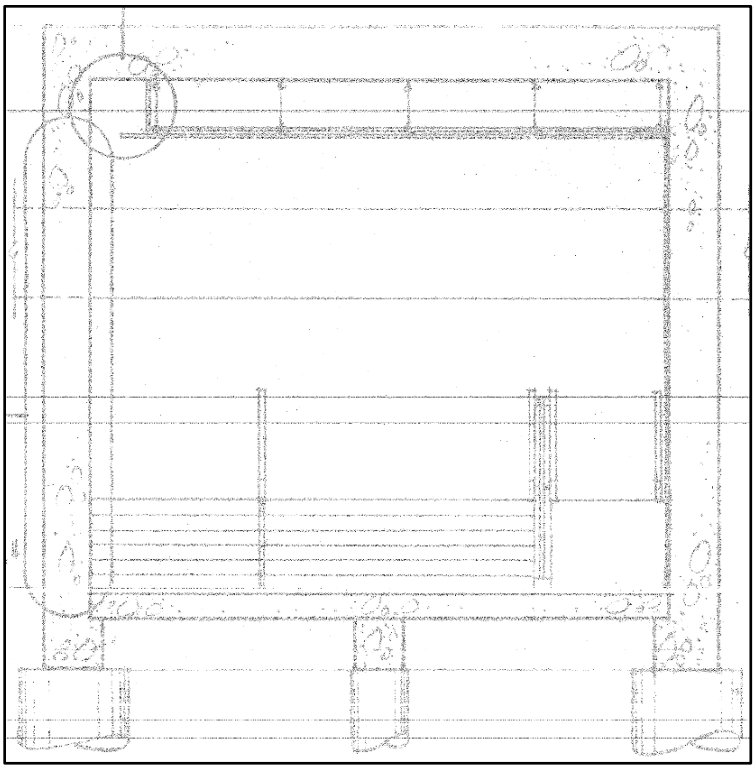


**Figure 3. Cross section of the below-grade concourse tunnel, excerpted from Arch. dwg. A9**

## 2.3 WATER AND SEWER UTILITIES

To better define the scope of work in terms of the watermain and sewer works within the Portage & Main Visioning Study, Stantec submitted overall conceptual working limits to the City for review (Figure 4). The reasoning behind these working limits was that where the concourse membrane renewal will take place, there will be the opportunity to expose and review all below grade utilities between the finished surface and underground concourse structure, including the identified water and sewer mains located in this area.

Beyond the limits of the concourse membrane renewal, it has been thought that there could potentially be various surface works (pavement resurfacing/reconstruction) that could take place in the surrounding area of the Portage and Main intersection. These are the overall conceptual working limits, where various watermain renewals and sewer improvements may be completed. Upon review of the overall conceptual working limits, the City of Winnipeg was in agreement with Stantec's planning methodology.

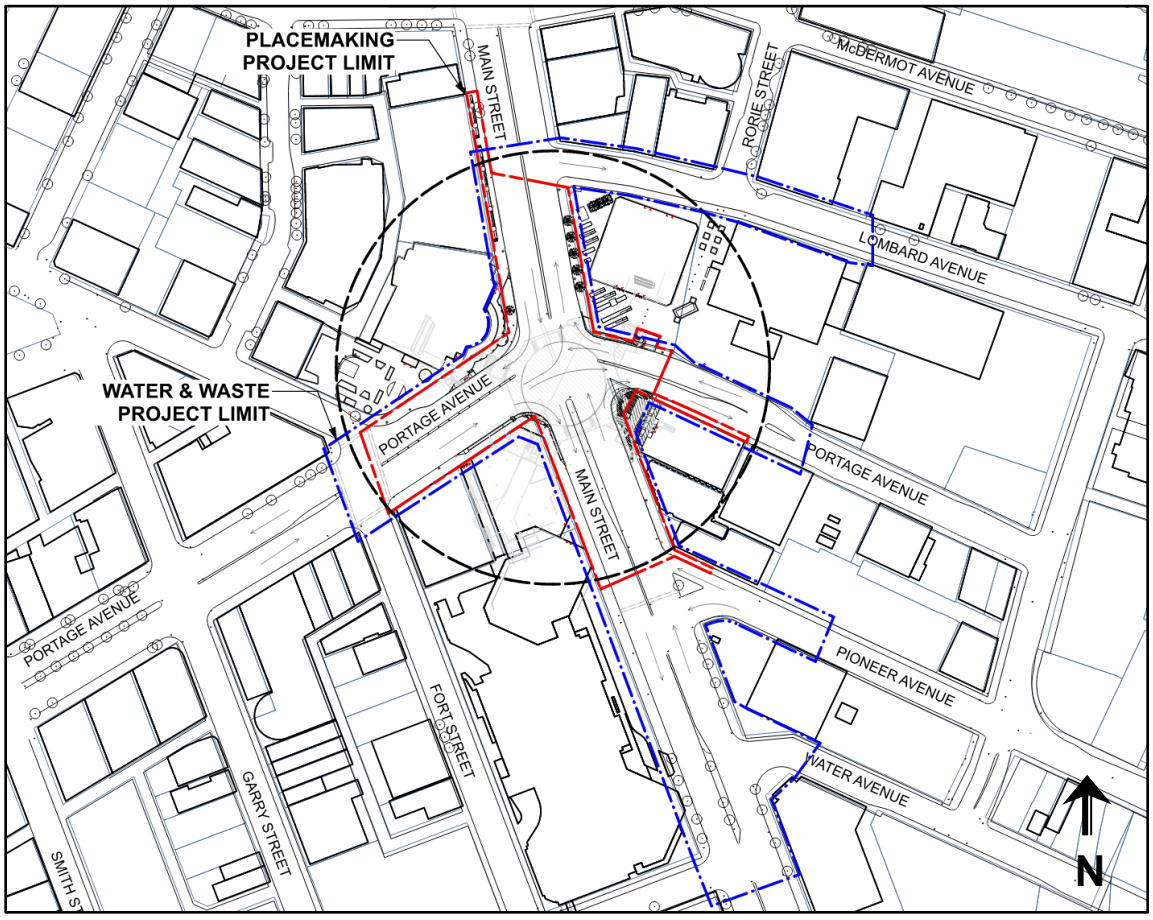



**Figure 4. Overall working limits and placemaking project limits**

These limits were even further defined to separate the watermain and sewer works into two areas. Area 1 is defined by all the watermain and sewers that fall within the concourse and within reasonable distance of the concourse membrane renewal (Figure 5). Area 2 is defined by all the watermain and sewer works that fall directly outside of Area 1 and extend to the absolute overall working limits, where surface works would be completed beyond the membrane renewal (Figure 6). Area 2 is the region that reasonably would be upgraded as part of the revisions to the Portage and Main intersection. Refer to Appendix A for details of Area 1 and Area 2.




**Figure 5. Approximate extent of Area 1**

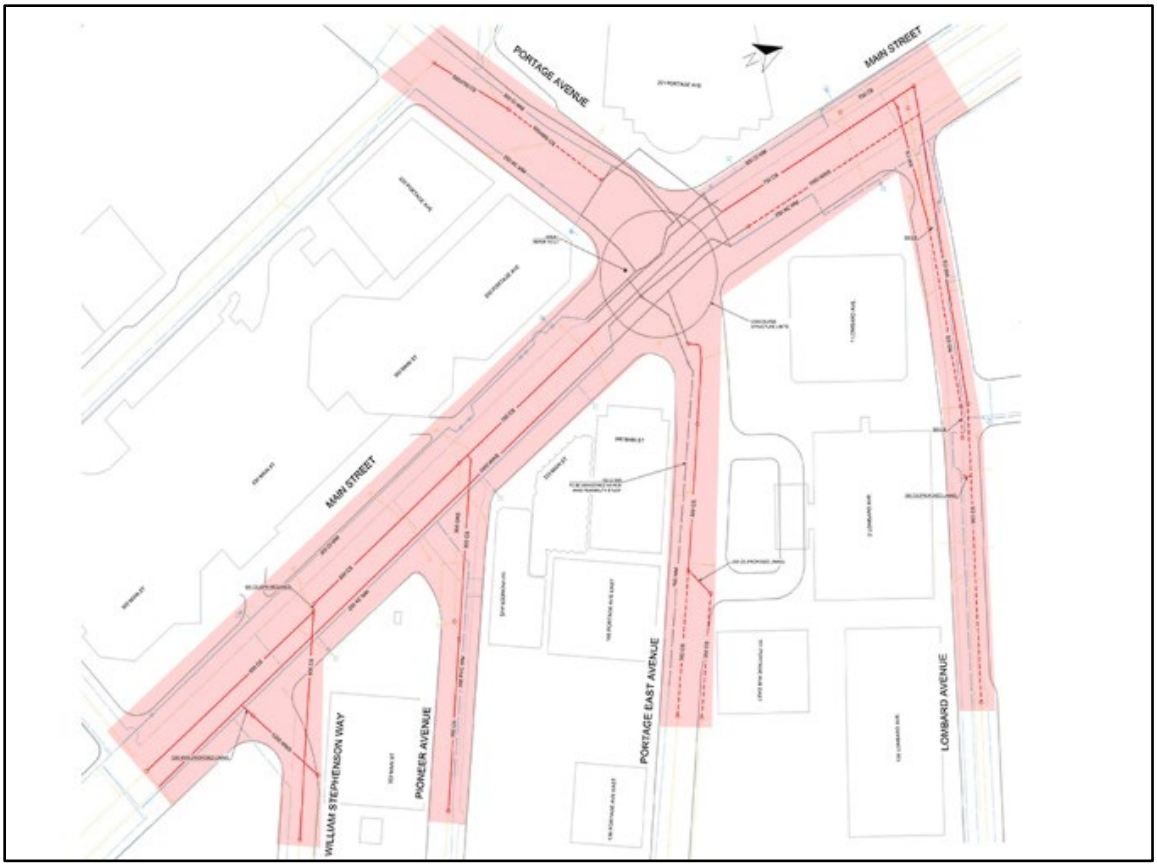



**Figure 6. Approximate extent of Area 2**

Upon review of existing record drawing information provided by the City, it is our understanding that the existing watermains along Main Street and Portage Avenue are comprised of a mixture of cast iron and asbestos concrete. Cast iron pipe would normally identify as a good candidate for renewal or replacement, based solely on the material type. If asbestos concrete has a history of watermain breaks and requires frequent repairs, it would also identify as a good candidate for renewal or replacement. If there are sections of watermain that do not have a history of breaks or frequent repairs, the watermain would most likely remain as is. Various side streets connecting to Main Street; Lombard Avenue, Pioneer Avenue and William Stephenson Way have been previously renewed with PVC pipe.

There is a 1950mm interceptor sewer along Main Street that carries wastewater to the North End Water Pollution Control Centre (NEWPCC). The City's My Utility Info GIS System currently has assigned a structural performance grade (SPG) of 3 for the section of interceptor sewer that falls within Area 1 and Area 2 limits; and is approaching a SPG rating that would require Asset Management's immediate attention. Current City of Winnipeg Asset Management funding levels prioritizes all SPG 5 and more critical SPG 4 sewers, to be addressed. Upon inspection, the ultimate goal is to maintain assets at SPG 3 or lower. Manholes and sewers of various sizes (200mm-1200mm) are present within the working limits and have been previously assigned SPG ratings from 1 to 5 based on completed closed-circuit television (CCTV) inspections. Typically, during the detailed design stage of pavement renewal/rehabilitation

projects, a CCTV inspection on all sewers and manholes within the working limits would be completed to provide a condition assessment and make recommendations on any repairs or renewals that should be completed in advance of the proposed pavement works. As we are in the conceptual design stage, CCTV review of existing sewer assets has not been completed at this time, and assumptions are made based on the SPG ratings to determine whether manholes and sewers would require any repair or cured-in-place pipe (CIPP) sewer lining installation, which would extend the sewer's life, without fully replacing the sewer piping.

Using as-built information provided by the City, Stantec provided figures to the City of Winnipeg Water and Waste Department (WWD) to review and compare existing infrastructure information within the working limits – as described above. The City of Winnipeg WWD provided feedback, which included some insight regarding the City's plans to manage the watermain and sewers within Area 1.

## 2.4 GEOTECHNICAL INFORMATION

The Winnipeg area consists of fat clay, some silt, overlying glacial till, overlying bedrock. The upper two to three metres of fat clay is brown and over consolidated, and transitions to grey normally consolidated clay with silt content increasing with depth. Trace fine sand and occasional boulder(s) are known to existing within the fat clay layer. Boulders and cobles are regularly found in the glacial tills. The bedrock is typically described as a limestone.

Moderate to heavy groundwater seepage and soil sloughing are expected during the excavation and construction works. The groundwater could originate from a shallow silt layer, the glacial tills and the bedrock. The groundwater from the glacial tills and the bedrock is usually under pressure and could rise as much as 2 to 3 meters from the ground surface.

# 3 CONCOURSE WATERPROOFING SYSTEM

## 3.1 GENERAL CONSIDERATIONS

The concourse waterproofing membrane is over 40 years old and is near the end of its useful service life. Following is a list of high-level considerations of the new waterproofing system replacement work.

- Unlike above-grade building components, the cost of access to repair and renew below-grade building components can be many times more than the direct cost of the essential repair or renewal. Therefore, the importance of durability and longevity of the waterproofing system outweighs its direct cost. The waterproofing system shall be selected and designed to have a long service life and ideally to match the remaining service life of the existing underground structure. A lifecycle study of existing underground concrete structure needs to be determined to guide the design of the new waterproofing system.

- Certain types of waterproofing systems have the advantage of localizing the water ingress area if it occurs. These systems typically include fully adhered membranes to the underlying substrates. Unlike loose sheet membranes, fully adhered membrane waterproofing systems prevent the free flow of water between the membrane and substrate layer. The new waterproofing system should be selected in the design stage to provide the opportunities to locate a failure if this failure occurs and to be able to address this localized failure from interior where accessible.

- Active leak detection monitoring systems can be incorporated to provide advanced alerts related to potential moisture intrusion below the membrane layer and allow for localized repairs where necessary.

- The soil condition adjacent to the tunnel structure can directly affect the viability of the existing concrete structure. For instance, the presence of sulfates near concrete can result in sulfate attack and degrade the concrete (e.g. chipping, spalling, cracking etc.). Contaminated soil containing oil and other foreign agents can also degrade certain types of new waterproofing membranes and result in systemic failure. Soil conditions must be verified to provide the basis of design.

- A hydrogeological investigation report dated April 15, 2020 and supplied by City of Winnipeg was reviewed to understand the water table conditions. Based on the report, the groundwater level in carbonate aquifer shows a continually rising trend since 1960’s with a stabilizing level from 2010 to late 2019. It appears that the groundwater levels in the carbonate aquifer have exceeded the geodetic elevations of the slab at the Portage and Main Concourse site on numerous occasions since 1985. The new waterproofing system will need to be installed to handle consistent hydrostatic pressures on the concourse structure. Refer to Figure 7.

- The overburden over the concourse roof can affect the waterproofing performance. If roof drains are not designed or installed, the overburden needs to be designed to promote surface drainage

and reduce the amount of water that migrates down to the roof level. The goal is to avoid a saturated subsurface and therefore reduce the hydrostatic load over the roof.

- Unlike new construction, the waterproofing of existing structures such as stairs, adjacent buildings, and planter walls can have a number of limitations (e.g., accessibility to work, compatibility with existing materials, substrate condition and preparation, ease of installation, etc.). These limitations can change the detailing in certain areas from achieving the ideal scenario. These limitations shall be understood prior to construction. Waterproofing redundancy will need to be designed to reduce the risk at these limitations. In the worst-case scenario, a monitoring and maintenance plan or localized repairs will need to be developed to prevent localized failures becoming systemic failures.

Stantec has included proposed waterproofing systems **Option 1** and **Option 2** as below. The waterproofing system in Table 2 (**Option 1)** is a conventional system with above considerations factored. The waterproofing system in Table 3 (**Option 2**) comes with increased risk and it can be regarded as a remediation measure.

It should be noted that although the proposed assembly in **Option 1** has a proven performance record, its effectiveness may not apply to all areas and sections of the entire concourse, and is subject to be adjusted based on the as-built conditions (e.g., adjacent building foundation, watermain pipes and manholes immediately over the roof, etc.) in the event field conditions do not match the as-built drawings.

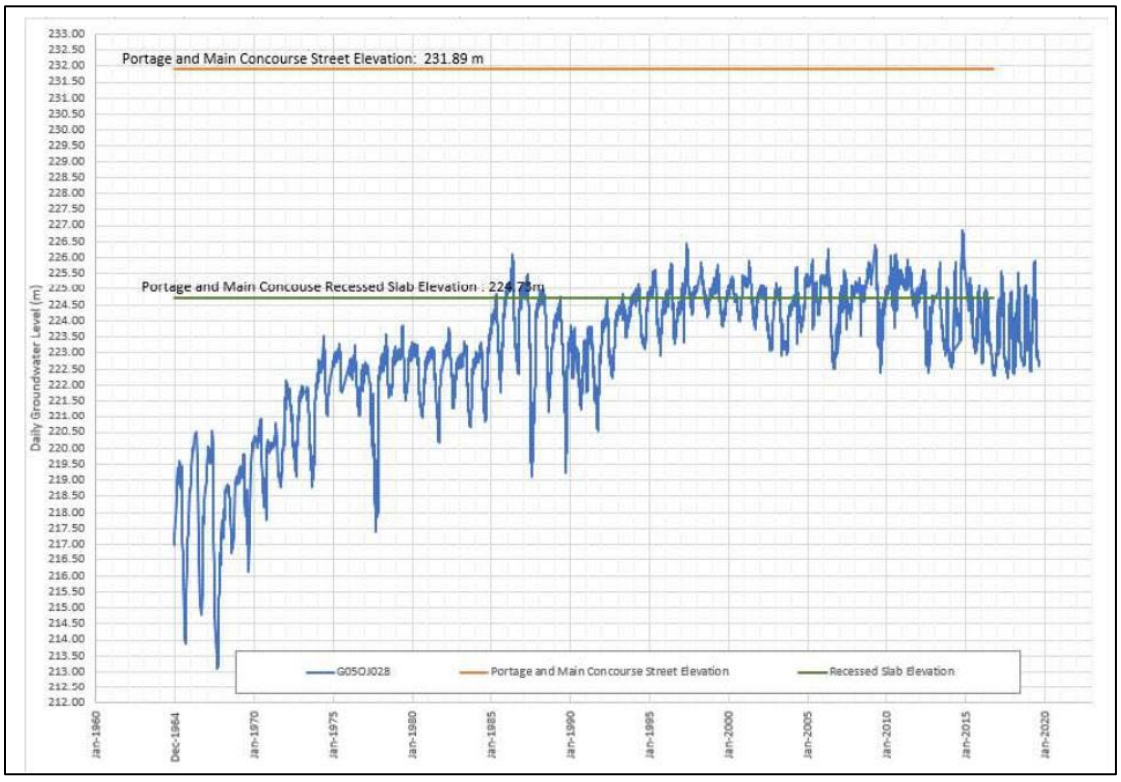



**Figure 7. Groundwater levels near the Portage and Main site**

**Table 2. Proposed Assemblies - Option 1, Recommended**

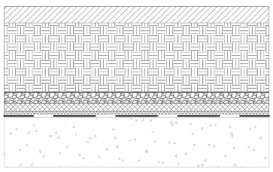
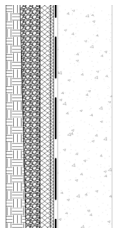
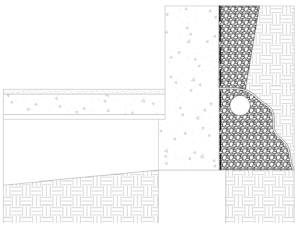
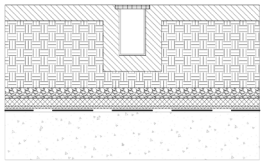
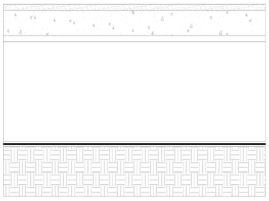
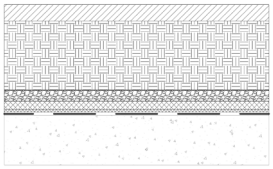
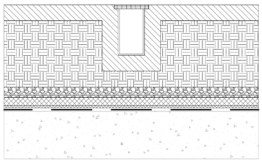
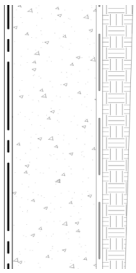
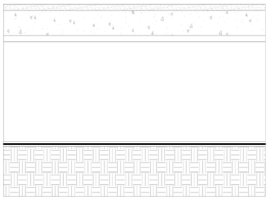
| Assembly | Make-up | Graphic Representation |
|---|---|---|
| Concourse Roof (from top to bottom) | • Impervious surface layer<br>• Aggregate drainage layer<br>• High density XPS Insulation<br>• High strength drainage mat<br>• Multi-ply SBS modified bitumen sheet membrane OR hot-applied rubberized asphalt waterproofing<br>• Existing structural concrete roof slab (Crack injection would be required to seal cracks) |  |
| Concourse Walls (from exterior to interior) | • Back-fill soil<br>• Aggregate drainage blanket<br>• High density XPS insulation<br>• High strength drainage mat<br>• Multi-ply SBS modified bitumen sheet membrane<br>• Existing structural concrete wall (Crack injection would be required to seal cracks) |  |
| Perimeter drain if applicable (from inside to outside) | • PVC drainage pipe with smooth inside surface along the tunnel and above the historic groundwater levels.<br>• Aggregate blanket surrounding the drainage pipe<br>• Filter fabric to fully capsulate the aggregate blanket |  |
| Drainage trench over roof if applicable | • Impervious surface and surface drainage trench |  |
| Concourse Floors (from interior to exterior) | • Interior<br>• Floor Finishes<br>• Existing concrete floor on steel deck OR new concrete floor slab (refer to section 3.3.2)<br>• Existing crawlspace with new sump pit / pumping system<br>• New 15-mil high density polyethylene vapour barrier, taped at seams and terminations (refer to section 3.3.1)<br>• Existing soil |  |

**Table 3. Proposed Assemblies - Option 2, Alternate (not recommended by Stantec)**

| Assembly | Make-up | Graphic Representation |
|---|---|---|
| Concourse Roof (from top to bottom) | • Impervious surface layer<br>• Aggregate drainage layer<br>• High density XPS Insulation<br>• High strength drainage mat<br>• Multi-ply SBS modified bitumen sheet membrane OR hot-applied rubberized asphalt waterproofing<br>• Existing structural concrete roof slab (Crack injection would be required to seal cracks) |  |
| Drainage trench over roof if applicable | • Impervious surface and surface drainage trench |  |
| Concourse walls (from interior to exterior) | • Crystalline coating<br>• Existing structural concrete wall (Crack injection would be required where cracks are found).<br>• Existing waterproofing membrane<br>• Existing backfill |  |
| Concourse Floors (from interior to exterior) | • Interior<br>• Floor Finishes<br>• Existing concrete floor on steel deck OR new concrete floor slab (refer to section 3.3.2)<br>• Existing crawlspace with new sump pit / pumping system<br>• New 15-mil high density polyethylene vapour barrier, taped at seams and terminations (refer to section 3.3.1)<br>• Existing soil |  |

## 3.2 WALLS AND ROOFS

Excavation along the inner wall of the ring appears to be less destructive than the outer side which exhibit changes of plane at many instances and the interaction with adjacent structures. Based on the existing drawing review, excavating approximately eight (8) feet from street level to the concrete roof is anticipated and the waterproofing system outlined in Table 3 **(Option 2)** may be applicable in this case. The waterproofing system in **Option 1** becomes possible only when additional twenty (20) feet excavation from the concrete roof to the crawl space is achievable. The excavation scope of these two options may vary significantly.

### 3.2.1 WATERPROOFING CONSIDERATIONS OF ROOFS

Concrete roofs constitute a major part of the existing concourse structure. Roof, being the foremost assembly to resist hydrostatic load, needs to be prioritized.

- **Scope and Extent** — Notwithstanding the unknown as-built condition, based on the drawing review, the concourse concrete roof extends all the way to the adjacent building foundations either with minimum clearance (Figure 8) or beyond the property line and connect to the adjacent structure (Figure 9). This condition may have a larger impact for the overall scope. The new waterproofing membrane may need to terminate short or extend beyond and tie in with the adjacent structure's waterproofing system. This issue can impact the continuity and integrity of the waterproofing system as well as the extent of the excavation work. It should be carefully considered within the design stage and reviewed with the adjacent building owners as the termination may represent a potential weak point in the system and owners need to be made aware so they can plan accordingly and reduce the risks later.

- **Roof Slope, Drain and Subgrade Water Management** — Based on the drawing review, the concrete roof does not appear to be designed with slope nor with roof drains. This observation may indicate that the storm water trickling down from the above-grade surface can turn the roof to a "water tank" that needs to resist consistent hydrostatic pressure (Figure 10). An impervious surface layer may provide advantages to promote surface drainage and avoid sub-surface water saturation. However, it may also simultaneously reduce the moisture evaporation rate of the subsurface. Portage and Main serves as a traffic intersection and most of the ground is with impervious surface. Therefore, a trench drain may be designed to collect the surface water and direct it to municipal sewer system, if applicable. Whether the concrete roof is structurally sloped and drained is unknown. Sloping the roof by pouring an overlay for example would help to direct water from the roof to the sides of the concourse but the value of the work would have to be confirmed by the membrane supplier. If there is little benefit from the supplier than this sloped topping might be avoided. Repairs to the roof should be anticipated and confirmed once the roof is exposed which might include patching and crack injecting.

- **Roof Planters** — Cast-in-place concrete planters are constructed directly above the roof at corners (Figure 11). The concrete planter creates a challenge for maintaining the continuity of the waterproofing membrane. Treatment of the existing concrete planters or the alternative detailing

of waterproofing membrane needs to be reviewed in detail. Based on the existing drawings the planters are placed on all four corners of Portage and Main. Further information on the extent of planters can be obtained from structural drawing S-17. The other issue of having planters is that the plant roots can extend downwards and damage the existing waterproofing membrane. As a result, additional protection including root barriers should be incorporated into the design of the new waterproofing system. The future vision of keeping or removing existing planters is not completely determined. If removing and creating new planter is targeted as part of new landscaping project, the continuity of new waterproofing membrane can be expected by incorporating a “starter curb detail” where the new waterproofing membrane can be slightly raised above the “primary drainage surface” and bypass the concrete planter wall. This detail can solve the membrane continuity issue and increase the waterproofing integrity. (Figure 12).

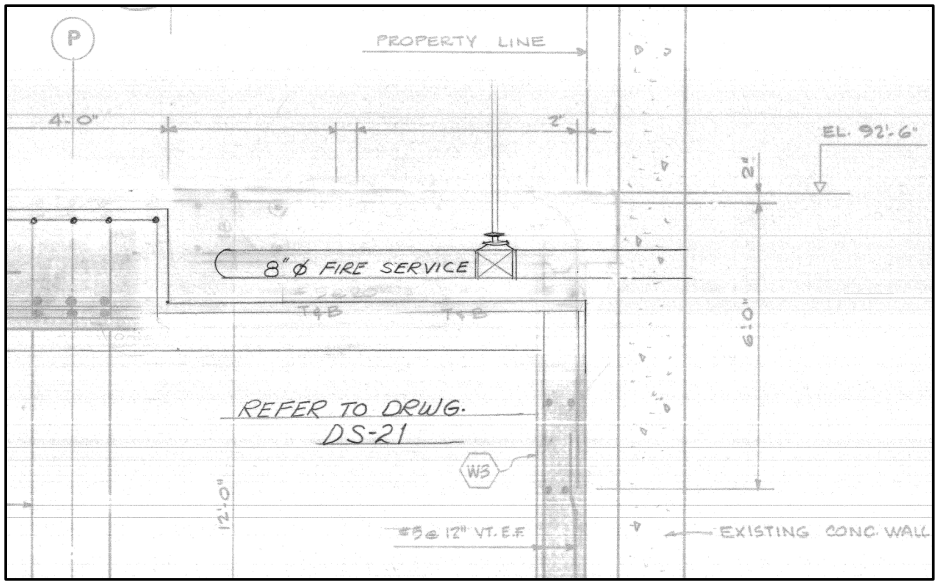



**Figure 8. Clearance between tunnel and the adjacent building, excerpted from Strut. Dwg. S9**

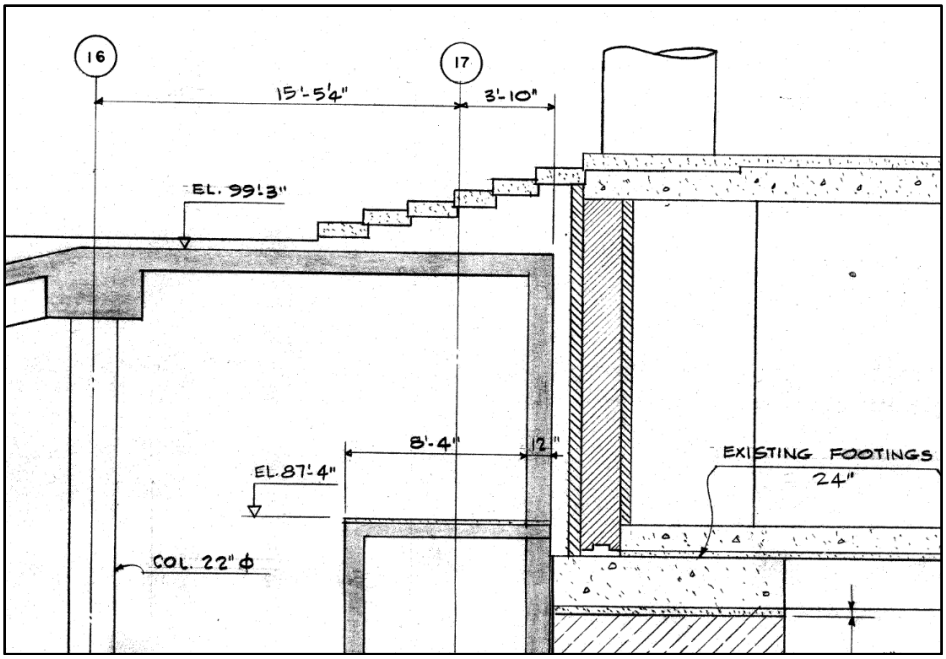



**Figure 9. Tunnel structure is adjoining the adjacent BMO building, excerpted from Strut. Dwg. S16**

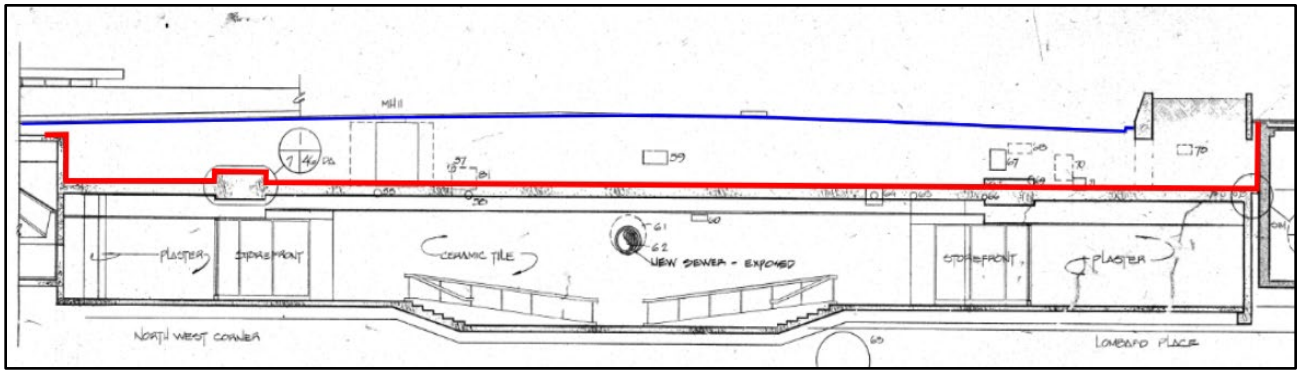



**Figure 10. Cross section showing the northwest corner street surface layer (blue) and the assumed waterproofing layer (red) over the concrete roof, excerpted from Arch. Dwg. A7.**

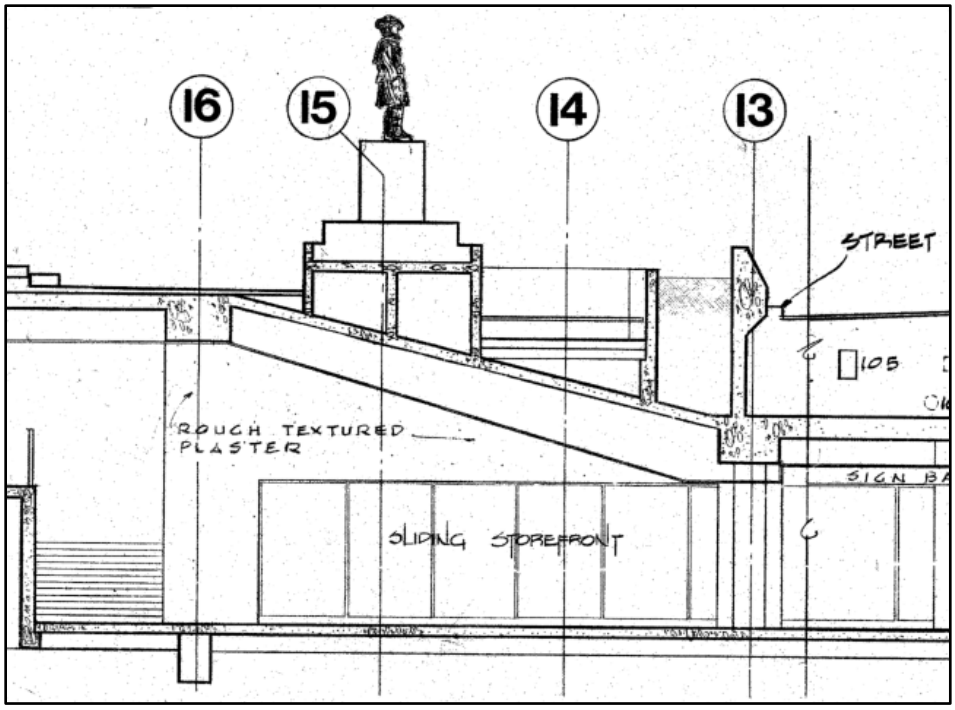



**Figure 11. Concrete planters over the concourse roof slab, excerpted from Arch. Dwg. A7**

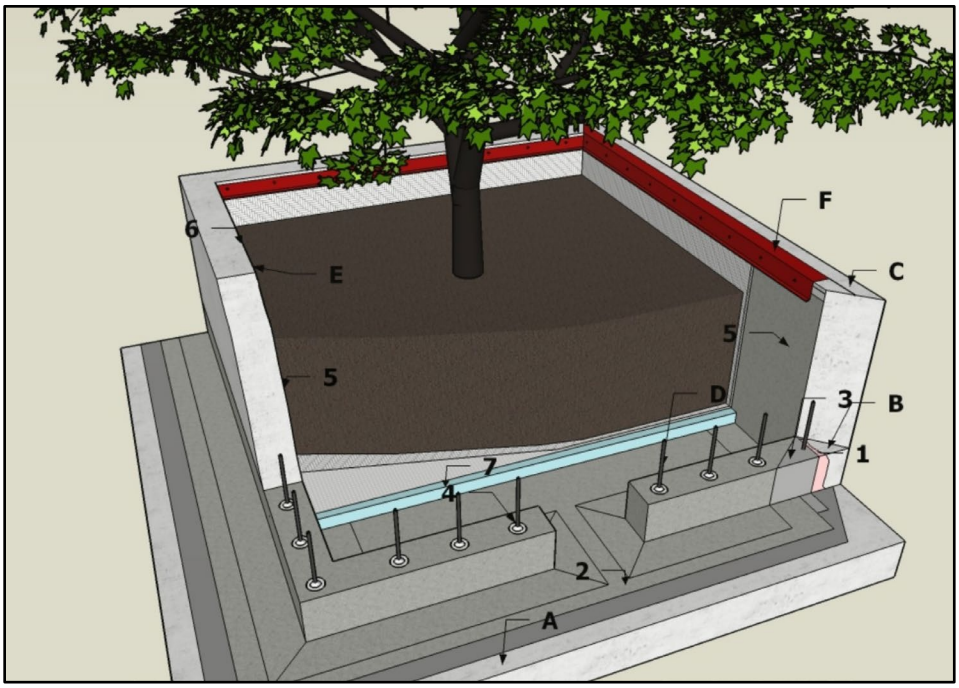



**Figure 12. Planter wall starter curb detail, excerpted from RCABC Roofing Practices Manual**

## 3.2.2 WATERPROOFING CONSIDERATION OF WALLS

The concrete wall may be designed to receive either positive side waterproofing (**Option 1**) or negative side waterproofing (**Option 2**). Positive side waterproofing is mostly used in new construction whereas negative side waterproofing is used in remediation work to accommodate existing conditions.

If positive side waterproofing system in **Option 1**– SBS modified bitumen is selected, significant excavation and shoring work both is anticipated. The means and methods of excavation will need to be explored. Aside from this, the following are additional considerations specific to the proposed SBS modified bitumen waterproofing system.

- **Protection of Installed Components** — the concrete wall poses unique requirements for the waterproofing work. Installing waterproofing membrane on vertical surfaces can require additional care and stabilization of the new components once installed (e.g. temporary securement of drainage mat and insulation). The goal is to protect the installed assembly and prevent dislodging of panels until backfilling.

- **Substrate Condition for Membrane** — the SBS modified waterproofing requires a strong bonding between the substrate and waterproofing membrane. The strong bonding requires the concrete walls and roofs to have a reasonable smooth finish without major cracks, spalling, rock pockets and honeycombs. The removal method of existing waterproofing needs to be assessed so that it does not damage the substrate surface nor create over-smoothed surfaces which can reduce the bonding strength. For instance, using fine sanders tends to polish the surface rather than retaining a mild texture for enhanced adhesion. During preparation, using primers or sealant to fill the holes and recessions should be strictly prohibited. The relative humidity of the substrate must be tested prior to applying the primer. Wood panels or planks originally used to assemble the formwork may lead to narrow liner concrete projections beyond the formed concrete wall surface once the concrete is cured. Tie rods used to brace the formwork may also contribute to the unevenness. These narrow projections create uneven surface and increase the challenge of new waterproofing membrane installation. The original cast-in-place concrete wall surface condition and waterproofing method shall be understood and confirmed when access is available. Given the age of this structure some repairs (e.g., crack repairs, injections, surface patches, etc.) of the existing concrete are expected. Based on the drawing review, the shoring section detail indicates that 4-feet clearance was previously designed between the shoring wall and the concrete wall (Figure 13). This may suggest that the existing waterproofing membrane is likely a positive side waterproofing approach.

  It is also prudent to understand the existence of any expansion joints or movement joints. Design to allow differential movements requires special treatment such as the incorporation of purpose-made expansion joint membranes to maintain the integrity of the waterproofing system, without inhibiting structural movement.

- **Transitions and Change of Plane** — Locations such as wall to roof transitions, corners, change of planes, and wall steps may require additional reinforcement, depending on the waterproofing membrane. The level of the reinforcement shall not be too low so that the membrane can sustain

the differential movement. It should not be too high either as there should be sufficient waterproofing agent contained in the membrane body. Multiple plies in multi-ply SBS sheet waterproofing can provide this redundancy.

- **Other Materials and Accessories** — At select areas such as existing penetrations for services, detailing membranes, liquid applied waterproofing and other accessory materials may be required. These should be compatible with the selected waterproofing membrane system, and ideally provided and approved by the membrane manufacturer.

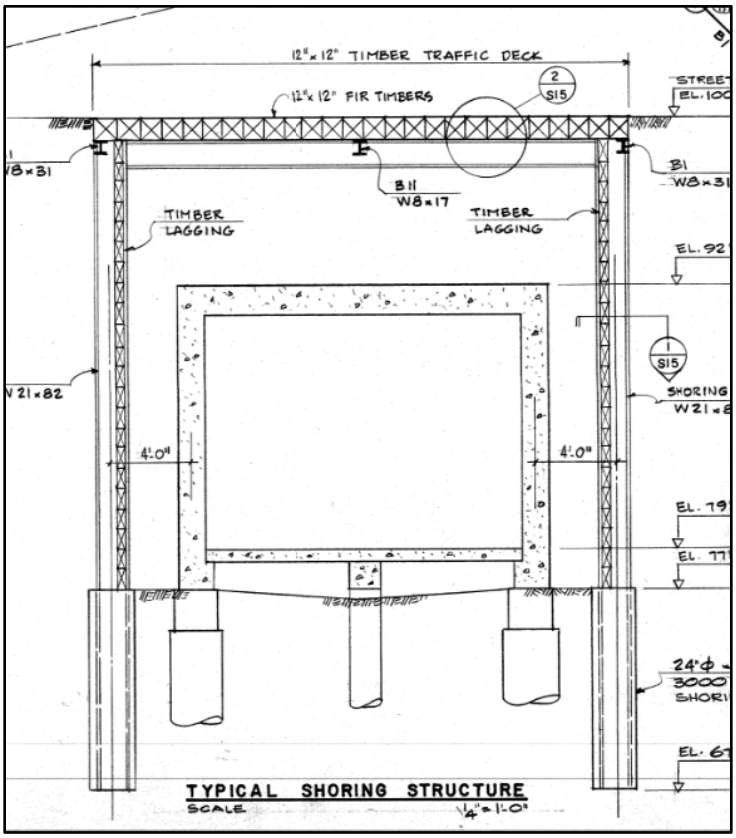



**Figure 13. Clearance between the original shoring wall and the concrete wall, excerpted from Strut. Dwg. S15**

If the negative side waterproofing system – crystalline waterproofing in **Option 2** is selected, there will be less significant excavation work, but the interior concrete walls need to be fully exposed to receive the crystalline waterproofing (except for the ceiling area). In this option, the SBS modified roof waterproofing will need to terminate on the wall and may have a minimum overlap with crystalline waterproofing at the roof-wall transition.

- **Termination of the SBS Modified Membrane on Walls** — In a conventional waterproofing system, the positive side SBS modified waterproofing system is typically brought up minimum 8” above the exterior grade and extended down slightly beyond the footing level. This application

ensures a continuous lateral barrier against both hydrostatic and hydrodynamic water intrusion. If this system is not continuous, such as what was presented in **Option 2** with termination on the foundation wall, the below-grade water can still migrate through the exterior concrete surface area that is not positively waterproofed via surface cracks and move to the backside of the installed waterproofing membrane, resulting debonding or other type of failure mechanisms. Therefore, termination of the waterproofing membrane on the wall as presented in **Option 2**, essentially creates discontinuities, and may have an increased failure rate.

- **The main Advantage of Crystalline Negative Side Waterproofing** — crystalline waterproofing provides one advantage over positive side waterproofing regarding accessibility, as it does not require exterior access to the vertical walls. Crystalline waterproofing can be troweled, brushed, and sprayed onto the walls. The following are considerations specific to the application of the crystalline waterproofing on the negative side (interior side) application.

- **Concrete Structure Protection** — crystalline waterproofing cannot protect the concrete structure from chemical degradation and corrosion from moisture ingress. It cannot protect the concrete from experiencing freeze-thaw cycles. The structural viability assessment and soil condition report should be both conducted and suggest if above is a deciding factor.

- **Movement Joints and Ceiling Application** — Crystalline waterproofing can bridge minor hairline cracks, but it may not perform with movement joints or large cracks. Crystalline waterproofing may not perform well if it gets applied to the ceiling of the structural slab (underneath the slab) mainly due to the gravity force and impracticability associated with the application.

- **Penetrations** — Any fastener penetrations through the crystalline coating from interior can create the discontinuities and void its waterproofing capability. The electrical and mechanical service line attachments within the concourse shall be carefully designed and preferably allocated below the ceiling. The existing finishes, including the artwork at the inner wall of the concourse tunnel may prohibit the use of an interior, negative side waterproofing approach.

- **Structure Lifecycle** — Negative side waterproofing systems generally have limited performance life cycles over positive side waterproofing systems, as they expose the structure to moisture and potential soil chemicals which can increase cracking and degradation. In addition, positive side waterproofing can mitigate the hydrostatic pressures exerted on the vertical walls with the incorporation of a capillary break. With negative side waterproofing, the vertical walls can get exposed to hydrostatic pressure exerted within the adjacent soil medium.

- **Concrete Art** – The entire centre core, 400 feet in circumference, is the largest concrete artwork by a Canadian artist, Winnipeg's Bruce Head. Option 2 would pose a significant risk to, and likely damage the artwork. Additional special consideration would have to be given to the long-term viability of the artwork.

Based on several considerations above, Stantec recommends a positive side waterproofing approach within **Option 1** be implemented for the concourse walls. Accordingly, Class 4 costs in Appendix C are provided for **Option 1** only.

### 3.2.3 GEOTECHNICAL CONSIDERATIONS

Any underground repair works will need to consider soil strength, clay thickness, depth to glacial till, depth to bedrock and groundwater conditions.

Open excavations are not expected to be a reasonable option given the nature of the soil, the depth of the excavation and the requirement for side slopes. Open excavations are susceptible to short- and long-term issues related to soil disturbance, backfilling, and slope failures.

A shoring system for the excavation is a more feasible option. In order of increased difficulty, typical shoring options in Winnipeg include:

- Soldier pile and timber lagging. H piles are driven to refusal, timber lagging install in between the H piles. Soldier piles and timber lagging may still be present from the original construction. Rakers or cross member may be added for additional support. It is simple system, but there are limitations regarding the forces this system can withstand. The existing shoring system might be in the ground but its condition is uncertain and thus as this could be a very large cost change, the use of an old piling system should be ignored.

- Sheet pile wall and rakers. Sheet piles are driven to refusal. Rakers or cross member may be added for additional support. It is a simple system, but there are limitations regarding the forces this system can withstand.

- Tangent piles. Piles are drilled into the clay or bedrock, the pile is made of concrete and steel reinforcing, the piles are constructed adjacent to each other creating a wall. The pile diameter and the reinforcing are designed by the structural engineer according to the forces pushing against the piles. The tangent piles can be left on site and used as part of the structure.

- Secant piles. Primary piles are drilled into the clay or bedrock, the pile is made of concrete but it does not include reinforcement. The primary piles have a space in between them to allow for secondary piles to be installed. Secondary piles are drilled (through concrete and soil) in between the primary piles, the secondary piles are made of concrete and steel reinforcement. The pile diameter and the reinforcing are designed by the structural engineer according to the forces pushing against the piles. The secant piles can be left on site and used as part of the structure. This type of shoring prevents groundwater from the soil been restrained from entering the excavation. However, any groundwater originating from the base of the excavation will still find its way into the excavation.

There have been shoring system failures in Winnipeg which have resulted in damages and delays in construction. An experienced engineer in the design and an experience contractor in the installation of shoring systems is recommended. The cost is included in Class 4 cost estimate in Appendix C with

soldier pile and timber lagging assumed to be the type of shoring. However, this system can change based on the geotechnical report.

The long-term considerations of the site must include high groundwater, swelling/heaving clays, corrosion, sulphates in the clay, and possible other challenges determined by detailed investigations of borehole samples.

A comprehensive geotechnical report is recommended to fully understand the challenges from a geotechnical point of view.

### 3.2.4 STRUCTURAL CONSIDERATIONS

It is recommended to undertake preliminary structural investigations before the membrane renewals work to assess the existing condition of the concourse structure. Provided the preliminary structural investigations determine the structure is viable, detailed structural assessment of the roof and walls at the time of construction will be necessary. Any required structural repairs will need to be completed prior to the membrane renewal work.

As the concrete is only accessible at this time from the interior of the concourse and limited amount of wall is available for testing, a few cores should be taken from the interior roof and walls for testing. As the inner walls are covered with an artwork, and the roof is obstructed by a decorative roof covering, the zones available for testing are limited and sampling should not be construed as exhaustive.

A concrete testing plan is currently under development.

## 3.3 FLOORS

The existing floor structure appears to consist of a reinforced concrete slab over 3" steel deck. The floor is supported by concrete beams, which are subsequently supported by concrete piles. We understand from recent investigations that the steel deck is corroded in some areas. There is a small crawl space below the floor of variable height and would not accommodate a viable working zone unless extensive excavation is undertaken. We believe the steel deck was mainly used as formwork. The beams below the metal formwork are showing corrosion and their life could be formed using ultrasonic thickness testing or coupon sampling. The steel beams are providing support to the slab and further analysis would need to be undertaken to understand the floor support conditions.

### 3.3.1 FLOOR WATERPROOFING CONSIDERATIONS

Waterproofing a suspended floor over a crawl space is a rare case in most buildings. The subfloor structures include piles and grade beams. These configurations along with the application constraints in this case pose a great challenge to continue the waterproofing membrane from the positive side. In most cases of a suspended floor over a crawl space, a vapour barrier is installed over the ground soil and tied to the adjacent structure to reduce the upward vapour migration. This measure is not waterproofing, but can substantially reduce the moisture and other soil gases that migrate to the crawl space, and subsequently reduce moisture-induced corrosion and deterioration in the floor slab. It should be noted that installing the new

vapour barrier within the crawl space while retaining the existing floor slab will have spatial constraints based on recent investigations.

Based on drawing review. there is no soil medium to enable the upward hydrostatic gradient unless the crawl space is fully submerged with ground water. Therefore, it makes more sense to monitor the water table conditions and install sump pit / pumping systems to handle the cyclic rising water tables.

### 3.3.2 STRUCTURAL CONSIDERATIONS

The existing floor assembly can only be accessed by several small access hatches around the concourse. Based on the longevity requirements, considerations as follows should be anticipated:

**Replace the existing floor structure with new concrete slab** – Service Life 80-100 years: replace floor and remove steel deck and beams to installation of new sump pit / pumping systems and 15-mil high density polyethylene vapour barrier, taped at seams and terminations.

**Retain the existing floor and complete localized repairs** – Service Life 20-50 years: rely on sump pits to remove groundwater, improve ventilation, and consider selective demolition of portions of the slabs based on regular maintenance. Considering adding new hatches and some hydro excavation for better access to the underside of the slab.

In both cases, the slabs would be removed using selective small equipment and sections of the Concourse would need to be restricted to public access during the work. The structure would need a full structural review if substantial changes are undertaken such as stability of walls, loading on piles, and encountered conditions for the final design. It would be prudent for the City to budget for on-going repairs or develop a maintenance plan as the structure continues to age and rehabilitation work is needed. The Class 4 Costs in Appendix C include replacement of the floor structure, and also provide an alternative price for localized repairs.

# 4 WATER AND SEWER UTILITIES RENEWAL CONSIDERATIONS

Prior to conceptualizing the renewal works for the below grade utilities (exclusively watermain and sewers), Stantec met with the City of Winnipeg WWD and received some additional feedback and any plans that they may have in the future, that would be incorporated into the conceptual renewal design. Some notable comments that were carried forward into the conceptual design include plans to abandon most of the watermain on Portage Avenue East and remove/abandon all watermains assets, and pre-emptively line all sewer assets within the concourse area/at the Portage and Main intersection. For the interceptor, the City is planning to install a manhole on the 1950mm interceptor section along Main Street between Portage Avenue and Wesley Street, to improve accessibility and ease inspection. The City of Winnipeg WWD also noted that this section of the interceptor compromises two defects near Wesley Street (far outside the Portage and Main Visioning working limits), which directly affects its current SPG rating of 3. By adding a manhole to this section, it would change the sewer condition within the Portage and Main intersection limits to a SPG 2, which would require minimal to no repair works prior to lining.

Several assumptions have been made throughout the conceptual design, as at this stage in the visioning, there is limited information on the condition of the assets. These assumptions formed the basis of the proposed work and opinion of probable cost for the below grade water and sewer utilities. Assumptions for Area 1 and Area 2 are as follows:

- Any existing plans to abandon/repair/renew various assets within the designated overall working limits, that Stantec is informed of will be considered completed, and will not be included in the Portage and Main Visioning Study works;
- Existing watermains within the working limits that are cast iron are candidates for renewal;
- Existing watermains within the working limits that are asbestos concrete will be assumed to have a history of breaks, and be candidates for renewal;
- All existing sewers within the working limits will be considered candidates for CIPP lining as a preventative measure, despite their current condition;
- If a sewer has a SPG of 1 or 2, no repairs will be required prior to lining;
- If a sewer has a SPG of 3 or 4, one (1) repair (up to 3.0m in length) will be required per run prior to lining;
- If a manhole has a SPG of 1 or 2, no repairs will be required as part of the works;
- If a manhole has a SPG of 3 or 4, one (1) repair will be required as part of the works; and
- If a manhole has a SPG of 5 or higher, two (2) repairs will be required as part of the works.

## 4.1 AREA 1

In Area 1, it has been assumed that an excavation of the concourse will take place, which will present the opportunity to remove any abandoned watermains in the area. As per discussion with the City's WWD, watermain removal was incorporated into the conceptual design as a method to eliminate unused infrastructure in this already complicated area. In addition, WWD had some preliminary planning regarding how they would like to see the watermain assets relocated to remove/abandon the majority of the existing watermain in the intersection. To maintain the looped system, the 250 and 300mm watermains along Portage Avenue and Main Street are connected via a new watermain, prior to crossing the intersection. The 150mm watermain within the intersection on Portage Avenue East would simply be abandoned as per direction from the WWD. On Main Street, south of the concourse, a section of the 250mm asbestos concrete and 300mm cast iron watermain will be renewed to PVC piping along with the looped connection.

The sewers in Area 1 have all been recently inspected by the WWD and maintain SPG ratings of 1 and 2, which would not require any repairs as per the assumptions noted previously. It is proposed that all sewers are lined as a preventative measure to decrease the potential of repairs/maintenance that could be required in the future. The manholes in this area have also been inspected and most of them would require repairs as per the assumptions made.

As previously noted, the City plans to add a manhole to the 1950mm interceptor sewer to reduce the SPG from this section of the sewer from 3 to 2. With this, it has been proposed to line the interceptor from manhole to manhole (approximately 92.0m) within Area 1. the northmost manhole on the interceptor in Area 1 has a SPG rating of 5, which has been assumed to require 2 repairs within the Area 1 work.

## 4.2 AREA 2

In Area 2, any existing watermain that is either cast iron or asbestos concrete has been proposed to be renewed. Within the overall working limits, the 250mm and 300mm watermain along Main Street (from Graham Avenue to midblock Portage Avenue and Lombard Avenue) would be renewed to PVC. All 250mm and 300mm watermain along Portage Avenue (from Main Street to Fort Street). All the watermains on Lombard Avenue, Pioneer Avenue and William Stephenson Way are all PVC piping as per information available to Stantec at the time this report was written and would not require any further renewal at this time. Stantec completed a 2021 Portage Avenue East Watermain Abandonment Feasibility Report for the WWD. Through discussions with the City, it was Stantec's understanding that the City's preference from Stantec's report was option 3 that included the following:

- Renew the existing 150mm cast iron watermain on Portage Avenue East from the existing 300mm PVC watermain renewal just west of Westbrook Street to approximately mid-block, east of the existing MTS building located at 166 Portage Avenue East with a new 300mm PVC watermain,
- Temporarily connect the existing 150mm cast iron watermain on Portage Avenue east mid-block,
- Renew existing services to the properties at 161 Portage Avenue East (Tetra Tech Building) and 138 Portage Avenue East,
- Provide new services connections (fire and domestic) for 166 Portage Avenue East to property line for future connection by the property owner,
- The City would then coordinate with properties at 166 Portage Avenue East and 335 Main Street to have their internal building reconfigured, and water services relocated to alternative locations. For 166 Portage Avenue East, this would be out of the east side of the building and connect to the newly installed service connections from Portage Avenue East renewal. For 335 Main Street, this would be out the southwest corner of the building and connect to the existing Main Street watermain, and
- Upon relocation and connection of the water services for 166 Portage Avenue East and 335 Main Street, the City would disconnect the temporary mid-block connection to the existing 150mm cast

iron watermain on Portage Avenue East and would then abandon the existing 150mm cast iron watermain from mid-block location of Main Street.

It has been assumed that this work will have already taken place at the time detail design takes place for the surface revitalization works, and associated costs for this work have not been included in the opinion of probable cost.

The sewers in Area 2 range in SPG from 1 to 4, however it has been assumed that all sewers within these limits would be lined. Throughout the Area 2 limits, there are also several manholes that would require repairs with SPG 3 and 4. On Main Street, all sewers between Lombard Avenue to Graham Avenue (including the 1950mm interceptor) are to be CIPP lined. In one instance, near William Stephenson Way, a small segment of 600mm sewer requires one external point repair (EPR) prior to lining as per the conceptual design assumptions. On Portage Avenue and Portage Avenue East, there are various sewers with SPG 3 and 4, which would require one EPR prior to lining. On Lombard Avenue, there are multiple sewers with a SPG 3, which would require one EPR prior to lining. On Pioneer Avenue and William Stephenson Way, all sewers within the working limits have SPG ratings 2 or lower, so they would not require any repairs prior to lining as per the conceptual design assumptions.

The Opinion of Probable Cost for the below-grade watermain and sewer utilities, for both Area 1 and Area is approximately $2,280,000 and Area 2 $4,280,000. More details of this can be found in Appendix B.

## 4.3 Shallow Utilities

There are significant non-municipal utility conduits crossing through the area of the concourse. The location of these utilities (which are composed of Manitoba Hydro electric and gas lines, various telecom company conduits and several abandoned facilities) are presented in the drawings attached in Appendix E. Many of these utilities are situated over the concourse and will require either protection or relocation in order to facilitate repairs to the membrane.

A preliminary relocation strategy identified the length of various utility trenches and vaults that require relocation. For costs to relocate/protect the conduits an allowance of $3M was included in the Traffic Management portion of the Opinion of Probable Costs. Costing was based on the assumption that new conduit lengths as described in Table 4 would be approximately twice as long as existing due to desire to vacate the concourse area prior to excavation work. More detailed design strategies should find efficiencies in this assumption and work needs to be coordinated with each utility company to address the potential to create a conduit corridor for ease of future access and surface maintenance.

The work to relocate the utilities is driven by the need to excavate for the concourse and adjust pavement to modify traffic flow.

**Table 4 Shallow Utility Inventory**

| Utility Proivder | Total Ex. Length | No. of Vaults (in CAD) | No. of Vaults (confirmed with streetview) | Relocation Length (Double Ex Length) |
|---|---|---|---|---|
| Hydro | 695 | 10 | 6 | 1390 |
| Hydro Gas | 120 | 0 | 0 | 240 |
| MTS | 1200 | 9 | 8 | 2400 |
| Shaw | 160 | 2 | 1 | 320 |
| Telus | 145 | 0 | 0 | 290 |
| Misc Fiber | 55 | 0 | 0 | 110 |

# 5 TRAFFIC MANAGEMENT

## 5.1 BACKGROUND

Based on information provided by the City of Winnipeg (2019 Traffic data), approximately 6000 vehicles, including transit service, pass through the intersection of Portage and Main intersection each AM and PM Peak Hour. Arrivals are presented based on approach direction in Table 5.

**Table 5. AM and PM peak hour arrivals**

| | | | Northbound | | | Southbound | | | Eastbound | | | Westbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Portage and Main** | | | lt | th | rt | lt | th | rt | lt | th | rt | lt | th | rt |
| | **AM Peak** | **2019** | 0 | 1300 | 59 | 0 | 1323 | 770 | 0 | 906 | 60 | 677 | 478 | 223 |
| | **PM Peak** | **2019** | 0 | 1437 | 13 | 0 | 1545 | 652 | 0 | 611 | 111 | 904 | 552 | 306 |

The membrane replacement will require the excavation and replacement of the road surface, the replacement/rehabilitation of utilities and the renewal of sidewalks in the general vicinity of the concourse. To replace/renew the membrane and conduct other structural repairs or replacements, a construction period of up to 3 years is anticipated. The disruption to traffic patterns will be extensive. Transit services will require revision, and pedestrian traffic will need to be rerouted. A traffic management plan that identifies the impact to all modes of mobility will be required.

There may be an opportunity to coordinate this change in traffic patterns with the development of the changes proposed in the Transit Master Plan. With the significant disruptions anticipated with both projects, there is an opportunity to examine the possibility of transitioning from the existing traffic patterns to the proposed traffic patterns associated with the changes to downtown Transit infrastructure, moving from the current conditions through the membrane construction phase to implement the future traffic flow patterns associated with the changes to transit infrastructure.

However, the Transit Master Plan did not formally review options for the transit routing approaching the Portage and Main intersection. Determining future transit routing will be completed under a separate process.

## 5.2 DETOUR CONSTRUCTION AND TRAFFIC ACCOMMODATION STRATEGY

The goals of the Traffic Management Plan will be to:

**Maintain north-south movements.** These movements are not easily accommodated through other routing options. The volumes associated with these movements account for about 50% of the traffic through the intersection. Parallel routes within reasonable travel distance either do not exist or do not have sufficient capacity to accommodate this traffic.

**Accommodate southbound right turn for Transit and general traffic.** This movement is currently critical to traffic circulation in the downtown area.

**Minimize changes to traffic patterns as much as possible**. The establishment of a long-term detour routing scheme allows travelers to become accustomed to the changes and establish a routine. Reducing the number of changes to travel patterns travellers make will reduce confusion, which can lead to congestion and potentially collisions.

**Accommodate pedestrian movements.** Accessible pedestrian accommodation will be required. The work on the concourse may disrupt existing pedestrian accommodation. Alternatives, including surface accommodation will require development. Surface access to building entrances will be accommodated through the construction period. Pedestrian routing within the concourse is likely to be disrupted to facilitate construction activity. Full extent of disruptions will be determined during detailed work plan development**.** The provisions in tender documents should emphasize the maintenance of and accommodation of pedestrian access throughout the concourse. Temporary at grade crossings adjacent to the construction area may be considered.

**Accommodate Emergency Services.** Emergency vehicle access and through movement accommodation is critical to the TMP. Excessive delays and congestion needs to be avoided.

**Facilitate utility replacements/upgrades**. The required/recommended utility work has been discussed in earlier sections. In addition to the municipal utilities, there are a number of private utilities in the area. A detailed review of these will need to be completed and renewal/accommodation plans developed in conjunction with the utility owners. The renewal/replacement works will need to be coordinated with the Membrane replacement work as well as the traffic accommodation.

**Accommodate access to businesses as much as possible.** There are several businesses/office towers in the area that rely on access for customers, employees, or delivery of goods. A review of their needs will be required, and accommodations and communication strategies for wayfinding assistance developed within the Traffic Management Plan. It is recognized that not all existing accommodations will be possible at all times and alternative plans may be needed.

**Plan for winter operations.** The construction of the membrane replacement will likely be a two-to-three-year project, so the detours will be required to operate over one or two winters. Snow clearing strategies will be required.

**Rebuild based on Vision/Transit.** The existing surface works will be removed for the concourse construction. The design for the replacement must be completed in conjunction with the design of this construction work. Completion and acceptance of the visioning project and confirmation of transit infrastructure is required prior to completing surface work.

**Minimize Construction Timeline.** There should be an effort made to provide incentives for minimizing construction timing. The strategies could include extended construction hours, alternate traffic management plans, innovative construction processes, etc.

## 5.3 PROPOSED STAGING

**Addressing Pedestrian traffic during construction**

Pedestrian accommodation is a critical design concern. Stakeholders are and should be concerned about the details of how the concourse repair and infrastructure tied to transit designs and other initiatives evolve. We have assumed that pedestrian accommodation will be provided through most areas of the concourse over the period of construction, however specific areas may require periodic disruption for safety reasons during construction. Alternate routing around closed areas will need to be provided.

Access to building entrances must be maintained and paths around the buildings must be protected throughout the construction activity and these requirements must be included in the tender documents. Maintaining access to each building on the surface is the recommended strategy, but details of specific routing to each building should be determined in conjunction with the construction plan submitted by the contractor in conjunction with the design team.

The road surface and public sidewalks will be impacted within the construction zones, but since cross street movements are currently not allowed at the intersection of Portage and Main, those movements need not be accommodated directly. The movements that are impacted to the greatest extent will be the movements within the concourse and access.

The pedestrian accommodation plan requires that pedestrian accommodation is an integral component of any future construction and traffic management plan formulated in detail as part of the tendered construction packages.

**Additional Pedestrian Considerations**

There are other pedestrian accommodations that can be explored in more detail:

- Property owners could potentially play a role in providing pedestrian links for example, the concourse link from 220 Portage to 300 Main, in lieu of having to navigate the long way around the entire block.
- If Portage East is completely closed to cars during construction, what is the feasibility of an interim pedestrian crossing near the Fairmont when the underground crossing is unavailable?
- Public Works could be open to exploring a temporary controlled crossing at Lombard during construction, rather than diverting people all the way to McDermot.

**Traffic Accommodation**

The proposed Traffic Management Plan will consist of five primary stages. The proposed timelines for the various stages are presented in Table 6. The following Proposed Stages are based on evolving information regarding the future state of downtown infrastructure and are intended only to provide one possible approach for accommodating traffic flows. Providing a more detailed Traffic Management Plan at this stage of project development with so many unknowns is not warranted.

**Preparatory Stage** – this stage consists of finalizing modifications to intersections, municipal Infrastructure relocation/reconstruction, pedestrian accommodation, traffic signal infrastructure and timing

adjustments for routes needed to support construction staging and the relocated traffic flow. The final configuration of modified infrastructure will be dependent on the geometric changes that needs to be built to accommodate the proposed infrastructure for the yet to be developed transit infrastructure and to accommodate the Portage & Main Vision. The Traffic Management Plan should accommodate both the traffic disrupted by the concourse construction and establish, as much as practicable, the future traffic flow patterns associated with the yet to be determined transit infrastructure.

**Stage 1** – This stage initiates the closure of east west traffic flows on Portage Avenue, accommodates construction laydown areas and accommodates median excavation and utility relocation and construction. Traffic is accommodated in two lanes for each direction on Main Street and because there are no conflicts with cross street traffic at Portage and Main, the traffic will flow freely through the construction area. Pedestrian traffic will be restricted through the concourse to facilitate excavation. Existing surface pedestrian crossings at adjacent intersections will be retained.

Traffic accommodation plans require in depthl study to determine capacity implications and supporting changes to infrastructure. With the complexity of the downtown transportation network and the work being done to accommodate the Winnipeg Transit Master Plan integral to the final design development of the street and sidewalk network in the project area, specific details on routing and capacity questions are not addressed in this report.

The concourse is partially excavated to accommodate construction of bridging to span the walls of the concourse to facilitate future excavation and membrane replacement. It is anticipated that temporary bridge structures would be used, but that needs to be determined by a structural review during future design detail development. The bridging will accommodate stage 2 southbound and transition to future northbound traffic flows (Figure 14). This stage could take one summer construction season to be completed and involve new signal installations and revised pavement infrastructure to accommodate new traffic flows. The new infrastructure to accommodate traffic flows should be based on changes required to accommodate modifications to traffic accommodation needed to support transit infrastructure proposed for Rapid Transit routing and changes to general transit routing.

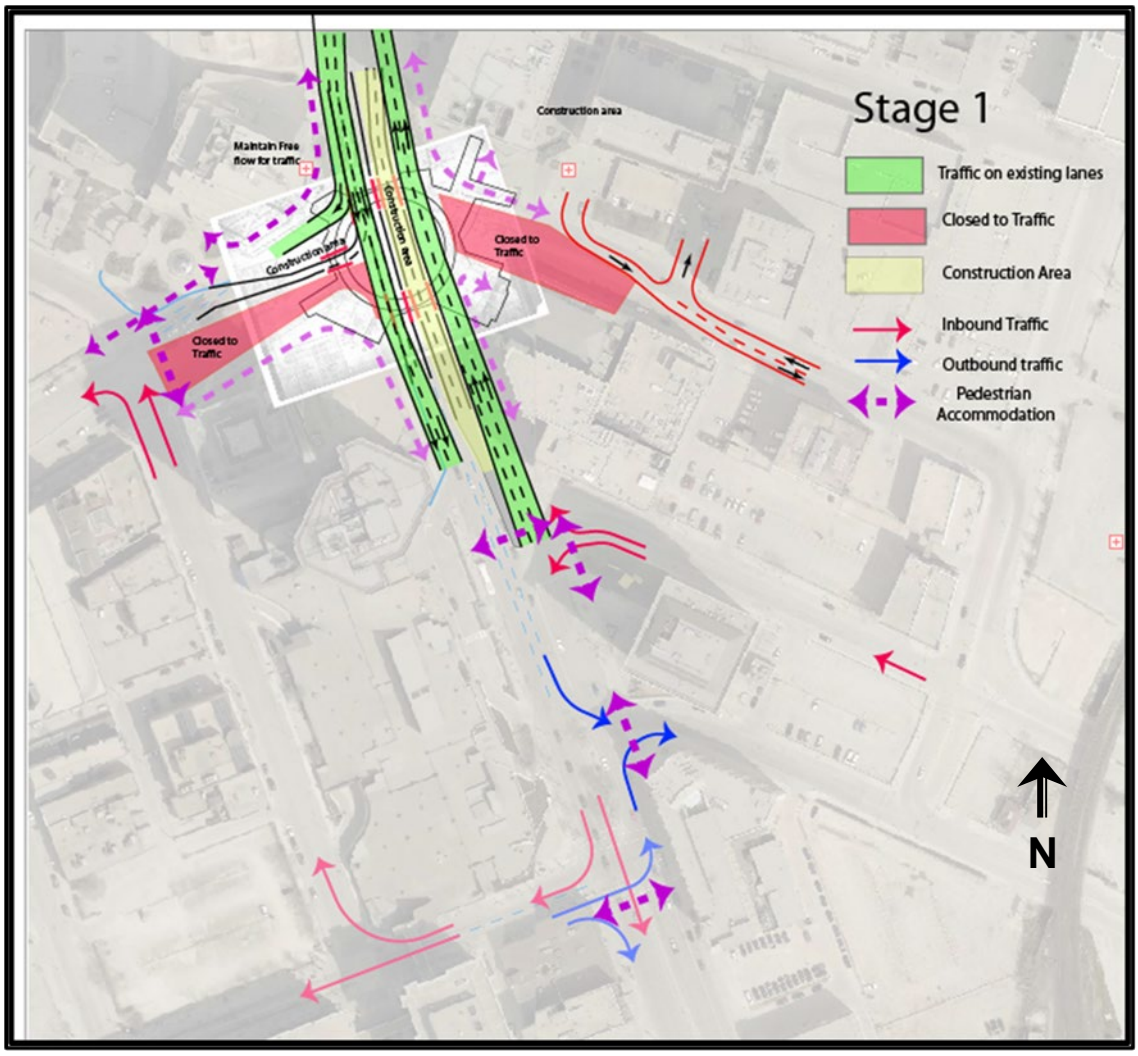



**Figure 14. View of the stage 1 Traffic Management Plan**

**Stage 2 –** Southbound traffic is moved onto the median road and bridges constructed in Stage 1. The future southbound detour bridges and roads will be constructed. Northbound traffic remains on existing northbound lanes (Figure 15). This stage could be completed in the first construction season immediately after stage 1.

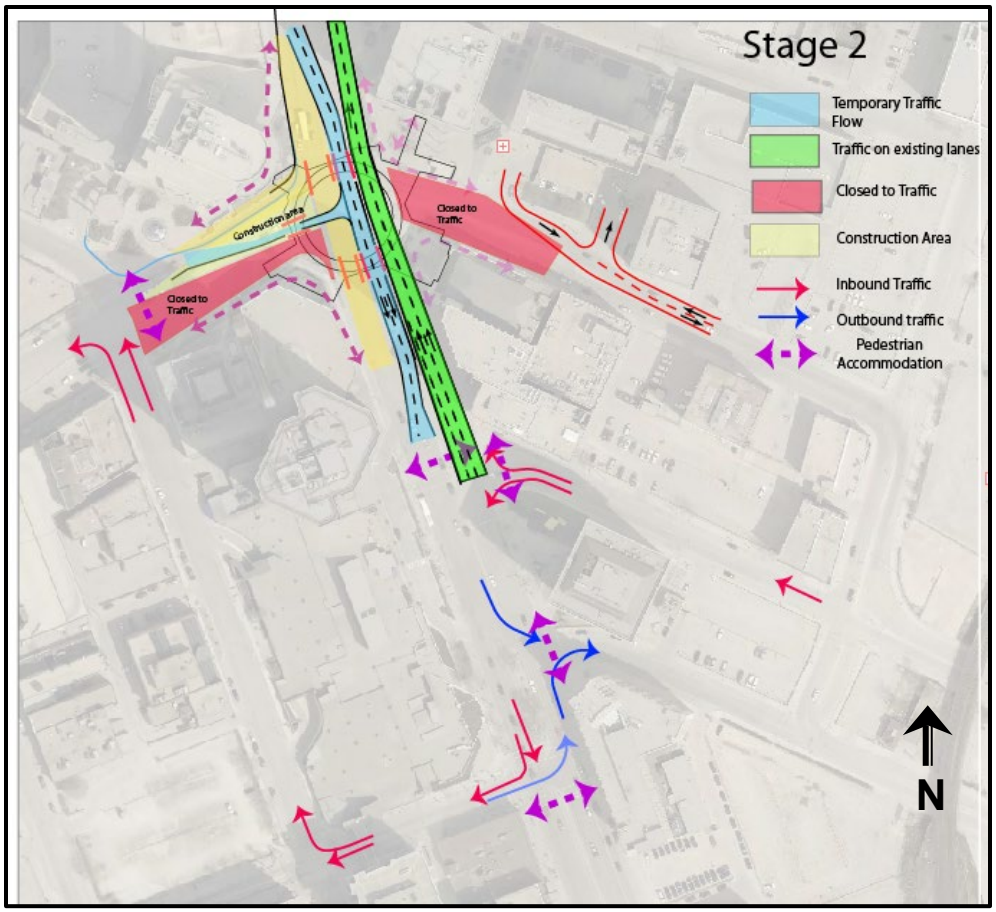



**Figure 15. View of the stage 2 Traffic Management Plan**

**Stage 3** – this is the long-term configuration of the detour and will remain in place for the duration of the concourse construction (Figure 16). At this time, it is estimated that this stage will remain in effect through a second summer construction season. Winter construction would see completion of the excavation and preparation of concourse for membrane replacement. Membrane replacement would occur during the second summer construction season and backfilling occurring before winter.

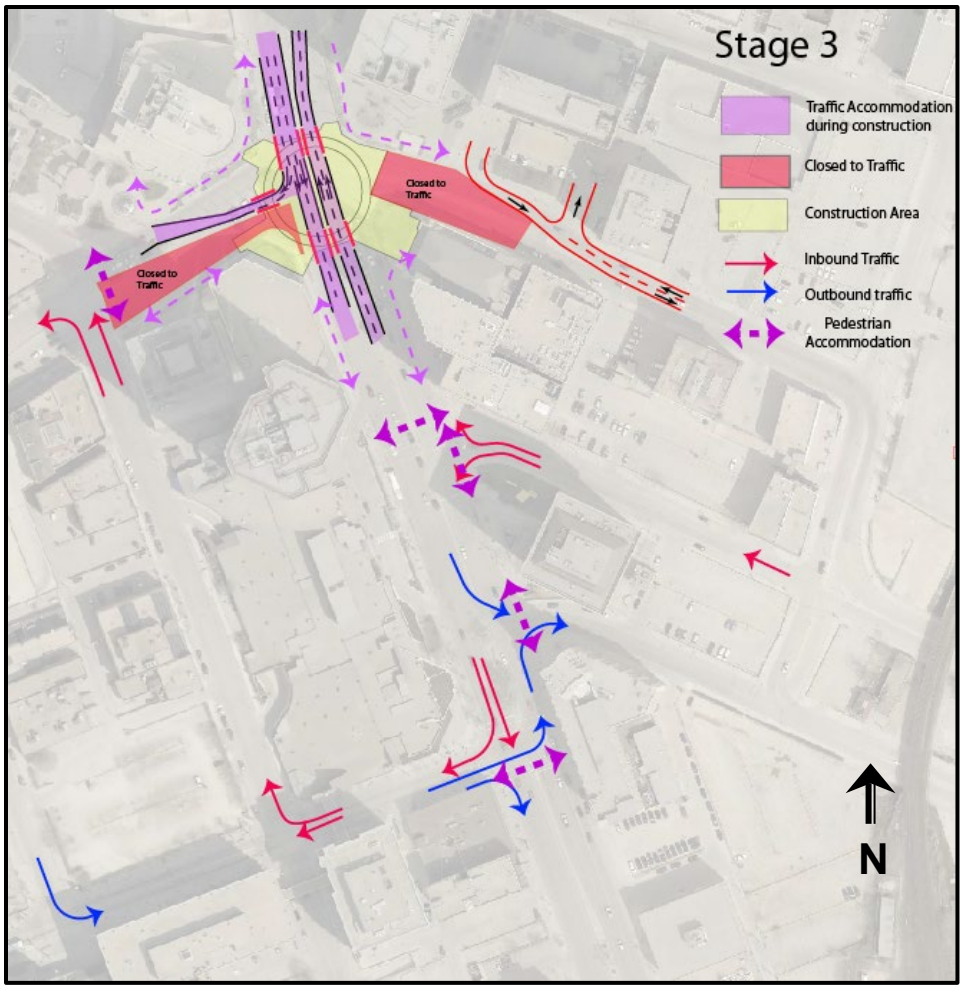



**Figure 16. View of the stage 3 Traffic Management Plan**

**Reconstruction** - Reconstructing the surface works will see the pattern reverse, with northbound traffic lane and east side sidewalks restored, followed by southbound traffic lanes and west side sidewalks (Figure 17). Work in the median will be completed last, establishing the final lane configurations as determined by the approved designs. This would require a third summer construction season to complete with work completed before winter.

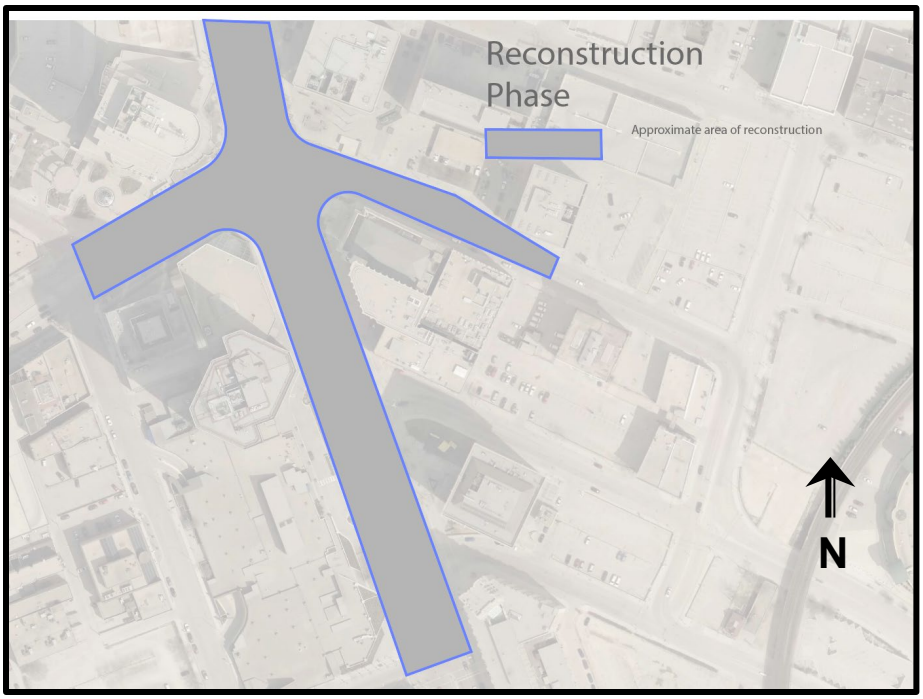



**Figure 17. View of the reconstruction area**

| Timeline | Stage | Activity | Start | End |
|---|---|---|---|---|
| Year 1 | Preparatory Stage | Utilities and surface infrastructure | April | October |
| Year 2 | TMP Stage 1 | Build TMP infrastructure | April | June |
| Year 2 | TMP Stage 2 | Build TMP infrastructure | July | October |
| Year 2 | TMP Stage 3 | Transition to Stage 3 Traffic Accommodation | October Year 2 | October Year 2 |
| Year 3-4 | Concourse Excavation | | October Year 2 | April Year 3/4 |
| Year 3-5 | Concourse Repair Road Renewal | Back fill and Surface reconstruction | April Year 3 | April Year 5 |
| Year 4-5 | Restoration | Complete Surface reconstruction | April Year 4 | October Year 5 |

**Table 6 Construction Timeline**

## 5.4 TRAFFIC IMPACT

The City of Winnipeg completed the modeling of the potential traffic patterns using their current Visum traffic model. The model run identified the following changes in traffic flows resulting from the proposed detours and transit infrastructure changes.

During the AM Peak there are the following impacts:

- Increased traffic on Broadway
- Slight increase traffic on York Avenue
- Increased traffic on Princess Street
- Increased traffic on Bannatyne Avenue

During the PM Peak there are the following impacts:

- Increased traffic on William Stephenson Avenue
- Increased traffic on Garry Street
- Increased traffic on McDermott Avenue
- Increased traffic on Smith Street north of Portage Avenue

The results of the model runs are presented in Figure 18 and Figure 19. This information will be used as background information for the development of a detailed simulation model for the downtown network. The Terms of Reference for the development of this Traffic model can be found in Appendix D. This model will be used to confirm the projected operational impact and final geometric changes needed to accommodate construction detours and ultimate transit driven changes to downtown traffic flows.

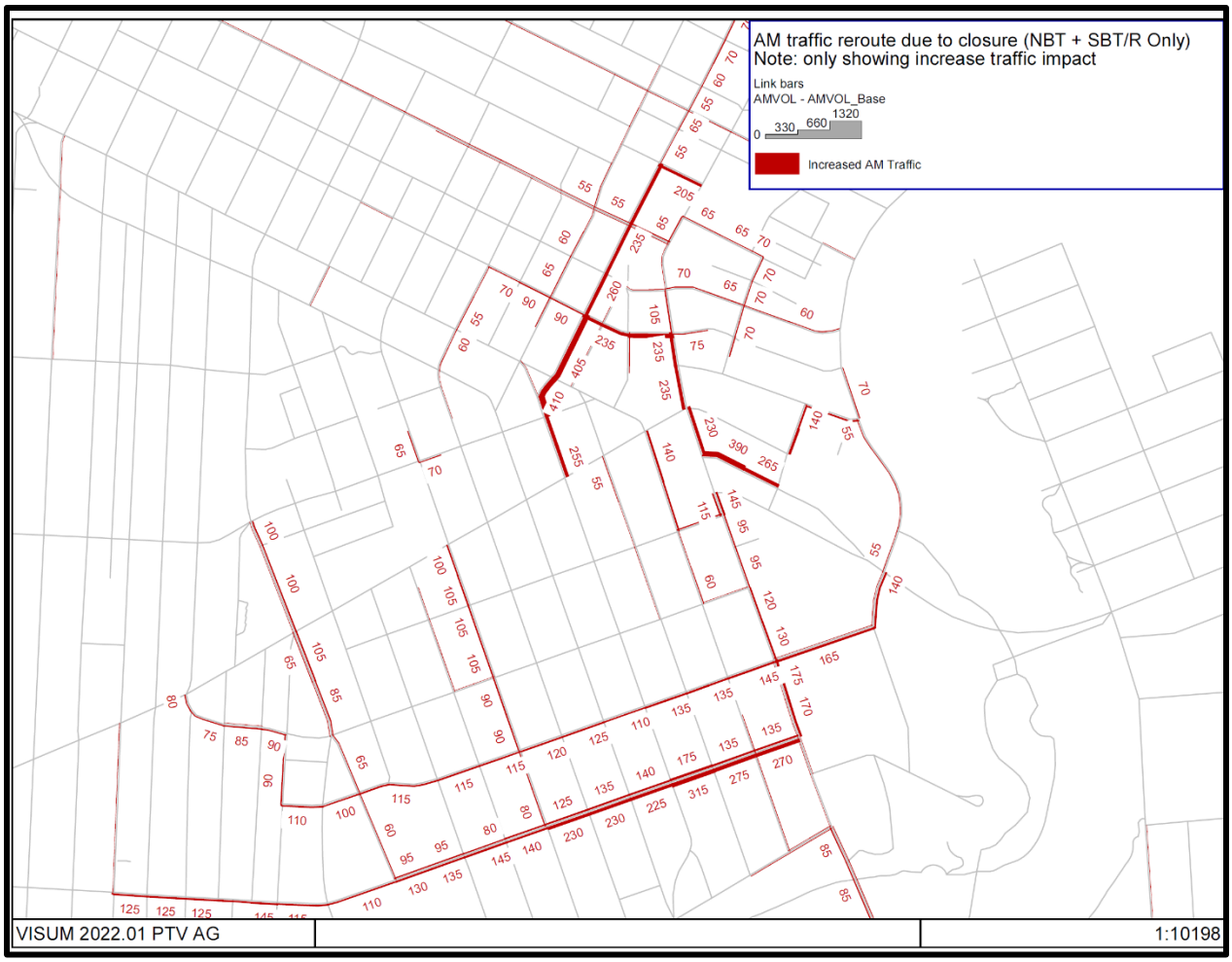



**Figure 18. View of City of Winnipeg VISUM AM traffic model**

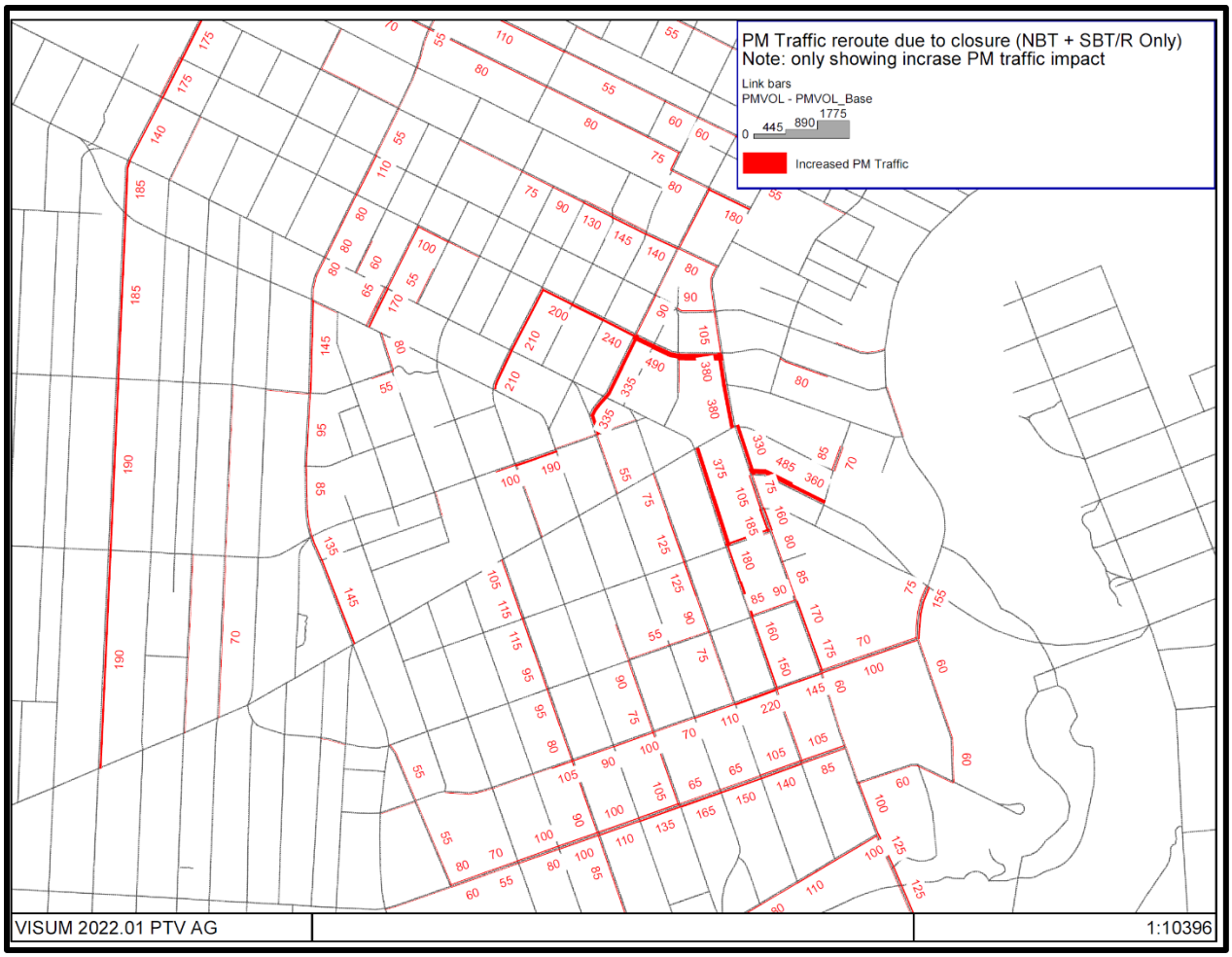



**Figure 19. View of City of Winnipeg VISUM PM traffic model**

## 5.5 BUDGET IMPLICATIONS

The preliminary budget for the Traffic Management Plan is based on installation and maintenance of traffic control devices, erection and maintenance of temporary structures, changes to infrastructure needed to accommodate changes to traffic flow, replacement of shallow utilities and surface works and development of a Transportation Model. A summary of the budget implication for traffic management plan is provided in Appendix B.

## 5.6 CONSTRUCTION CONSIDERATIONS

The City asked how the work could be accelerated and if Stantec could investigate construction implications. The following is a partial list of items that would need to be considered in the scheduling of the works:

- Construction could proceed year-round but some materials might need to be changed to accommodate cold weather such as compaction of clay might need to be changed to more expensive granular. This would significantly increase costs for backfilling around structures.
- Work could be scheduled to be 24hrs a day, 7 days a week which is common on large complex projects. This might have resistance from contractors who don't work in this manner and would increase costs on the project due to night premiums. This would be a minor cost increase.
- Flexibility in the material selection could be considered if specific products are not available or if there are production issues reducing delays. Suggesting 2-3 products would make the project competitive. During the past few years, many products are difficult to obtain due to supply issues. This would have a minor impact on the project.
- Some products could be pre-fabricated such as traffic diversion structures to reduce field related operations. This would reduce field time but the lead time would need to be extended. Pre-fabricated products would need to be scheduled and the impact is unknown but based on past projects, we generally see a reduced construction schedules.
- The City would need to understand the limits of Stakeholders (such as the Tower building owners) if there are any issues related to noise or work restrictions.
- Public gatherings in the area could be reduced to minimize site related restrictions with respect to the general public interacting with the construction site. Enhanced signage and wayfinding would reduce public interactions with the project. Many groups like to gather at the Portage and Main intersection to celebrate or to demonstrate and as such the City should plan for these activities to continue and find an alternate gathering location.
- Other projects in the area should be sequenced as to minimize work related to this project to reduce timelines.

- Heating and hoarding would be required in order to facilitate work proceeding during the winter months. This would increase project costs but reduce the project schedule.

# 6 CLASS 4 COST ESTIMATE

Following in Table 6 is a summary of Class 4 Opinion of Probable Cost (OPC) as of July 2022. Refer to Appendix B, Appendix C and the corresponding sections for more details.

**Table 6. Summary of Class 4 OPC.**

| Item | Description | Cost |
|---|---|---|
| 1 | Water Mains and Sewers (Refer to Appendix B) | |
| 1a | Area 1 | $ 2,284,753.25 |
| 1b | Area 2 | $ 4,279,298.40 |
| 2.a | Opinion of Probable cost for Roads & Traffic Management (Refer to Traffic Management Budget Implications in Appendix B) | $ 11,000,000.00 |
| 2.b | Opinion of Probable Cost for Repairs/Reconstruction of Roads impacted by detours | $ 7,000.000.00 |
| 3 | Opinion of Probable Cost of Concourse Waterproofing System Replacement (Refer to Appendix C) | $ 26,524,319.00 |
| 4 | Surface Works including pavement restoration, placemaking, new Pedestrian barriers, specialty lighting and public art priced elsewhere | Refer to Urban Design Vision Report Appendix 8 for Surface Works Costs |
| 5 | **Total** | **$ 51,088,370.65*** |
| 6 | **Adjusted 2023 Opinion of Probable Cost (9% Escalation)** | **$ 55,686,324.00*** |

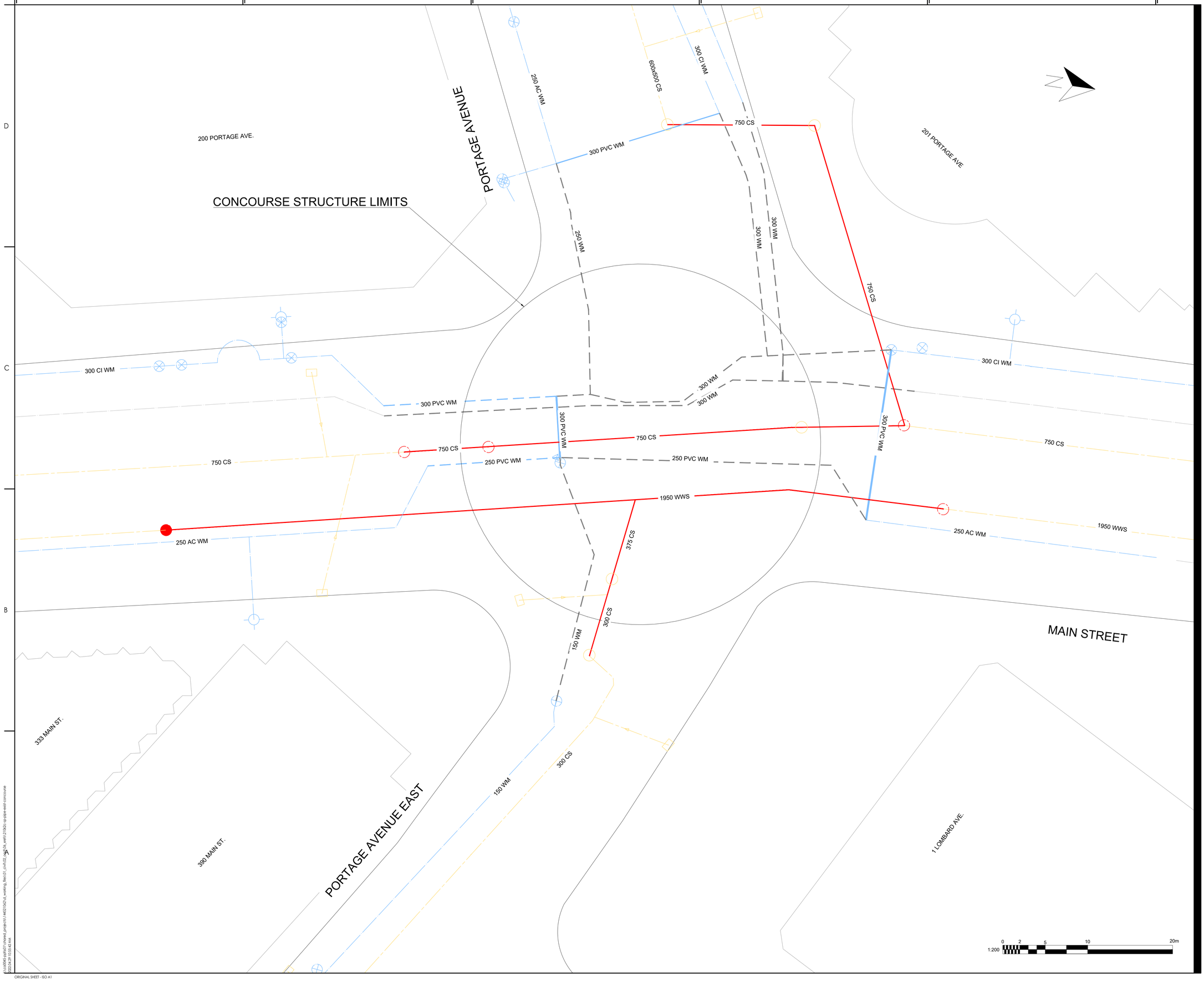
*Soft Costs - excluded from Class 4 OPC

*Escalation Contingency - excluded from Class 4 OPC
Considering current market volatility, construction escalation is approximately 1.5% per month, we recommend carrying an escalation contingency from October 2022 to the anticipated date of Tender Close.

*Construction Contingency - excluded from Class 4 OPC

# APPENDICES

# Appendix A Area 1 and Area 2





Stantec

STANTEC
311-500 PORTAGE AVE.
WINNIPEG MANITOBA CANADA
Tel: (204) 489-5900
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Notes

## LEGEND

- EXISTING WATERMAIN
- WATERMAIN TO BE REMOVED/ ABANDONED
- PROPOSED NEW WATERMAIN
- WATERMAIN RENEWAL
- EXISTING SEWER
- ABANDONED SEWER/ WATERMAIN
- PROPOSED LINING OF SEWER
- EPR REQUIRED PRIOR TO LINING SEWER
- MANHOLE REPAIR
- NEW MANHOLE INSTALL

| Revision | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| | | | |

| Issued | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| | | | |

| File Name: 21062C-SP-PIPE-EXIST-CONCOURSE | Dwn. | Dsgn. | Chkd. | YYYY.MM.DD |
|---|---|---|---|---|
| | | | | 2022.04.14 |

Permit/Seal

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CITY OF WINNIPEG

PORTAGE & MAIN VISIONING STUDY

WINNIPEG, MANITOBA

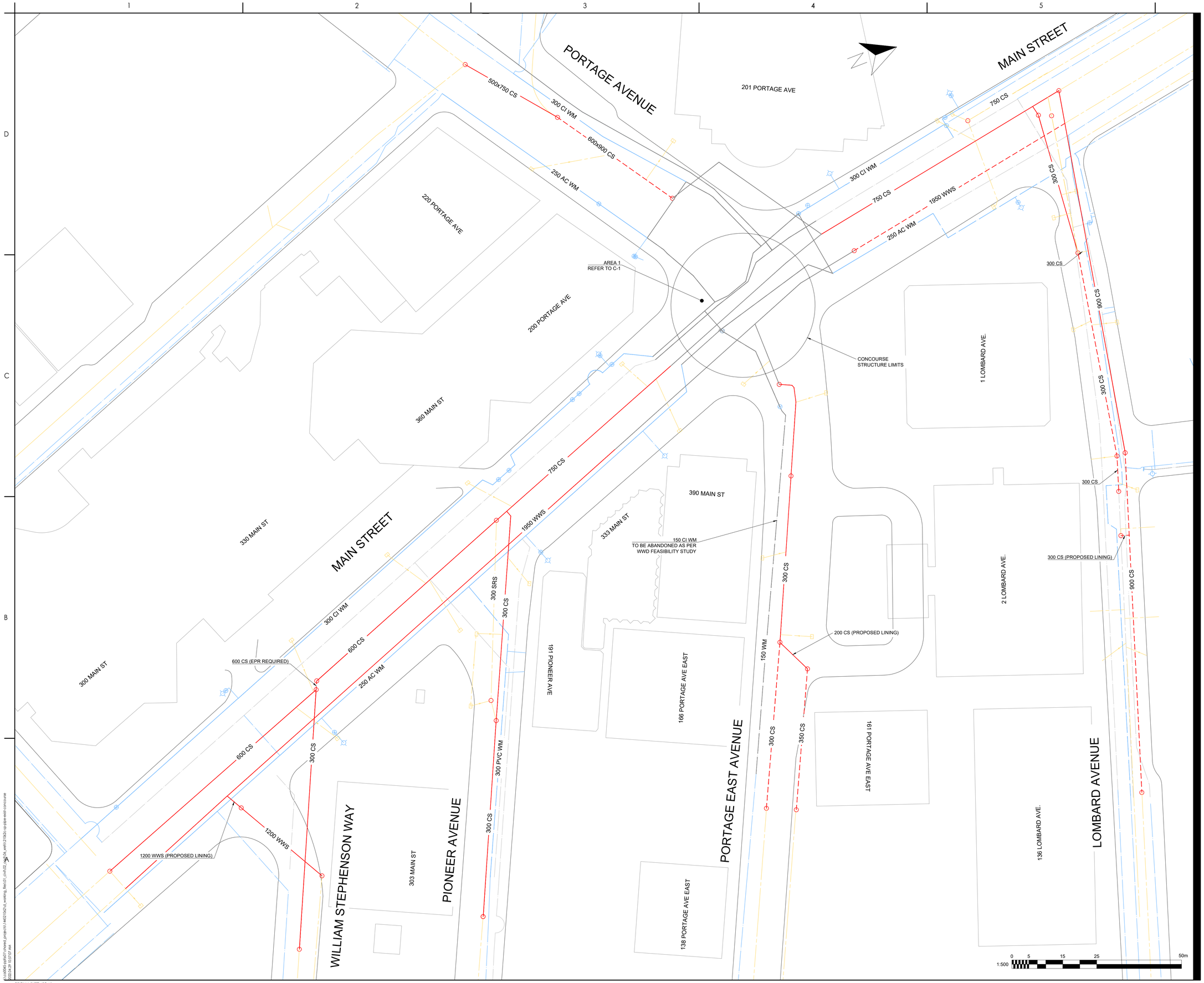
Title
AREA 1 - BELOW GRADE UTILITIES UPGRADES
WATERMAIN & SEWER

| Project No. | Scale |
|---|---|
| 144521062 | 1:200 |

| Revision | Sheet | Drawing No. |
|---|---|---|
| | 1 of 2 | FIGURE C-1 |


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ORIGINAL SHEET - ISO A1





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## LEGEND

- EXISTING WATERMAIN
- WATERMAIN TO BE REMOVED/ ABANDONED
- PROPOSED WATERMAIN RENEWAL
- EXISTING SEWER
- ABANDONED SEWER/WATERMAIN
- PROPOSED LINING OF SEWER
- EPR REQUIRED PRIOR TO LINING SEWER
- AREA 1 WORKS
- MANHOLE REPAIR
- NEW MANHOLE INSTALL

| Revision | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| | | | |

| Issued | By | Appd | YYYY.MM.DD |
|---|---|---|---|
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| File Name: 21062C-SP-PIPE-EXIST-CONCOURSE | Dwn. | Dsgn. | Chkd. | YYYY.MM.DD |
|---|---|---|---|---|
| | | | | 2022.04.14 |

Permit/Seal

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WINNIPEG, MANITOBA

Title
AREA 2 - BELOW GRADE UTILITIES UPGRADES
WATERMAIN & SEWER

| Project No. | Scale |
|---|---|
| 144521062 | 1:500 |

| Revision | Sheet | Drawing No. |
|---|---|---|
| | 2 of 2 | FIGURE C-2 |


ORIGINAL SHEET - ISO A1

# Appendix B Opinion of Probable Cost of Water Mains and Sewers and Traffic Management Budget

| Opinion of Probable Costs for Traffic Management Plan | | |
|---|---|---|
| **Items** | **Description** | **Cost** |
| **1** | **Infrastructure Improvements Traffic Managemant Plan** | |
| 1.a | Temporary surface works | $ 3M allowance |
| 1.b | Temporary Traffic signal Installation and retiming | $ 1.5 M allowance |
| 1.c | Temporary Pedestrian Accomodation | $ 0.5 M allowance |
| 1.d. | Shallow utility relocation (Shaw, Bell, Hydro, Telecom, etc) | $3 M Allowance |
| | **Sub-total** | **$ 8 M Allowance** |
| **2** | **Temporary Structures to Support Construction** | |
| 2.a | Supply and removal temporary bridge structures | $ 2M allowance |
| | **Sub-total** | **$ 2M Allowance** |
| **3** | **Installation and Maintenance of Traffic Control Devices** | |
| 3.a | Maintenance of signs and public information process during construction | $ 1M allowance |
| | **Sub-total** | **$ 1M Allowance** |
| | **Total Traffic Management Plan** | **$11M Allowance.** |
| | | |
| **4** | **Opinion of Probable Costs for Surface Works Replacement** | |
| 4.a | 10,000 sq m of surface works replacement at $500 / sq m (includes: surface works, subgrade and grade work, sidewalks, drainage works, miscellaneous works (includes: street lights, signage, signals) | $ 5.0M |
| 4.b | 8000 sq m of enhanced surface works replacement at $250/sq m in areas of enhanced curbworks, pavement treatments etc (includes only infrstructure supporting pavement enhancements : street lights, signals , drainage, base and subgrade. ) | $ 2.0 M |
| | Sub-total | **$7.0 M** |
| | **Total** | **$18.0 M** |

Costs do not inclue GST.
All costs are based on 2022 prices.

| Opinion of Probable Cost - Area 1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **ITEM** | | **DESCRIPTION** | **UNIT** | **APPROX. QUANTITY** | **UNIT PRICE** | | **AMOUNT** |
| A.1 | | Watermain Renewal/Replacement trenchless installation, Class B sand bedding, Class 1 backfill | | | | | |
| | a) | 250mm | m | 15.5 | $ 631.00 | $ | 9,780.50 |
| | b) | 300mm | m | 70.0 | $ 760.00 | $ | 53,200.00 |
| A.2 | | Watermain Removal | | | | | |
| | a) | 150mm | m | 30.0 | $ 100.50 | $ | 3,015.00 |
| | b) | 250mm | m | 68.0 | $ 157.75 | $ | 10,727.00 |
| | c) | 300mm | m | 170.0 | $ 190.00 | $ | 32,300.00 |
| A.3 | | Connection to Existing Watermains | | | | | |
| | a) | 250mm | m | 4 | $ 7,833.00 | $ | 31,332.00 |
| | b) | 300mm | m | 3 | $ 8,166.00 | $ | 24,498.00 |
| B.1 | | Manhole Repairs | each | 5 | $ 1,800.00 | $ | 9,000.00 |
| B.2 | | CIPP Sewermain Lining Installation | | | | | |
| | a) | 300m | m | 10.0 | $ 250.00 | $ | 2,500.00 |
| | b) | 375mm | m | 10.0 | $ 285.00 | $ | 2,850.00 |
| | c) | 750mm | m | 114.0 | $ 650.00 | $ | 74,100.00 |
| | d) | 1950mm | m | 92.0 | $ 5,100.00 | $ | 469,200.00 |
| B.3 | | Manhole Installation | | | | | |
| | a) | New Manhole on Existing Sewer | each | 1 | $ 35,000.00 | $ | 35,000.00 |
| B.4 | | Interceptor Sewermain By-pass Pumping | L.S. | 1 | $ 1,000,000.00 | $ | 1,000,000.00 |
| | | **Sub-Total** | | | | **$** | **1,757,502.50** |
| | | Contingency & Engineering | L.S. | 1 | 30% | $ | 527,250.75 |
| | | **Grand Total** | | | | **$** | **2,284,753.25** |

*OPC Unit Prices based on 2022 City of Winnipeg Pricing ** Prices do not include GST or MRST

| Opinion of Probable Cost - Area 2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **ITEM** | | **DESCRIPTION** | **UNIT** | **APPROX. QUANTITY** | **UNIT PRICE** | | **AMOUNT** |
| A.1 | | Watermain Renewal/Replacement trenchless installation, Class B sand bedding, Class 1 backfill | | | | | |
| | a) | 250mm | m | 348.0 | $ 631.00 | $ | 219,588.00 |
| | b) | 300mm | m | 346.0 | $ 760.00 | $ | 262,960.00 |
| A.2 | | Hydrant Assembly | each | 7 | $ 12,204.00 | $ | 85,428.00 |
| A.3 | | Watermain Valve | | | | | |
| | a) | 250mm | each | 10 | $ 5,575.00 | $ | 55,750.00 |
| | b) | 300mm | each | 9 | $ 6,908.00 | $ | 62,172.00 |
| A.4 | | Connection to Existing Watermains | | | | | |
| | a) | 250mm | m | 8 | $ 7,833.00 | $ | 62,664.00 |
| | b) | 300mm | m | 6 | $ 8,166.00 | $ | 48,996.00 |
| B.1 | | Sewer Repair (up to 3m Long) | | | | | |
| | a) | 300mm | each | 3 | $ 16,000.00 | $ | 48,000.00 |
| | b) | 350mm | each | 1 | $ 16,600.00 | $ | 16,600.00 |
| | c) | 600mm | each | 2 | $ 18,500.00 | $ | 37,000.00 |
| | d) | 900mm | each | 1 | $ 28,000.00 | $ | 28,000.00 |
| B.2 | | Manhole Repairs | each | 9 | $ 1,800.00 | $ | 16,200.00 |
| B.3 | | CIPP Sewermain Lining Installation | | | | | |
| | a) | 200mm | m | 12.0 | $ 230.00 | $ | 2,760.00 |
| | b) | 300mm | m | 438.0 | $ 250.00 | $ | 109,500.00 |
| | c) | 350mm | m | 42.0 | $ 250.00 | $ | 10,500.00 |
| | d) | 600mm | m | 153.0 | $ 500.00 | $ | 76,500.00 |
| | e) | 750mm | m | 183.0 | $ 650.00 | $ | 118,950.00 |
| | f) | 900mm | m | 251.0 | $ 2,000.00 | $ | 502,000.00 |
| | g) | 1200mm | m | 37.0 | $ 4,500.00 | $ | 166,500.00 |
| | h) | 1950mm | m | 267.0 | $ 5,100.00 | $ | 1,361,700.00 |
| | | **Sub-Total** | | | | **$** | **3,291,768.00** |
| | | Contingency & Engineering | L.S. | 1 | 30% | $ | 987,530.40 |
| | | **Grand Total** | | | | **$** | **4,279,298.40** |

*OPC Unit Prices based on 2022 City of Winnipeg Pricing ** Prices do not include GST or MRST

# Appendix C Concourse Waterproofing Replacement - Class 4 Cost

# CLASS '4' ESTIMATE

# CITY OF WINNIPEG PORTAGE & MAIN CONCOURSE WATERPROOFING SYSTEM REPLACEMENT WINNIPEG, MANITOBA

Prepared for:
HTFC Planning & Design

July 28, 2022
Revised: October 5, 2022

Hanscomb
QUANTITY SURVEYORS

July 28, 2022 Ref # WIN1945
Revised: October 5, 2022

HTFC Planning & Design
500 - 115 Bannatyne Avenue E.
Winnipeg, Manitoba R3B 0R3
T: (204) 944-9907
E: cdouvris@htfc.ca

Attn: Constantina Douvris, Principal

Re: City of Winnipeg Portage & Main, Concourse Waterproofing System Replacement, Winnipeg, Manitoba

Dear Constantina:

Please find attached our Class '4' Estimate for the City of Winnipeg Portage & Main, Concourse Waterproofing System Replacement in Winnipeg, Manitoba.

This Class '4' Estimate is intended to provide a realistic allocation of direct construction costs and is a determination of fair market value. Pricing shown reflects probable construction costs obtainable in the Winnipeg, Manitoba area on the effective date of this report and is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the work.

Hanscomb has prepared this estimate(s) in accordance with generally accepted principles and practices. Our general assumptions are included in Section 3 of this report and any exclusions are identified in Section 1.6. For quality assurance, this estimate has been reviewed by the designated Team Lead as signed below. Hanscomb staff are available and pleased to discuss the contents of this report with any interested party.

Requests for modifications of any apparent errors or omissions to this document must be made to Hanscomb within ten (10) days of receipt of this estimate. Otherwise, it will be understood that the contents have been concurred with and accepted.

We trust our estimate is complete and comprehensive and provides the necessary information to allow for informed capital decisions for moving this project forward. Please do not hesitate to contact us if you have any questions or require additional information.

Yours truly,

**Hanscomb Limited**
Team Lead

Irene Malang
B.Sc. CE, EIT, PQS
Technical Manager

**Hanscomb Limited**
Principal / Estimate Reviewer

Isaac Gwendo
PQS, B.A. (Build. Econ)
Executive Vice President

**Hanscomb Limited**
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- A - Cost Estimate

Documents and Drawings:
- AA - Documents and Drawings List
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# 1. INTRODUCTION

## 1.1 PURPOSE

This Class '4' Estimate is intended to provide a realistic allocation of direct construction costs for the City of Winnipeg Portage & Main, Concourse Waterproofing System Replacement, located in Winnipeg, Manitoba, with the exception of the items listed in 1.6 Exclusions.

## 1.2 DESCRIPTION

The City of Winnipeg Portage & Main, Concourse Waterproofing System Replacement located in Winnipeg, Manitoba is comprised of the following key elements:

*The project includes concourse waterproofing system replacement work (Option 1 Recommended) since the concourse waterproofing membrane is over 40 years old and is near the end of its useful service life. The scope of work includes waterproofing to concourse roof & walls, installation of footing level perimeter drain if applicable (from inside to outside), drainage trench over roof if applicable and replace the existing floor structure with new concrete slab or retain the existing floor & complete localized repairs.*

## 1.3 METHODOLOGY

Hanscomb has prepared this estimate(s) in accordance with generally accepted principles and practices. Hanscomb staff are available to discuss its contents with any interested party.

From the documentation and information provided, quantities of all major elements were assessed or measured where possible and priced at rates considered competitive for a project of this type under a stipulated sum form of contract in Winnipeg, Manitoba.

Pricing shown reflects probable construction costs obtainable in the Winnipeg, Manitoba area on the effective date of this report. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the work.

## 1.4 SPECIFICATIONS

For building components and systems where specifications and design details are not available, quality standards have been established based on discussions with the design team.

# 1. INTRODUCTION

## 1.5 ESTIMATE CLASSIFICATION AND COST PREDICTABILITY

Estimates are defined and classified based on the stage of a project's development and the level of information available at the time of the milestone estimate.

> *This Class '4' Estimate is considered to have an expected degree of accuracy of* +/- 20-30%. *In other words, bid results might vary by this amount if the construction budget were set at this milestone estimate.*

At the initial stages of a contemplated project, the cost accuracy of the estimate is low as there may be little or no information available to inform a first high-level concept estimate or order of magnitude estimate. As a project nears design completion and is ready to be released to market for tender, the level of accuracy of the estimate is high as the detail is generally extensive and typically represents the information on which contractors will bid.

Milestone cost estimates or "checks" are recommended as the project design develops to keep track of scope and budget. Early detection of potential budget overruns will allow for remedial action before design and scope are locked in. The number of milestone estimates will depend on a project's size and schedule and cost predictability will improve as the design advances.

According to the Canadian Joint Federal Government/Industry Cost Predictability Taskforce, industry standards for estimate classification and cost estimate accuracy may be summarized as follows:

| COST ESTIMATE CLASSIFICATION SYSTEM | | | | | | |
|---|---|---|---|---|---|---|
| **AACE** | Class 5 | Class 4 | Class 3 | | Class 2 | Class 1 |
| **DND** | | | Indicative | | Substantive | |
| **RAIC** | OME | Sketch Design | Design Develop | | Contract Documents | Tender Documents |
| **GOC** | OME | **D** | **C** | ← **B** → | | **A** |
| **Design Documentation % Complete** | | **12.5%** | **25.0%** | | **95.0%** | **100.0%** |
| **Cost Estimate Accuracy (+/-%)** | **+/- 30%** | **+/- 20-30%** | **+/- 15-20%** | | **+/- 10-15%** | **+/- 5-10%** |

**Legend**

| | |
|---|---|
| AACE | Association for the Advancement of Cost Engineering |
| DND | Department of National Defence |
| GOC | Government of Canada |
| RAIC | Royal Architectural Institute of Canada |
| OME | Order of Magnitude Estimate |

While the classification categories differ from one authority to the next, the overarching principle for cost predictability remains the same – as the level of detail and design development increases, so does the level of accuracy of the estimate.

# 1. INTRODUCTION

## 1.6 EXCLUSIONS

This Class '4' Estimate does not provide for the following, if required:

- Cost of contaminated soil removal
- Cost of hazardous material (e.g. asbestos, lead, PCB, etc.) removal
- Equipment beyond that identified in this estimate
- Escalation contingency
- Financing costs
- Winter Construction (Concrete foundation and masonry heating & hoarding)
- Water & sewer utilities renewal cost
- Traffic management cost
- Value-added tax (Goods and Services Tax)
- Premiums associated with Public-Private Partnership procurement model
- Trade tariffs
- Third party commissioning costs
- Cash allowances
- Construction contingency
- Overtime premiums for work done outside normal working hours
- Phased construction premium
- Soft Costs
  - Building permit
  - Development charges
  - Easement costs
  - Fund raising costs
  - Land acquisition costs and impost charges
  - Legal fees and expenses
  - Owner's staff and associated management
  - Preventative maintenance contracts
  - Professional fees and expenses
  - Relocation of existing facilities, including furniture and equipment
  - Right of way charges
  - Value-added tax (Goods and Services Tax)
- unexpected labour unavailability and productivity disruptions leading to delays and added costs
- supply chain disruptions leading to delays and added costs
  New roadwork at Portage Avenue @ Main Street

## 2. DOCUMENTATION

This Class '4' Estimate has been prepared from the documentation included in Appendix AA of this report.

All of the above documentation was received from Stantec and was supplemented with information gathered in meeting(s) and telephone conversations with the design team, as applicable.

Design changes and/or additions made subsequent to this issuance of the documentation noted above have not been incorporated in this report.

# 3. COST CONSIDERATIONS

## 3.1 COST BASE

All costs are estimated on the basis of competitive bids (a minimum of 4 general contractor bids and at least 4 subcontractor bids for each trade) being received in July 2022 from general contractors and all major subcontractors and suppliers based on a stipulated sum form of contract. If these conditions are not met, bids received could be expected to exceed this estimate.

We assumed that this project will be tendered as a single contract (not per individual scope of work). If this will be tendered per individual scope of work, cost will far exceed this estimate.

## 3.2 UNIT RATES

The unit rates in the preparation of this Class '4' Estimate include labour and material, equipment, subcontractor's overheads and profit. Union contractors are assumed to perform the work with the fair wage policy in effect.

## 3.3 GENERAL REQUIREMENTS AND FEE

General Requirements and Fee cover the General Contractor's indirect costs which may include but not be limited to supervision, site set up, temporary utilities, equipment, utilities, clean up, etc. as covered in Division 1 General Conditions of the Contract Documents. It also includes the contractor's fees and should not be confused with Design or Consultant fees which are excluded from the Construction Costs and carried separately in the Owner's Total Project Costs.

## 3.4 DESIGN AND PRICING ALLOWANCE

An allowance of 25.0% has been included to cover design and pricing unknowns. This allowance is not intended to cover any program space modifications but rather to provide some flexibility for the designers and cost planners during the remaining contract document stages.

It is expected that this allowance amount will be absorbed into the base construction costs as the design advances. The amount by which this allowance is reduced corresponds to an increase in accuracy and detailed design information. Hanscomb recommends that careful consideration be made at each milestone estimate to maintain adequate contingency for this allowance.

As a project nears completion of design, Hanscomb recommends retaining some contingency for this allowance for the final coordination of documents.

## 3.5 ESCALATION ALLOWANCE

All costs are based on July 2022 dollars. No allowance has been made for construction cost escalation may occur between July 2022 and the anticipated tender date of the project. Escalation during construction is included in the unit rates.

For escalation, the budgeted amount will typically decline as the time to award nears. Forecasting escalation requires careful assessment of a continually changing construction market which at best is difficult to predict. The escalation rate should be monitored.

# 3. COST CONSIDERATIONS

## 3.6 CONSTRUCTION ALLOWANCE

An allowance of 0.0% has been made to cover construction (post contract) unknowns. This allowance, also known as the Post Contract Contingency (PCC), is intended to cover costs for change orders during construction that are not foreseeable. It is not intended to cover scope changes to the contract. The amount carried in a budget for this allowance is typically set at the initial planning stage and should be based on the complexity of the project and the probability of unknowns and retained risks.

## 3.7 CASH ALLOWANCE

Cash allowances are intended to allow the contractor to include in the bid price the cost for work that is difficult to fully scope at the time of tendering based on factors that are beyond the Owner and Prime Consultant's control. Cash allowances attempt to reduce the risks by dedicating a set amount for use against a certain cost that cannot yet be detailed. The Contractor is obligated to work as best as possible within the limitations of the Cash Allowance.

Examples of Cash Allowances include hardware, inspection and testing, site conditions, replacement of existing elements during demolition for renovation, hazardous materials abatement, signage, etc.

Any Cash Allowances if applicable are included either in the details of this estimate under the appropriate discipline or at the summary level.

## 3.8 TAXES

No provision has been made for the Goods and Services Tax. It is recommended that the owner make separate provision for GST in the project budget.

## 3.9 SCHEDULE

Pricing assumes a standard schedule of work appropriate to the size and scope of this project. Premiums for off-hour work, working in an operational facility, accelerated schedule, etc., if applicable, are identified separately in the body of the estimate.

## 3.10 STATEMENT OF PROBABLE COSTS

Hanscomb has no control over the cost of labour and materials, the contractor's method of determining prices, or competitive bidding and market conditions. This opinion of probable cost of construction is made on the basis of experience, qualifications and best judgment of the professional consultant familiar with the construction industry. Hanscomb cannot and does not guarantee that proposals, bids or actual construction costs will not vary from this or subsequent cost estimates.

# 3. COST CONSIDERATIONS

## 3.11 ONGOING COST CONTROL

Hanscomb recommends that the Owner and design team carefully review this document, including line item description, unit prices, clarifications, exclusions, inclusions and assumptions, contingencies, escalation, and mark-ups. If the project is over budget, or if there are unresolved budgeting issues, alternative systems/schemes should be evaluated before proceeding into the next design phase.

It is recommended that a final updated estimate at the end of the design stage be produced by Hanscomb using Bid Documents to determine overall cost changes which may have occurred since the preparation of this estimate. The final updated estimate will address changes and additions to the documents, as well as addenda issued during the bidding process. Hanscomb cannot reconcile bid results to any estimate not produced from bid documents including all addenda.

This estimate does not constitute an offer to undertake the work, nor is any guarantee given that an offer, to undertake the work at the estimate(s) price, will subsequently be submitted by a construction contractor. Unless explicitly stated otherwise, it is assumed that competitive bids will be sought when tender documents have been completed. Any significant deviation between bids received and a pre-tender estimate prepared by Hanscomb from the same tender documents, should be evaluated to establish the possible cause(s).

## 3.12 COVID-19 CLASS A ESTIMATE STATEMENT

If this project is expected to be tendered in the near future and because risks related to COVID-19 are a currently known but unquantifiable project risk at this time and therefore may not support a claim under any force majeure contract clause. Hanscomb expects general contractors to include in their bids an allowance for COVID-19 risk unless that risk is mitigated in the bid documents. Inclusion of an allowance for risk related to COVID-19 will increase the overall cost of the project, in some cases materially.

The current risk of Covid-19 within the North American market has been rapidly reducing. Many jurisdictions are planning to reduce or even eliminate Covid-19 restrictions in the near future. Although the economic activity within the global economy has seen improvements, there has been increased Covid- 19 infections recently in the Southern Hemisphere. If this situation continues within the Asia countries, then it will impact the delivery of materials and finished goods to the Northern Hemisphere. Supply chain issues will persist in the Northern Hemisphere.

Hanscomb believes inclusion of these risks in bids could impact normal competitive market conditions resulting in a bid price increase by a minimum of 5 to 10% or in extreme situations as much as 10 to 20%.

We encourage building owners and Architect & Engineering teams to address this situation by providing clear directives to the bidders on risk mitigation for COVID-19 within the tender documents.

# 3. COST CONSIDERATIONS

## 3.12 COVID-19 CLASS A ESTIMATE STATEMENT cont'd

Items related to COVID-19 that may be included in bidders' risk allowances:

- Reduced site productivity due to:
  - lack of availability of labour for sickness and other reasons,
  - delays related to recruiting or unavailability of replacement workers,
  - social/physical distancing requirements,
  - site shutdowns due to outbreaks among site workers,
  - government mandated industry shutdowns,
  - delays in delivery of materials and equipment to the site,
  - unavailability of materials due to factory closure or shipping interruption,
  - delays related to acquiring substitutions for unavailable materials,
- Effect of reduced site productivity on project schedule,
- Effect of project schedule delays on overheads.

If any or all of these risks are encountered the completion date for the project will be delayed.

## 3.13 OTHER CURRENT RISKS TO CONSTRUCTION ESCALATION

**THE IMPACT OF THE RUSSIA / UKRAINE WAR:**

The impact of the Russia / Ukraine war on the Western economy will accelerate inflationary pressure within the Western economy. The Western Countries have laid siege to Russia in the form of severe sanctions on most transactions of goods and services that originate from Russia. The impact of these sanctions will reduce the function of normal trade of goods and services within the global economy. The impact will thus affect the construction activity as follows:

- Increase in costs of oil and natural gas
- The restriction of the trade of base metal materials (Nickle, palladium, iron, zinc, aluminum etc.)
- Increased constrained of supply of oil-based chemicals and other materials
- Shortages of fertilizers (potash and products made from oil & gas)
- Shortages of wheat and sunflower based products

We expect that Russia will increase trade of the above materials to China to avoid the effect of sanctions on the Russian economy. It is currently unclear how the Western Countries will react towards Chinese businesses. The situation will likely increase inflationary pressure on the Western Countries which will, in turn, fuel higher wage demands within these Western Countries.

## 4. GROSS FLOOR AND SITE DEVELOPED AREAS

**Gross Floor Area**

| Description | m2 |
|---|---|
| Concourse (Approximate Area) | 2,500 |
| **Total Gross Floor Area** | **2,500** |

**Site Developed Area (Road work affected allowed)**

| Description | m2 |
|---|---|
| Site | |
| Building Footprint | |
| **Total Site Developed Area** | |

The above areas have been measured in accordance with the Canadian Institute of Quantity Surveyors' Method of Buildings by Area and Volume.

## 5. CONSTRUCTION COST ESTIMATE SUMMARY

See Appendix A

**Appendix**
**A - Cost Estimate**

**CITY OF WINNIPEG PORTAGE & MAIN**
**CONCOURSE WATERPROOFING SYSTEM REPLACEMENT**
**WINNIPEG, MANITOBA**

Date: July 28, 2022
Revised: Oct. 5, 2022
Approximate Concourse GFA: 2,500m²

**OPTION 1 (RECOMMENDED)**

| Item # | Scope Description | Quantity | Unit | Unit rate | Amount |
|---|---|---|---|---|---|
| | | | | | |
| **1** | **Demolition of existing road, walkway, etc. at Portage Avenue @ Main Street** | **3,500** | **m2** | **53.00** | **$ 185,500** |
| *1a* | *saw cut* | *350* | *m* | *30.00* | *$ 10,500* |
| *1b* | *removal of pavement* | *3,500* | *m2* | *50.00* | *$ 175,000* |
| | | | | | |
| **2** | **Allowance for excavation work** | **10,000** | **m3** | **75.00** | **$ 750,000** |
| | | | | | |
| **3** | **Allowance for shoring & traffic deck** | **1** | **Sum** | **5,000,000.00** | **$ 5,000,000** |
| | | | | | |
| **4** | **Allowance for dewatering during excavation & construction** | **1** | **Sum** | **200,000.00** | **$ 200,000** |
| | | | | | |
| **5** | **Allowance for concourse concrete roof waterproofing** | **2,500** | **m2** | **300.00** | **$ 750,000** |
| *1a* | *Impervious surface layer* | *2,500* | *m2* | *25.00* | *$ 62,500* |
| *1b* | *Aggregate drainage layer* | *2,500* | *m2* | *25.00* | *$ 62,500* |
| *1c* | *High density XPS Insulation* | *2,500* | *m2* | *130.00* | *$ 325,000* |
| *1d* | *High strength drainage mat* | *2,500* | *m2* | *20.00* | *$ 50,000* |
| *1e* | *Multi-ply SBS modified bitumen sheet membrane* | *2,500* | *m2* | *100.00* | *$ 250,000* |
| *1f* | *Existing structural concrete roof slab to remain* | | | | |
| | | | | | |
| **6** | **Allowance for concourse concrete wall waterproofing** | **2,000** | **m2** | **275.00** | **$ 550,110** |
| *2a* | *Back-fill soil (Included elsewhere)* | | | | *$ -* |
| *2b* | *Aggregate drainage blanket* | *2,000* | *m2* | *25.00* | *$ 50,010* |
| *2c* | *High density XPS insulation* | *2,000* | *m2* | *130.00* | *$ 260,052* |
| *2d* | *High strength drainage mat* | *2,000* | *m2* | *20.00* | *$ 40,008* |
| *2e* | *Multi-ply SBS modified bitumen sheet membrane* | *2,000* | *m2* | *100.00* | *$ 200,040* |
| *2f* | *Existing structural concrete wall to remain* | | | | |
| | | | | | |
| **7** | **Allowance for footing level perimeter drain if applicable** | **1,000** | **m** | **120.00** | **$ 120,000** |
| *3a* | *Corrugated PVC drainage pipe with smooth inside surface along the tunnel and immediately below the floor slab top surface* | *1,000* | *m* | *100.00* | *$ 100,000* |
| *3b* | *Aggregate blanket surrounding the drainage pipe (Included above)* | | | | *$ -* |
| *3c* | *Filter fabric to fully capsulate the aggregate blanket (Included above)* | | | | *$ -* |
| *3d* | *Allowance for tie-in drainage pipe to existing drainage* | *1* | *Sum* | *20,000.00* | *$ 20,000* |
| | | | | | |
| **8** | **Allowance for drainage trench over roof if applicable** | **300** | **m** | **133.33** | **$ 40,000** |
| *4a* | *Impervious surface and surface drainage trench* | *300* | *m* | *100.00* | *$ 30,000* |
| *4b* | *Allowance for tie-in drainage trench to existing drainage* | *1* | *Sum* | *10,000.00* | *$ 10,000* |
| | | | | | |
| **9** | **Allowance for new concourse floor** | **2,500** | **m2** | **1,164.00** | **$ 2,910,000** |
| *5a* | *Removal of existing composite floor slab* | *2,500* | *m2* | *200.00* | *$ 500,000* |
| *5b* | *Allowance for new composite floor slab (concrete topping on metal deck)* | *2,500* | *m2* | *500.00* | *$ 1,250,000* |
| *5b* | *Allowance for floor finishes* | *2,500* | *m2* | *450.00* | *$ 1,125,000* |
| *5c* | *Existing crawlspace with new sump pit / pumping system* | *1* | *Sum* | *25,000.00* | *$ 25,000* |
| *5d* | *New 15-mil high density polyethylene vapour barrier, taped at seams and terminations* | *1* | *Sum* | *10,000.00* | *$ 10,000* |
| *5e* | *Existing soil to remain* | | | | *$ -* |
| | | | | | |
| **10** | **Allowance for backfill** | **10,000** | **m3** | **100.00** | **$ 999,999** |
| | | | | | |
| **11** | **Allow for unforeseen work affected during demolition & construction** | **1** | **Sum** | **1,000,000.00** | **$ 1,000,000** |
| | | | | | |
| **Net Construction Estimate (excluding mark-ups)** | | | | | **$ 17,061,219** |
| | | | | | |
| 12 | Phased Construction Premium | | | 5.0% | **$ 853,100** |
| 13 | General Requirements | | | 15.0% | **$ 2,687,100** |
| 14 | Contractor's Fee | | | 3.0% | **$ 618,000** |
| 15 | Design & Pricing Allowance | | | 25.0% | **$ 5,304,900** |
| 16 | Escalation Allowance | | | | **Excluded** |
| 17 | Construction Allowance | | | | **Excluded** |
| | | | | | |
| **TOTAL CONSTRUCTION ESTIMATE (INCLUDING MARK-UPS)** | | | | | **$ 26,524,319** |

**Alternate Price:**
Option to repair the existing floor in lieu of replacing (retain the existing floor & complete localized repairs), allowance for total cost repair: $1,500,000; Savings or deduct to allowed base cost repair instead or replacing: $3,000,000 (mark-ups included).

Hanscomb
QUANTITY SURVEYORS

**Appendix AA**
**Documents and Drawings List**

## DOCUMENTS AND DRAWING LIST

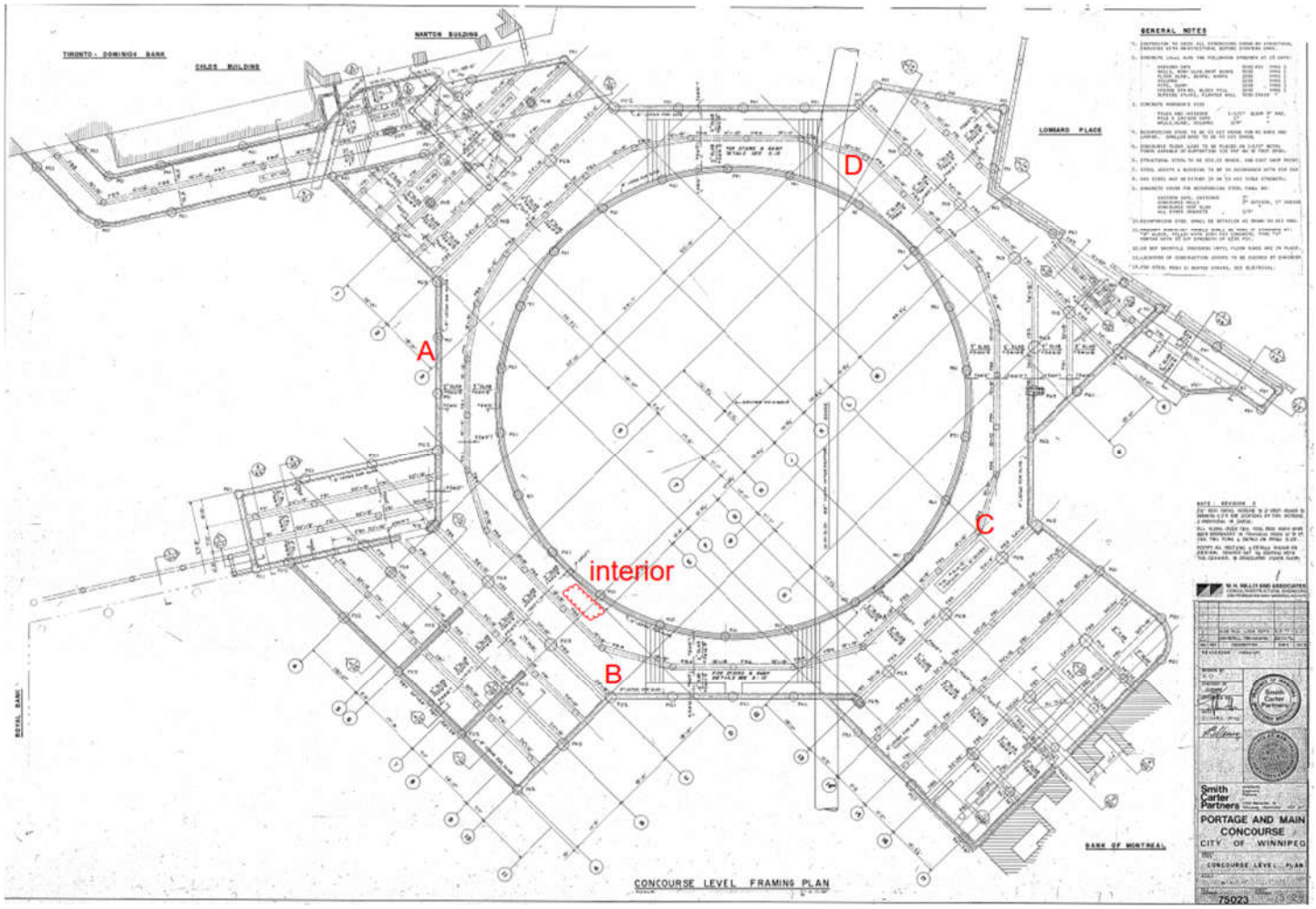
DOCUMENTS

| Number | Title | Dated | Received |
|---|---|---|---|
| 52 pages | 20220712 Portage_and_Main_membrane_renewal_draft submission[1] | July 12, 2022 | July 13, 2022 |
| | City comments via email | | Oct. 4, 2022 |

DRAWINGS

| Number | Title | Dated | Received |
|---|---|---|---|
| 28 sheets | Combined Original Drawings | May 5, 1977 | July 18, 2022 |
| 18 sheets | Existing Structural Drawings | Oct. 22, 1976 | July 18, 2022 |

**Appendix AB**
**Representative Drawings**


A
B
C
D
interior
CONCOURSE LEVEL FRAMING PLAN
PORTAGE AND MAIN
CONCOURSE
CITY OF WINNIPEG

## Hanscomb: Providing Excellence in the Construction Industry Since 1957

Hanscomb Limited, a leading independent organization of project control specialists, has been privileged to serve both Canadian and international clients on a wide variety of construction projects since 1957. By planning, monitoring, and controlling cost in an unbiased independent professional manner, Hanscomb has become an internationally recognized leader in the coordinated management of capital projects.

Our growing team of trusted professionals and experts consists of quantity surveyors, cost consultants, project monitors, schedulers, and value specialists, skilled in a remarkable variety of project sectors including but not limited to transportation, civil infrastructure, education, healthcare, residential, and commercial. Hanscomb takes pride in the multi-disciplinary character of the company and the ability of its people to bring together, in a team, the professional and practical skills of the very diverse field of quantity surveying.

Our nationwide network of offices and worldwide associates allows for the easy exchange of information, skills and resources ensuring we stay abreast of the latest in design, construction practices and trends. With offices located coast to coast, Hanscomb has the local experience and worldwide presence to keep your projects on track.

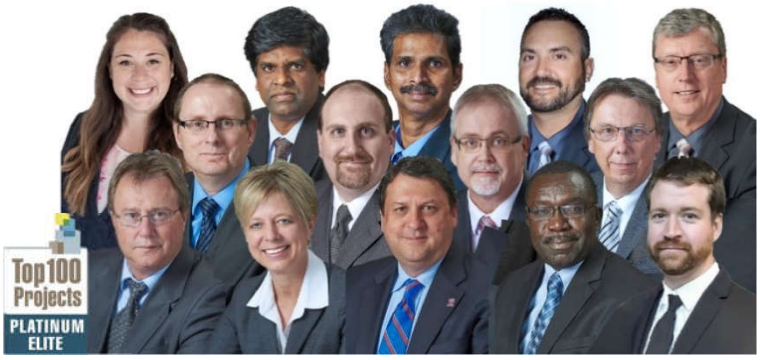
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# Appendix D TRAFFIC VISUALIZATION MODEL TERMS OF REFERENCE

The development of the Traffic Management Plan requires comprehensive understanding of traffic flows in the downtown and how they will be impacted. A draft Terms of Reference for the development of the downtown traffic model is provided for reference and inclusion in future work packages.

The proposed budget for the Model creation and maintenance is $500,000.00

# D.1 DRAFT TERMS OF REFERENCE

The bidder should develop a VISSIM micro-simulation model that is capable of evaluating traffic conditions in and around the Main Street and Portage Avenue intersection during the membrane replacement project. The model would be used to evaluate how traffic would function under various Traffic Management Plans (TMP). The model will inform City of Winnipeg staff of the likely effectiveness of mitigation measures, proposed by the bidder and the likely delays that would result from accommodating alternate routing to accommodate construction activity.

## D.1.1 EXISTING RESOURCES

A VISSIM microsimulation model has previously been developed by a consultant for the City of Winnipeg. This model will be made available to the successful bidder. The previously developed model focused on traffic operations along Portage Avenue from just west of Memorial Boulevard to just east of Main Street and along Main Street from just south of Tache Avenue to just north of Higgins Avenue. The model's extents are presented in Figure D1.

A 2019 PM peak hour (1-hour) was previously modeled in Vissim and starts with a half-hour warm-up / seed period. In addition to vehicular traffic and traffic signals, the model coded pedestrian crosswalks and bus stops. The intersections along Portage Avenue and Main Street are modeled but the simulation does not have the ability to process traffic through the local streets that feed Portage and Main Street. For example, the model does not allow traffic to travel along Fort Street between Portage Avenue and Broadway, or along York Avenue between Memorial / Route 62 and Main Street. The model volumes are setup in an origin-destination format.

The City of Winnipeg also has an existing conditions PM peak hour Vistro model of downtown Winnipeg. This model can also be made available to the successful bidder.

## D.1.2 MODEL UPGRADES

The simulation model to be developed by the successful bidder will need to have upgraded functionality and network coverage vs. the City of Winnipeg's current model.

**The model should be capable of:**

- Modeling the peak 2-hours of a typical weekday morning (AM)
- Modeling the peak 2-hours of a typical weekday afternoon / evening (PM)
- Evaluating the impact that turning movement closures (e.g., at the Main Street & Portage Avenue intersection) have on queue length, travel time & delay, and density (defined as vehicles per hour per lane for a segment) in the modeled area. The model should be capable of reflecting volume changes due to construction related re-routing.
- Evaluating how different signal timings would impact traffic operations

- Modeling vehicular (including transit) and pedestrian traffic along the street grid as presented in *Figure D2*. The modeled streets should be interconnected as to permit trips to re-route via alternative streets should a closure be implemented.

## D.1.3 MODELING REQUIREMENTS

- The AM and PM models should be developed and calibrated to current traffic conditions. Input volumes should reflect typical conditions during the year 2019. Peak-hour volumes will be provided by the City of Winnipeg. Shoulder hour volumes may be developed as a factor or percentage of the peak hour volumes. factors should be based on historical or existing traffic volume data in the study corridor.
- Trip OD patterns should be derived from survey data. (Location based services data such as Streetlight Inc. or similar)
- Each model should be calibrated against turning movement and approach volumes, typical queue lengths, and typical speeds. The City of Winnipeg will not provide this data or estimates of historic queues and speeds will need to be obtained by the bidder. Calibration efforts are intended to increase the confidence of the model's ability to predict operations along the impacted roadways. Minor roadways that are not impacted by construction closures do not need to be well calibrated. Major roadways and roadways that are subject to diversions should be well calibrated.
- Suggested calibration metrics are:
    - GEH Statistic for individual link flows is less than 5 for at least 85% of all links.
    - GEH statistic for turning movements is within 5 for at least 85% of all movements where input volume exceeds 50 vehicles.
    - The formula for the GEH statistic is:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

, where M is the hourly traffic volume from the traffic model and C is the real-world hourly traffic count
    - Modeled queue lengths are within the greater of 25%, or 500 feet of observed queue lengths.
    - Modeled travel times along major streets (Portage Ave. Main Street, IsrealAsper Way/Waterfront Drive) should be within 85% of observed travel times
- Alternative calibration metrics can be suggested by the bidder.

## D.1.4 MEASURES OF EFFECTIVENESS AND DELIVERABLES

The model results will be used by the City of Winnipeg to understand how various closures will impact traffic operations, including due to the impact of re-routed traffic. The model should provide travel time and speed, queue length, and vehicle throughput. Model results s along with detour and mitigation plans should be presented in a manner that is suitable for evaluation by the City of Winnipeg staff, to executive staff, and to the public. In addition to quantitative outputs, videos of the simulation should be recorded for viewing by City staff and the public. The simulation model files, including any inputs, scripts and outputs would be provided to the City of Winnipeg after the completion of the modeling effort.

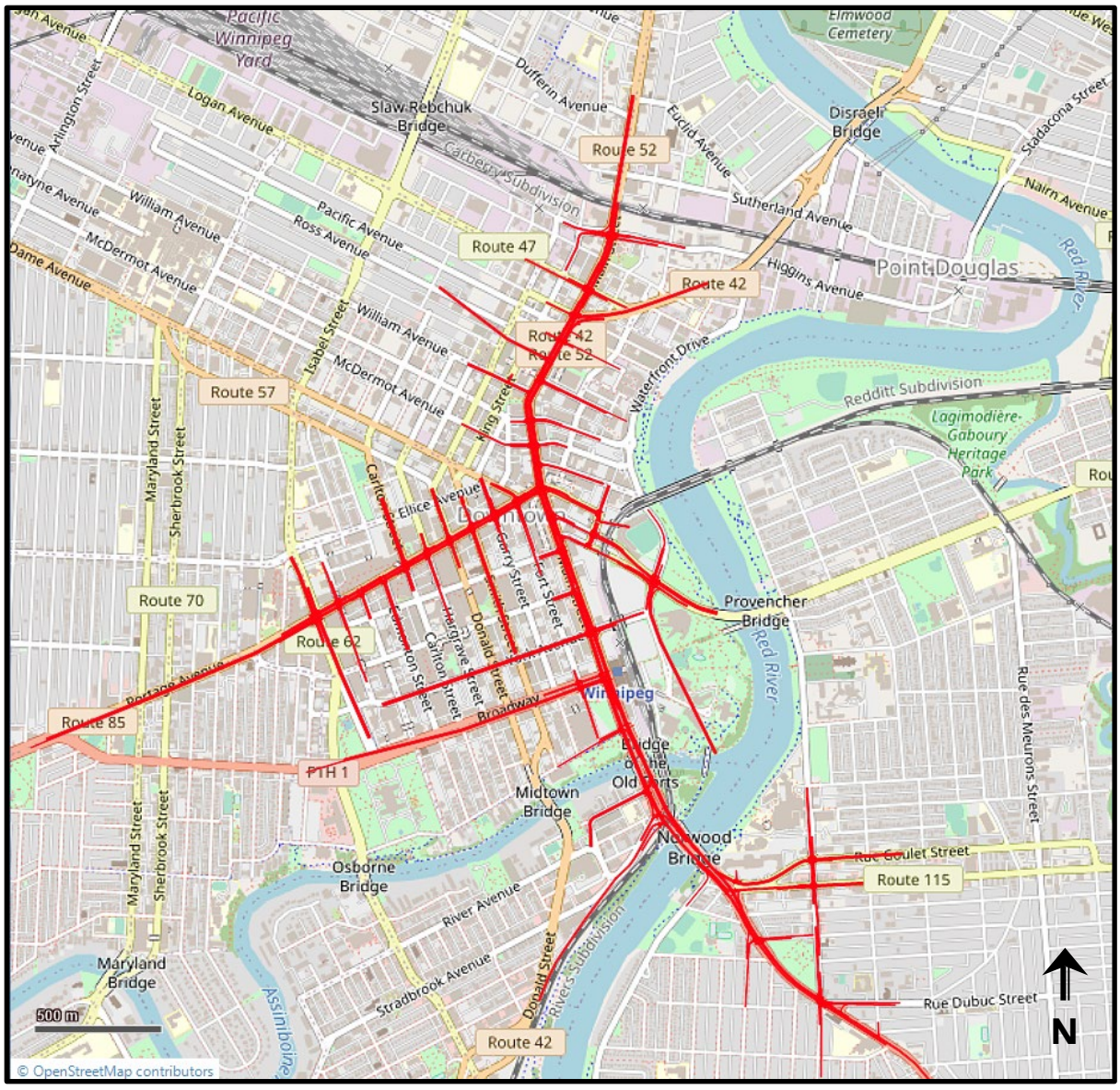



**Figure D1. City of Winnipeg's 2019 PM peak hour simulation model network extents**

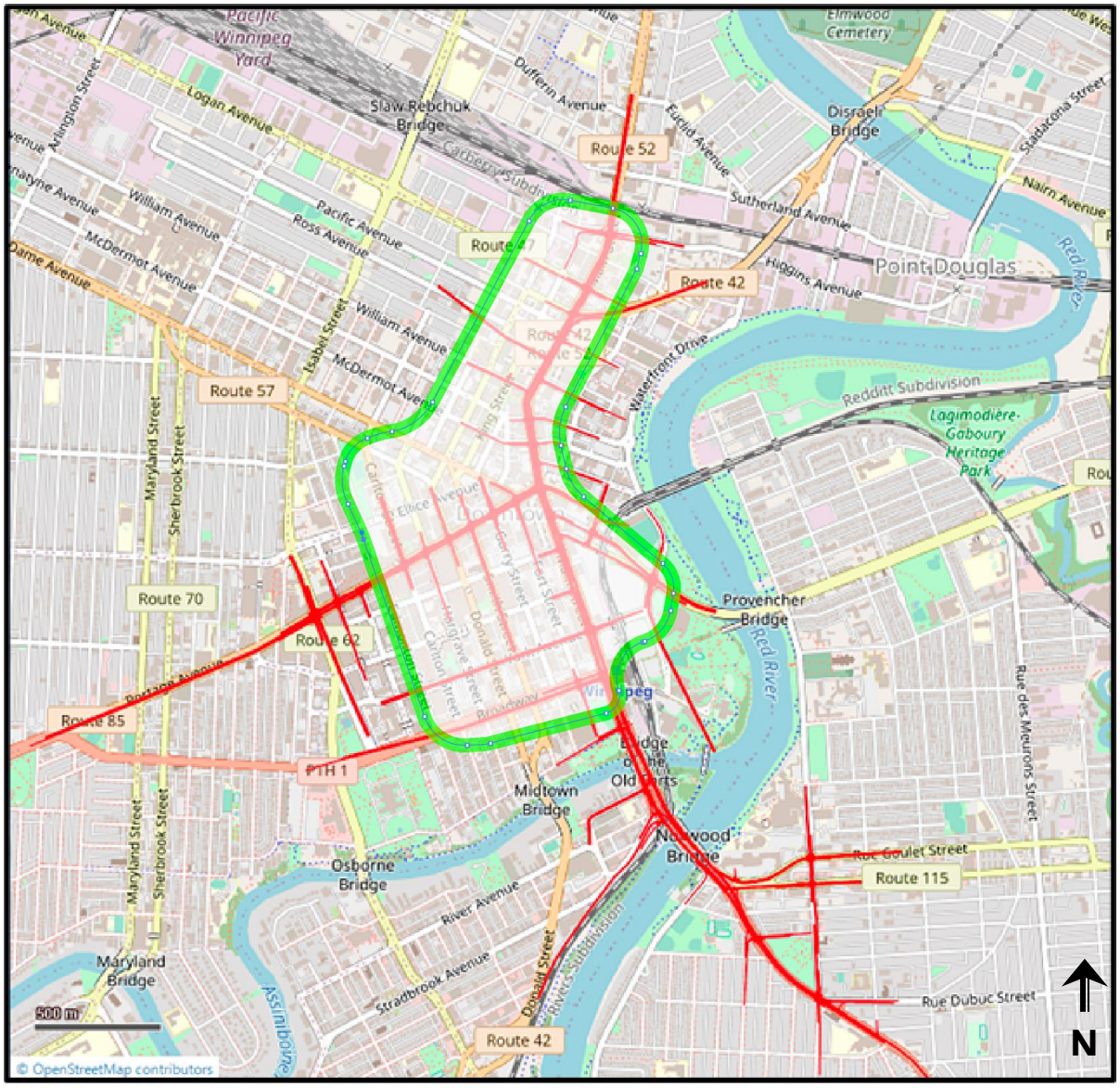
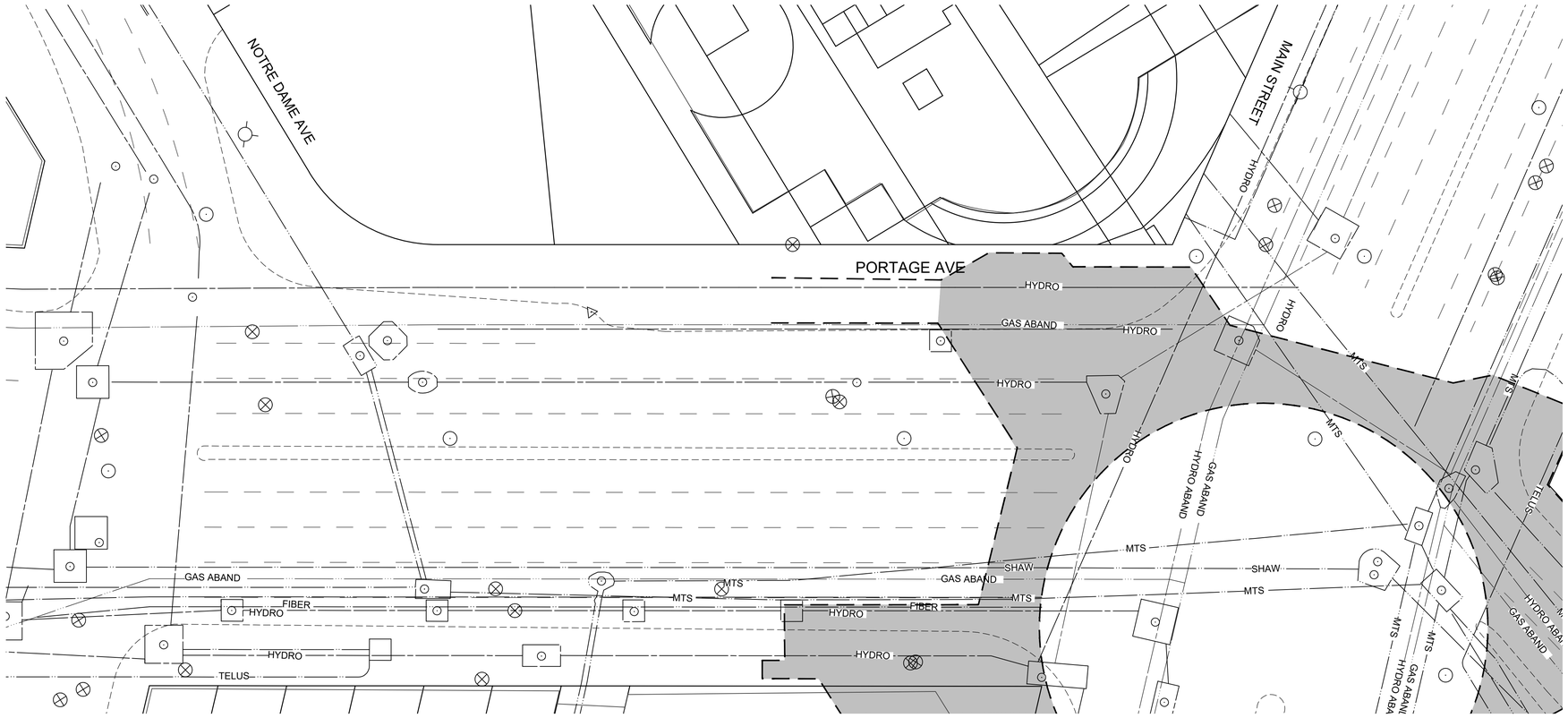
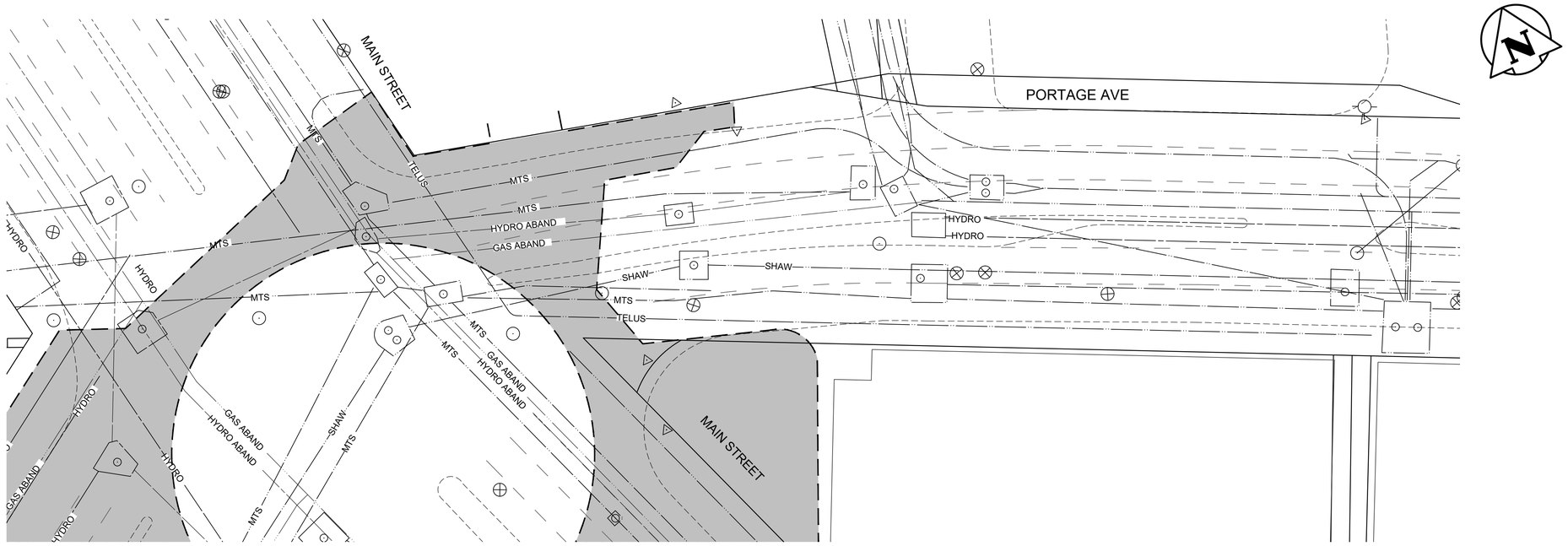



**Figure D2. Upgrade VISSIM model network extents. Bounded by Broadway to the south, Higgins Avenue to the north, Princess Street and Carlton Street to the west, Main Street to the east north of Portage Ave and Waterfront Drive /Israel Asper Way south of Portage**

# Appendix E Shallow Utilities




## METRIC

WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

## WARNING

IF POWER EQUIPMENT OR EXPLOSIVES ARE TO BE USED FOR EXCAVATION ON THIS PROJECT THE CONTRACTOR MUST:

1) NOTIFY THE GAS COMPANY OF THE PROPOSED LOCATION OF EXCAVATION.

2) TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.

SEE PROVINCIAL REGULATION 140/92 FOR DETAILS

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Legend

| EXISTING | LEGEND-PLAN | PROPOSED |
|---|---|---|
| | WASTEWATER SEWER | |
| | LAND DRAINAGE SEWER | |
| | WATERMAIN | |
| | MANHOLE | |
| | HYDRANT | |
| | CATCH BASIN | |
| | VALVE | |
| | PLUG | |
| | CULVERT | |
| | GAS | |
| | HYDRO | |
| | F.O.C. | |
| | ASPHALT | |
| | CONCOURSE | |
| | PROPERTY LINE | |
| | COMMUNICATION | |
| | TOP OF BERM | |
| | SLOPE | |
| (57.600) | GRADE | |
| | DITCH | |
| | LIGHT STANDARD | |
| | HYDRO POLE | |
| | SIGN | |
| | GUY WIRE | |

Notes

DRAWING BASED ON AVAILABLE INFORMATION AS OF SEPTEMBER 2022.
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| Revision | By | Appd. | YY.MM.DD |
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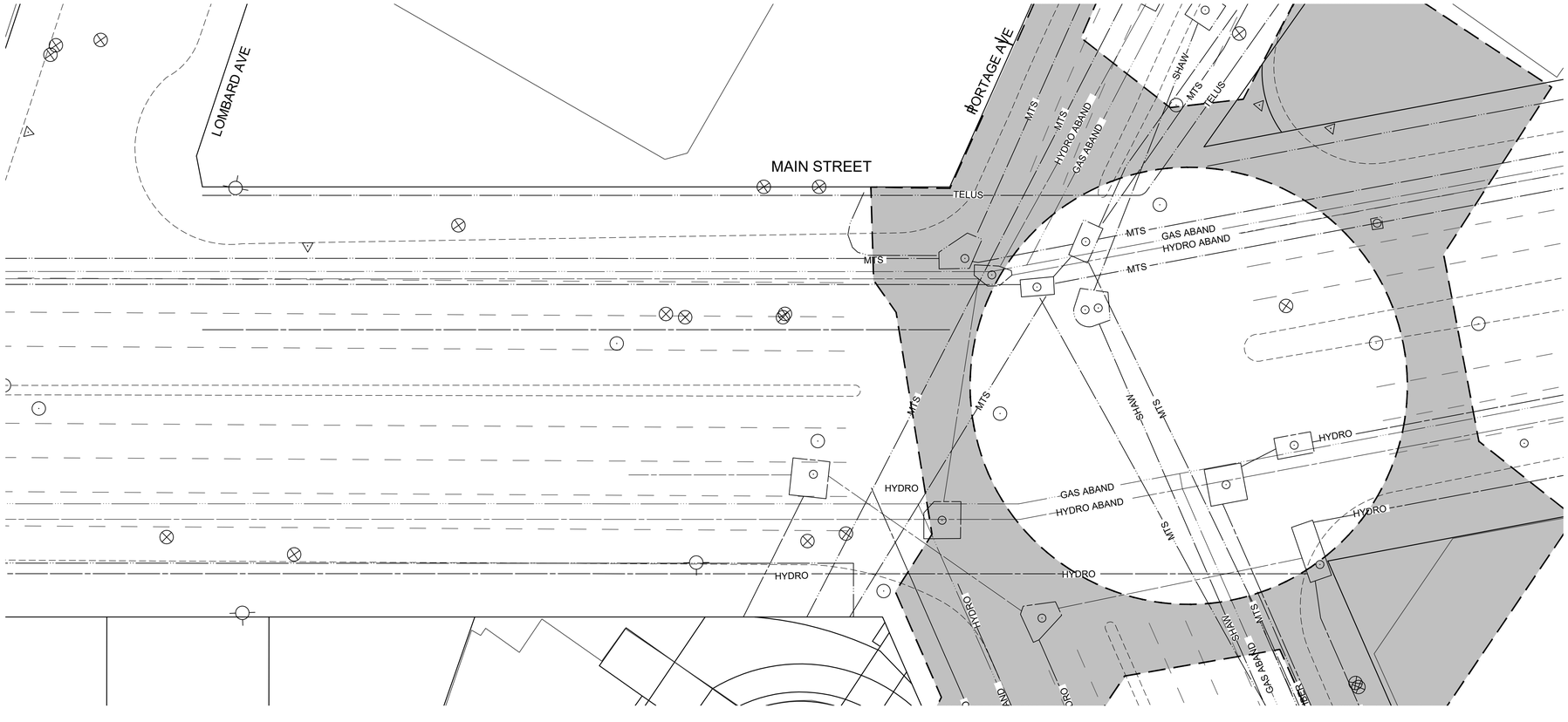
UTILITIES

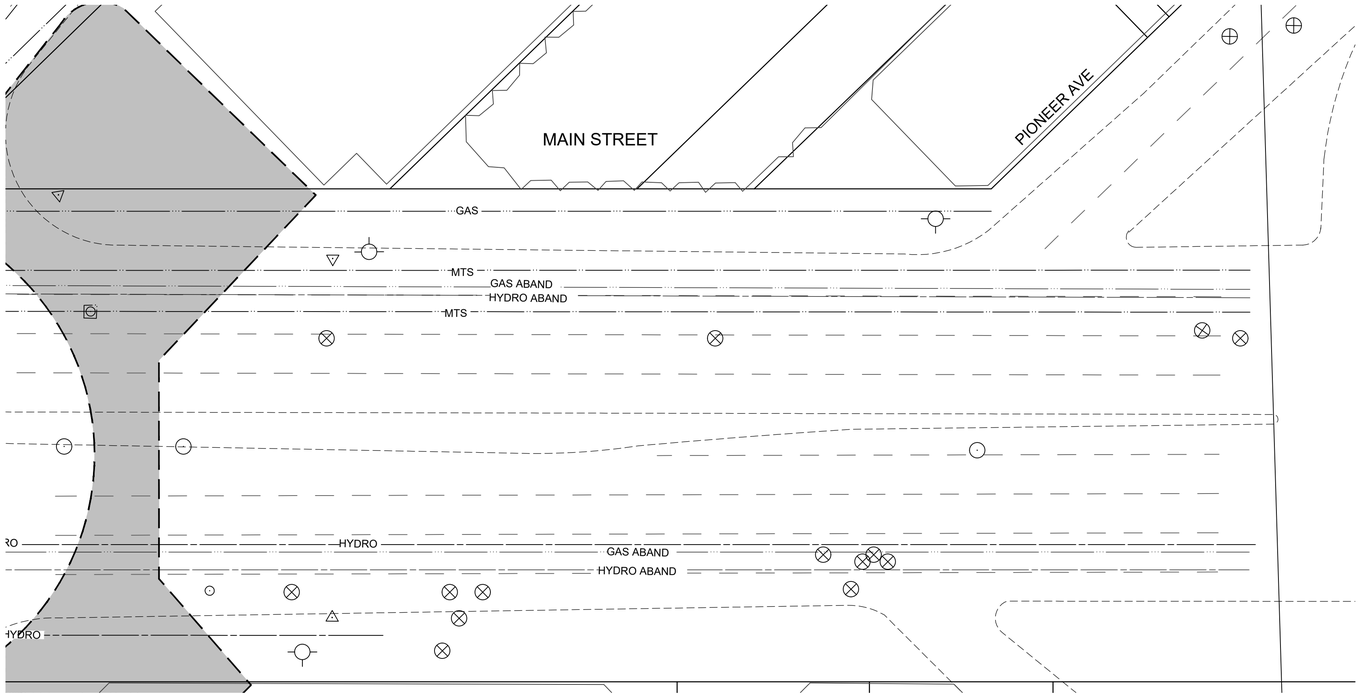
Winnipeg, Manitoba

Title

PORTAGE AND MAIN VISIONING

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|---|---|---|
| 144521062 | 1:250 | |
| **Drawing No.** | **Sheet** | **Revision** |
| C-301 | of | 0 |




## METRIC

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Legend

| EXISTING | LEGEND-PLAN | PROPOSED |
|---|---|---|
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| | LAND DRAINAGE SEWER | |
| | WATERMAIN | |
| | MANHOLE | |
| | HYDRANT | |
| | CATCH BASIN | |
| | VALVE | |
| | PLUG | |
| | CULVERT | |
| | GAS | |
| | HYDRO | |
| | F.O.C. | |
| | ASPHALT | |
| | CONCOURSE | |
| | PROPERTY LINE | |
| | COMMUNICATION | |
| | TOP OF BERM | |
| | SLOPE | |
| (57.600) | GRADE | |
| | DITCH | |
| | LIGHT STANDARD | |
| | HYDRO POLE | |
| | SIGN | |
| | GUY WIRE | |

Notes

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