

APPENDIX A

ENVIRONMENTAL REGULATORY INFORMATION

CITY OF WINNIPEG

Riviera Crescent Outfall Fisheries Act Authorization Report and Offsetting Plan

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STATEMENT OF LIMITATIONS AND CONDITIONS

Limitations

This report has been prepared for the City of Winnipeg in accordance with the agreement between KGS Group and the City of Winnipeg (the “Agreement”). This report represents KGS Group’s professional judgment and exercising due care consistent with the preparation of similar reports. The information, data, recommendations and conclusions in this report are subject to the constraints and limitations in the Agreement and the qualifications in this report. This report must be read as a whole and sections or parts should not be read out of context.

This report is based on information made available to KGS Group by the City of Winnipeg and unless stated otherwise, KGS Group has not verified the accuracy, completeness or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith. KGS Group shall not be responsible for conditions/issues it was not authorized or able to investigate or which were beyond the scope of its work. The information and conclusions provided in this report apply only as they existed at the time of KGS Group’s work.

Third Party Use of Report

Any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

Geo-Environmental Statement of Limitations

KGS Group prepared the geo-environmental conclusions and recommendations for this report in a professional manner using the degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report is based on the information that was made available to KGS Group during the investigation and upon the services described, which were performed within the time and budgetary requirements of the City of Winnipeg. As this report is based on the available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate or contradicted by additional information. KGS Group makes no representation concerning the legal significance of its findings or the value of the property investigated.

1.0 FINANCIAL GUARANTEE

The City of Winnipeg will obtain a Letter of Credit to provide the financial guarantee, which will be included in Appendix A once the offsetting costs are agreed upon.

2.0 BACKGROUND AND DESCRIPTION OF PROPOSED WORK

Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) was contracted by the City of Winnipeg to address safety and stability concerns regarding several outfalls along the Red and Assiniboine Rivers which all required cleaning and/or erosion protection and repair. The outfalls are all important and necessary assets of the City of Winnipeg Sewer Management System and routine repairs and maintenance are required to protect the upstream neighborhoods from potential surface and basement flooding. One of the outfalls that was identified by the City of Winnipeg was the Riviera Crescent Outfall (City of Winnipeg Asset # S-MA70007648), an 1800 mm diameter concrete/2000 mm diameter CMP storm water outfall pipe that discharges into the Red River.

The need for emergency repairs was identified at the Riviera Crescent Outfall during the summer of 2020 due to a large sinkhole that had opened up along the riverbank just below the Ordinary High Water Mark (OHWM, EL. 226.62 m). A Request for Review was submitted to Fisheries and Oceans Canada (DFO) on November 12, 2020, for the proposed emergency repairs. DFO issued a Letter of Advice (LoA) on December 16, 2020 (DFO File No. 20-HCAA-02308) stating, with implemented mitigation measures, the proposed emergency repairs could proceed. The emergency sink hole repair was completed in March 2021.

Subsequently, on April 20, 2021, another Request for Review was submitted to DFO to complete the cleaning and/or erosion protection and repairs for six outfall sites, which included the permanent repairs at the Riviera Crescent Outfall. On June 1, 2021, DFO issued a LoA (DFO File No. 21-HCAA-00897) stating, with implemented mitigation measures, the proposed projects could proceed. However, since receiving the LoA, KGS Group determined that the design for the Riviera Crescent Outfall needed to be substantially revised due to additional data collected from slope stability monitoring instrumentation. The monitoring suggested that active riverbank movements were occurring, and the outfall erosion protection design would need to be more extensive. After further analysis of the data and discussions with the City of Winnipeg, a new bank stabilization plan was designed for the Riviera Crescent Outfall to address the slope stability concerns.

The proposed revised repair and erosion protection design are presented in Appendix B and include the following Works:

- Installation of a 108.3 m² temporary clay cofferdam to facilitate a safe, dry work environment for outfall repairs, as required.
- Removal of 8.6 m of existing 2000 mm diameter CMP and 26.3 m of 1,800 mm diameter concrete pipe and replace with 34.9 m of 2120 mm diameter SPCSP with polymer coating and a debris gate.
- Installation of twenty-three (23) 2.1 m diameter rockfill columns imbedded 1 m into the underlying till. These will be installed above the OHWM and be covered with a 0.6 m clay cap.
- Regrade the riverbank slope between the OHWM and ASRL by excavation to a stable 4:1 slope.
- Installation of a 28.2 m long, 3.5 m wide rockfill shear key imbedded 0.6 m into the underlying till. This will be constructed below the OHWM.
- Installation of an 869.0 m² riprap blanket extending from the OHWM to approximately 9 m horizontally beyond the ice scour line. Riprap installed above the ice scour line will be sub-cut approximately 600 mm into the bank. The riprap footprint encompasses the entirety of the project's components.
- Erosion Control, Site Restoration and Offsetting - as required.

The Red River falls within the range of Mapleleaf mussel (*Quadrula quadrula*) habitat, which is a species listed as Endangered under *The Endangered Species and Ecosystems Act* (Manitoba) and as Threatened under the federal *Species at Risk Act* (SARA). As riprap armouring is considered a major threat to Mapleleaf mussel, an Aquatic Habitat Assessment was completed at the project site in 2020 to determine if there might be potential habitat for the species within the project footprint. During the cursory shoreline survey at the outfall empty Mapleleaf valves were found along with empty shells of four other species. The Aquatic Habitat Assessment also found the presence of compact clay with gravel/cobble substrate, which is suitable habitat, at the downstream half of the survey area approximately 5 m offshore from the Average Winter River Level (AWRL, EL. 222.92)⁽¹⁾. The nature of the substrate and presence of numerous shells, including Mapleleaf, suggest that the project area likely provides habitat for Mapleleaf as well as other mussel species.

The revised bank stabilization design includes a 259.2 m² area of riprap blanket area that extends below the ice scour (EL. 222.32), and of that area, 47.0 m² impacts a clay with gravel/cobble substrate that is potential Mapleleaf mussel habitat. The project will also alter 212.2 m² of soft silty clay below the ice scour that is not typically considered suitable Mapleleaf mussel habitat.

Due to the large-scale changes to the project design and the resulting permanent alteration of potential Mapleleaf mussel habitat, DFO indicated on January 26, 2022, that a new Request for Review would have to be submitted. On March 4, 2022, KGS Group submitted the required updated Request for Review. Through discussions with the Fish and Fish Habitat Protection Program of DFO it was confirmed that the project would require authorization under the *Fisheries Act* and under SARA. This document satisfies part of the application required for authorization under the *Fisheries Act*.

2.1 Project Design

Works that will occur below the OHWM includes a temporary cofferdam, culvert repairs, installation of a rockfill shear key, riverbank regrading and installation of an 869.0 m² riprap blanket encompassing the entire project footprint below the OHWM. The project will alter 869.0 m² of fish habitat and affect 47.0 m² of potentially suitable Mapleleaf mussel habitat. The detailed project design is shown in Appendix B – Design Drawings 001 and 002.

2.2 Method of Construction

The method of construction for the slope stabilization and outfall repair activities are described as follows.

- Clay Cofferdam – In order to facilitate a safe and dry working environment for outfall repairs, a clay cofferdam will be installed, as required, depending on the water level and ice thickness at the outfall. It will be located as close to the outfall outlet as possible to minimize the footprint below the ice scour level. The temporary cofferdam will allow the pipe repair work to be conducted below the OHWM as well as below the ice scour. The top of the cofferdam will be 0.3 m wide, 0.3 m above ice level and will cover a total area of 108.3 m². Once the cofferdam is constructed the area below the ice scour (7.2 m²) will require dewatering and contractors will take all necessary precautions to avoid excess sediment from being pumped into the river. Every effort will be made to limit the duration of in-water works. Once pipe repairs and riprap installation in front of the pipe is complete, the cofferdam material will be completely removed and hauled away off site.

- **Pipe Repairs** – Before work begins, all existing water from inside the pipe will be pumped back into the river and contractors will take precautions to limit any sediment transport. As construction will take place in the winter months, flow within the pipe is unlikely. The repairs to the outfall pipe end will begin by excavating around the pipe to expose 34.9 m of the pipe to be replaced. Contractors will remove 8.6 m of existing 2000 mm diameter CMP and 26.3 m of existing 1,800 mm diameter concrete pipe and replace the entire length with 34.9 m of 2,120 mm diameter SPCSP with polymer coating and a new debris gate will be installed at the outlet. The end of the pipe will be beveled to match the contours of the riverbank. One (1) - 1.0 m thick clay plug will be placed along the length of the new SPCSP and an additional clay plug will be installed at the pipe outlet as shown on the Drawings.
- **Rockfill Shear Key** – Along the riverbank at the outfall a 28.2 m long, 3.5 m wide trench-excavated rockfill shear key will be installed. The key will be embedded a minimum of 0.6 m into the underlying dense till and be approximately 5.5-6 m deep. The trench will be capped with 0.6 m of clay after construction which would bring it level with the base of the riprap blanket. The shear key will be constructed below the OHWM and is entirely within the riprap footprint. All material that will be excavated shall be disposed of off-site immediately upon excavation.
- **Rockfill Columns** – The contractor will vibrocompact rockfill columns starting in the middle/at pipe alignment and work towards the North extent. Columns South of the pipe alignment will be vibrocompacted following the North half compaction. Vibrocompaction of rockfill columns shall be completed in advance of pipe installation works. The rockfill columns will be 2.1 m in diameter and embedded a minimum of 1.0 m into the underlying till. These columns will be installed above the OHWM and be covered with a 0.6 m clay cap flush with the existing ground.
- **Shoreline Sub-Cut & Slope Regrade** – Prior to placement of rockfill riprap, the riverbank above the ice scour line and below the OHWM will be regraded by excavation to a stable 4:1 slope tied in to match the existing riverbank contours and geometry upstream and downstream of the site. All riprap above the ice scour line will be sub-cut into the bank (i.e., excavate a minimum of 0.6 m of existing substrate) to avoid infilling of fish habitat. All excavated materials will be removed off site during construction.
- **Rockfill Riprap Blanket** – The rockfill material placed will consist of clean free-draining material, free from organics, roots, silts, sand, clay or any other material that would detract from the strength and drainage characteristics of clean rockfill. The riprap size will be 50 mm to 450 mm with an average diameter of 300 mm to withstand the erosive action of the river. The riprap shall be durable, comprised of either white crystalline limestone, granite, or other quality dense rock. Rock will be pushed or rolled into place in such a manner that the larger rocks are uniformly distributed, and the smaller rocks serve to fill the places between the larger rocks, and that the excessive segregation of the various rock sizes does not occur. Sufficient leveling will be done to produce a neat and uniform surface and will be tapered at both the downstream and upstream extents to provide a smooth hydraulic transition. The riprap blanket will extend out from below the OHWM and cover an area of 869.0 m², extending approximately 9 m horizontally beyond the ice scour.
- **Machinery and Site Access** – It is anticipated that the contractor will use a loader, excavator/backhoe, piling rig, crane, and skid steer to complete the required repair works. Other smaller equipment that may be necessary includes appropriately sized pumps, small hand tools, and generators. Site access will be limited to a single access point that will be maintained throughout the duration of the project. Works near the river edge will be conducted during low flow (winter) and access will take place during frozen

ground and ice conditions. Access to the outfall is through private property, therefore all necessary agreements with the adjacent property owners will be established before work begins.

- Sediment Control and Erosion Mitigation – Native riverbank grass seed installation, silt fencing, and erosion control blanket shall be used at the mid and lower bank as erosion mitigation. Back-filled excavations and areas disturbed by construction activities shall be regraded to match the existing riverbank contours. The materials will consist of clean clay fill, compacted in 150 mm lifts. All deleterious materials shall be removed off-site during the regrading operations. Silt fences and erosion control blankets will be used to prevent the release of sediment laden runoff into the Red River during excavation or other construction activities. These protection measures will be maintained until re-vegetation has been re-established. Any sediment, sand, or debris introduced to the ice surface shall be removed upon project completion and prior to spring thaw. Effective long-term erosion and sediment control measures (e.g., erosion control blankets, sediment barriers, straw mulch, silt fences) will be used to prevent any construction activities from contributing sediment to the water body. This includes stabilizing and seeding disturbed areas after construction and ensuring they are reclaimed to vegetation within one growing season. In addition to the above, all work will be performed in accordance with an Environmental Protection Plan approved by the Contract Administrator.
- Revegetation – Any area along the riverbank where the natural vegetation is disturbed during construction at the outfall site will be revegetated with native grasses as required mitigation of project effects and will not be considered as offsetting. Revegetation of temporary access and laydown areas with topsoil and grass seed is scheduled to be performed immediately following construction activities. Restorations will be completed by June 30, 2023. The complete offsetting plan is described in Section 16 and shown in Appendix C.

3.0 ENGINEERING DRAWINGS

A set of renewal and rehabilitation design drawings (PP-R-C0048-001 & -002) showing the proposed works for the Riviera Crescent Outfall Permanent Works is provided in Appendix B.

4.0 PHASES AND SCHEDULE INFORMATION

The in and near water works are anticipated to begin and be completed between January 1, 2023 and March 15, 2023 during low flow and before the spring thaw. Site restoration will be completed following the conclusion of the work in spring before June 30, 2023. The in and near water activities that will be completed within the time frame include: the installation of rockfill columns, a shear key, a riprap erosion protection blanket, a temporary cofferdam, pipe repairs and regrading between the OHWM and ASRL as seen in the design drawings (Appendix B). After the work is complete, KGS Group will complete the offsetting site restoration plan laid out in Section 16.

5.0 LOCATION

The project location and size of works relative to the surrounding area, existing structures and the winter and high-water levels is presented in Appendix B. The approximate latitude and longitude coordinates of the project are 49°49'51.41"N and 97° 8'56.87"W. The project site is located in Winnipeg, Manitoba. To reach the site, travel north on Pembina Highway (Rte 42 N) from the Trans-Canada Highway (Rte 100) for approximately 7 km. Turn east onto Riviera Crescent and travel 0.5 km. Turn south onto Riviera Crescent and the subject site will be located immediately to the east. Note that the subject site is located on private property.

6.0 NEAREST COMMUNITY

The project is proposed to take place within the neighbourhood of Fort Gary South within the City of Winnipeg, Manitoba.

7.0 CONSULTATIONS UNDERTAKEN

KGS Group has had on-going coordination/engagement with the adjacent property owners and have initiated obtaining Private Property Access Agreements with the affected property owners. The City of Winnipeg will post the project on their website under a “Notification of Construction/Sewer Work” and KGS will hand deliver construction notices to the adjacent residents/community before work begins. A public notice will also be posted on the Common Project Search Public Registry under the approval process for Transport Canada. There was no additional public or Indigenous engagement for this project.

8.0 DESCRIPTION OF FISH AND FISH HABITAT

A description of the fish and fish habitat present in the Red River at the project area and the methodology used to obtain this information was provided in the City of Winnipeg Outfall Program at Riviera Crescent–Aquatic Habitat Assessment ⁽¹⁾ that was submitted with the Request for Review. The bank of the Red River in the survey area was moderately sloped with riparian vegetation consisting primarily of forbs and shrubs, with some overhanging vegetation and large woody debris. In comparison, the mid-bank area is mainly comprised of manicured grass and small shrubs, with scattered mature deciduous trees near the top of bank and the shoreline was predominated by silty clay (Site Photographs included in Appendix D). Based on the Aquatic Habitat Assessment, the survey area was predominated by clay interspersed with silt, comprising 60.8% of the substrate. At the downstream half of the survey area, the clay was also interspersed with gravel and, to a lesser extent cobble, with this substrate type comprising the remainder 39.2% of the survey area ⁽¹⁾.

The Red River provides year-round habitat for approximately 56 fish species. This includes species that are sought after for recreational fishing, such as Walleye (*Sander vitreus*), Sauger (*Sander canadensis*), Channel Catfish (*Ictalurus punctatus*), and Northern Pike (*Esox lucius*). Two of the fish species inhabiting the Red River in the vicinity of Winnipeg have been specially designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Saskatchewan-Nelson River population of Lake Sturgeon was designated as “Endangered” in 2017 but is not listed under SARA. It is believed that Lake Sturgeon captured on the Red River by anglers has been linked back to stockings of sturgeon in the river. The Bigmouth Buffalo (*Ictiobus cyprinellus*) was designated as “Special Concern” in 2009 and is currently listed as “Special Concern” under Schedule 1 of SARA (Federal). The Chestnut Lamprey (*Ichthyomyzon castaneus*, Saskatchewan- Nelson River populations) and the Silver Lamprey (*I. unicuspis*) were both listed as “Data Deficient” by COSEWIC in 2010 and 2011, respectively. The chestnut lamprey remains listed under Schedule 3 of SARA as “Special Concern”, while the silver lamprey is not currently listed under any schedules of SARA. None of these species are designated as species at risk (Endangered or Threatened) on Schedule 1; therefore, none are protected under SARA ⁽²⁾.

The proposed outfall site contains habitat suitable for various life stages of both forage and larger bodied fish species, but the habitat is not rare or limiting and is readily available both upstream and downstream of the site. Cover for fish was limited to approximately 10% of the survey area where overhanging vegetation and some large woody debris was present. Due to the lack of in-stream vegetation, it is unlikely to be used by species such as Pike for spawning.

The Red River, as previously noted, also falls within the range of Mapleleaf mussel, which is listed as Endangered under *The Endangered Species and Ecosystems Act* (Manitoba) and as Threatened under SARA. During the cursory shoreline survey at the outfall empty Mapleleaf valves were found along with empty shells of four other species. The presence of compact clay with gravel provides suitable habitat for Mapleleaf downstream of the outfall site approximately 5 m offshore from the AWRL. This in addition to the presence of Mapleleaf empty valves suggests that Mapleleaf may be found at the site and have existing potential habitat.

9.0 EFFECTS ON FISH AND FISH HABITAT

Death of fish is not likely to occur and there will be no permanent loss of fish habitat, however, riprap placement will permanently alter fish habitat and impact potential Mapleleaf mussel habitat, as the existing substrate will be overlaid by clean riprap armouring. Potential effects to fish and fish habitat due to construction of the project and installation of riprap shoreline armouring may arise because of the following:

- Introduction of deleterious substances into the Red River during construction,
- Increased erosion and sediment input into the Red River during construction,
- Permanent Alteration of Fish Habitat.

9.1 Introduction of Deleterious Substances

Spills or accidental release of fuels and hazardous materials could occur during the use of construction equipment and/or from handling and storage of these materials in the project area. Hydrocarbons can enter watercourses during the use, maintenance and fueling of construction vehicles and machinery near watercourses. The release of these deleterious substances has the potential to adversely impact the aquatic environment at and downstream of the project site, reducing surface water quality, and resulting in potentially toxic effects to aquatic organisms, including fish. If released into the environment, these deleterious substances may kill fish or other aquatic biota directly, or may result in reduced health, vigor, or productive capacity.

The potential for introduction of deleterious substances into water during the proposed January to March construction period is low due to the frozen conditions. Implementation of best management practices during the construction period such as refuelling or performing maintenance on machinery at least 100 m away from the construction area will reduce the potential for leaks, spills, or releases of fuel and hazardous materials. Daily inspections of the equipment to identify leaks will further mitigate potential effects to surface water quality and associated effects to aquatic organisms.

9.2 Increased Erosion and Sediment Input

Construction activities such as excavation along the shoreline and placement of riprap have the potential to cause increased erosion and introduce sediments into the river during in-water works. Erosion and sedimentation resulting from construction activities may cause increased levels of turbidity and total suspended solids (TSS) in the Red River. This could decrease surface water quality and increase sedimentation downstream of the project area. There are multiple negative effects associated with increased levels of suspended and deposited sediment, including effects to primary producers, invertebrates and fish. A decrease in light penetration due to higher turbidity can lead to decreased photosynthesis by primary producers and affect the food chain for higher trophic levels, such as invertebrates and fish. Large influxes of deposited sediment can bury aquatic invertebrates, an important food item for many fish species, resulting in reduced invertebrate species diversity and abundances. Fine sediment deposition over existing larger substrates may result in habitat loss for invertebrate species that anchor to coarse substrates. Sedimentation may also result in the loss of spawning habitats and/or decreased spawning success for some fish species.

Infilling of existing coarse or rocky substrates with finer materials may create unsuitable spawning habitat for some fish species, smother deposited eggs or inhibit larval emergence from spawning substrates.

The Red River is however already characterized by high levels of turbidity and TSS from soil erosion and scouring of the riverbed during periods of high flow, with concentrations generally highest during April and lowest during the winter ⁽³⁾. Considering the naturally elevated levels of turbidity and TSS and the planned construction mitigation methods with winter work and when the ground is frozen, it is unlikely that increased erosion and sedimentation due to the Project will occur and adversely affect fish and fish habitat.

9.3 Permanent Alteration of Fish Habitat

Bank remediation and in-water works will alter the physical characteristics of the aquatic environment. The project area contains habitat suitable for various life stages of both forage and larger bodied fish species but the habitat is not rare or limiting and is readily available both upstream and downstream of the site. It is expected that many of the fish species occurring in the area could use the study site for foraging throughout the open water season. The riprap placement will result in a permanent change to the substrate class, which can alter fish foraging and spawning activities as well as affecting potential Mapleleaf mussel habitat. The potential Mapleleaf mussel habitat that will be permanently altered is currently a mix of compact clay with gravel ⁽¹⁾.

While there will be no loss of fish habitat, the placement of the riprap blanket is estimated to alter approximately 869.0 m² of fish habitat, of which, 47.0 m² is potential Mapleleaf mussel habitat. Above the winter ice level, the clean riprap will be sub-cut into the bank to avoid infilling fish habitat and maintain the channel geometry while creating a stable slope for riprap placement. Additionally, the natural conditions within the Red River typically cover the rock that is deposited at the toe of the banks, particularly within areas that remain inundated throughout the summer months when the river level is regulated by the St. Andrew's Lock and Dam. Studies conducted within the Red and Assiniboine rivers have shown that overall fish abundance at riprap/armoured bank sites in these rivers were significantly higher than at natural and unmodified bank sites. This is likely related to the increased variation in habitat for benthic invertebrates at riprap armoured sites, which are a food source for many fish species ⁽⁴⁾.

10.0 MEASURES AND STANDARDS TO AVOID OR MITIGATE DEATH OF FISH OR HADD.

DFO's Measures to Protect Fish and Fish Habitat (<http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html>) were considered during project design. The project has been designed to comply with the fish and fish habitat protection provisions of the *Fisheries Act* by incorporating measures to avoid causing the death of fish and/or the harmful alteration, disruption or destruction (HADD) of fish habitat.

10.1 Mitigation Measures and Expected Effectiveness

Environmental management practices proposed to prevent or mitigate environmental effects that were determined to be adverse, as described in Section 9.0, are summarized below. Mitigation is defined under the Canadian *Impact Assessment Act* as the elimination, reduction and control of the adverse effects of a project and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. Mitigation measures must be technically and economically feasible, allowing for practical implementation.

10.1.1 INTRODUCTION OF DELETERIOUS SUBSTANCES

The bank stabilization and in-water construction activities will be conducted in winter when the ground and Red River will be frozen which will reduce the risk of potential leaks, spills, or releases of fuel and hazardous materials entering the river. Additionally, implementation of best management practices during construction to reduce the risk of and immediately respond to leaks, spills or releases will further mitigate the potential effects to surface water quality and associated effects to aquatic organisms. Proposed best management practices include the following.

- Use of machinery that is in a clean condition and free of fluid leaks.
- Maintenance of equipment will not be permitted on-site.
- Using an approved fuel truck for refueling of equipment, at least 100 m from the Red River and using a drip tray.
- Provision of fuel handling training for operators.
- Complying with provincial fuel storage and dispensing regulations and storing hazardous materials in approved containers.
- Development of an emergency (spill) response plan, including provision of spill clean-up equipment and materials.
- Stopping work and containing deleterious substances to prevent dispersal in the event of a spill.
- Reporting any spills of sewage, oil, fuel or other deleterious material whether near or directly into a water body.
- Ensuring clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse.
- Cleaning up and appropriately disposing of the deleterious substance.
- Providing an Environmental Monitor to ensure and document that best management practices are adhered to and to conduct periodic inspection of construction equipment for leaks, spills, and releases.

Given the measures listed above, it is not likely that deleterious substances will be introduced into the Red River from spills or releases of fuel or hazardous materials associated with construction equipment. As such, the project is not expected to cause the death of fish and/or the HADD of fish habitat from the introduction of deleterious substances.

10.1.2 INCREASED EROSION AND SEDIMENT INPUT

The bank stabilization and in-water construction activities will be conducted during the winter when water flows are lower reducing the risk of elevated erosion and sediment. The small area of excavation required below the ice level will be isolated from flowing water in the Red River through construction of a temporary cofferdam. Additional mitigation will be provided through the implementation of best management practices and development of an erosion and sediment control plan. Proposed best management practices and measures to be included in the erosion and sediment control plan include the following.

- Operating machinery on land in stable dry areas and limiting the riverbank impacts.
- Disposing of and stabilizing all excavated material above the high-water mark or top of the riverbank and ensuring sediment re-entry to the watercourse is prevented.
- Avoiding introducing sediment in the water by using construction materials that are clean, free of fine materials, and of sufficient size to meet design criteria.
- Avoiding the use of poor-quality rocks that fracture and break down quickly when exposed to the elements.
- Installing effective erosion and sediment control measures to stabilize all erodible and exposed areas.
- Regularly inspecting and maintaining the erosion and sediment control measures during all phases of the project.
- Keeping the erosion and sediment control measures in place until all disturbed ground has been permanently stabilized and re-vegetated.
- Using biodegradable erosion and sediment control materials whenever possible and removing all exposed non-biodegradable erosion and sediment control materials once the site is stabilized.
- Heeding weather advisories and scheduling work to avoid wet, windy and rainy periods that may result in high flow volumes and/ or increase erosion and sedimentation.
- Regularly monitoring the watercourse for signs of sedimentation during all phases of the work, undertaking or activity and taking corrective action if required.
- Stopping work and containing sediment-laden water to prevent dispersal.

Following completion of construction, mitigation measures to further reduce the effects of erosion and sedimentation will include revegetation of exposed soils along the shoreline with native grasses. Increased erosion and sedimentation are not expected to cause the death of fish and/or the HADD of fish habitat because the potential effect will be greatly reduced by winter construction, adherence to best management practices and on-site monitoring.

10.1.3 PERMANENT ALTERATION OF FISH HABITAT DUE TO PROJECT FOOTPRINT

While there will be no loss of fish habitat the project is estimated to alter approximately 869.0 m² of fish habitat due to construction of the proposed riprap blanket. However, the proposed riprap placement is

anticipated to provide beneficial habitat diversity and is not expected to result in a loss of productive capacity of fish habitat, as there will be no additional infilling of the existing river channel.

The placement of riprap below the ice level is estimated to affect approximately 47.0 m² of potential Mapleleaf mussel habitat. As such, a mussel survey and relocation program will be completed for the project footprint in fall 2022 prior to in water works. The scope of work for the mussel survey and relocation will include the following.

- Preparation of a SARA Permit application (unless approved as part of this FAA).
- Acquisition of a provincial Scientific Collection Permit.
- Preparation of all reports required to satisfy conditions of the SARA permit and Scientific Collection Permit.
- Completion of the mussel survey and relocation at the project site, including hiring a dive team to conduct the survey and relocation.

11.0 MONITORING TO ASSESS THE EFFECTIVENESS OF MITIGATION

11.1 Construction Monitoring

KGS Group will have personnel on-site to visually inspect all phases of the project to ensure that all mitigation measures proposed for the construction period are being implemented, adhered to, and are effective. Activities monitored during construction include but are not limited to the following.

- Protection of riparian vegetation during construction.
- Implementation of an erosion and sediment control plan.

Environmental monitoring will be conducted during the construction period to ensure that best management practices outlined in Section 10.1.1 (Introduction of Deleterious Substances) and Section 10.1.2 (Increased Erosion and Sediment Input) are followed and to ensure that unforeseen effects do not occur. It is anticipated that a construction monitoring report will be produced describing monitoring activities and unforeseen effects, should they occur.

11.2 Monitoring Following Mussel Relocation

To minimize disturbance to individual mussels a survival and growth monitoring program following the mussel relocation is not being proposed. Removing mussels from the substrate a second time to assess survival post-relocation could have additional potential adverse effects beyond those caused during the initial relocation.

12.0 CONTINGENCY MEASURES

In the event that the proposed erosion controls are not effective, contingency measures will be immediately implemented to minimize the release of sediment to surface waters. These measures would depend on the site conditions but may include repair to existing erosion and sediment control measures or provision of additional sediment control measures. Contingency measures would be discussed with DFO prior to implementation.

13.0 DEATH OF FISH AFTER MEASURES AND STANDARDS ARE IMPLEMENTED

Implementing the proposed mitigation measures is anticipated to prevent the death of fish. Additionally, completing a mussel survey and relocation program in fall 2022 prior to in water works, is anticipated to move any mussels that are potentially present in the project area to another location and thus there will be no death of mussels.

14.0 RESIDUAL HADD OF FISH HABITAT AFTER MEASURES AND STANDARDS ARE IMPLEMENTED

Implementation of measures and standards during project construction will mitigate the potential death of fish and Mapleleaf mussel. These will, however, not completely prevent the potential HADD of fish habitat. As described in Section 9.3, the installation of riprap will result in the permanent alteration of approximately 859.0 m² of fish habitat including approximately 47.0 m² of potential Mapleleaf mussel habitat.

For many aquatic species alterations by placement of riprap will be either neutral or positive. Mapleleaf mussel, however, is not known to inhabit areas with substrates consisting of riprap and therefore the proposed alteration is negative. According to the 2016 COSEWIC Status Report, habitat changes associated with modifications to the banks of the Red River (e.g., riprap and dikes) and altering the flow hydrology of these rivers are considered threats to the species⁽⁵⁾ and any specimens present when the riprap blanket is constructed would be smothered by the armouring rock. The preferred habitat of the species is described as medium to large rivers with slow to moderate current, to lakes and reservoirs in mud, sand, or gravel bottoms. While there is some recent experience suggesting that filling riprap interstitial spaces with gravel may provide suitable habitat for the species, this is not yet verified.

Based on the substrate assessment completed at the project site in 2020, the habitat within the project area is predominately clay interspersed with silt. At the downstream half of the survey area, the clay was also interspersed with gravel and, to a lesser extent, cobble⁽¹⁾. The nature of the substrate and presence of numerous shells, including Mapleleaf, suggest that the project area likely provides habitat for Mapleleaf mussels as well as other mussel species.

15.0 HABITAT CREDITS

The proponent does not currently have any habitat credits that may be used to offset the proposed works.

16.0 OFFSETTING PLAN

As there has been no recovery plan made available to the public for Mapleleaf mussel in Manitoba consideration was given to providing offsets that would be beneficial to the Mapleleaf mussel. Habitat availability is not cited as a factor limiting the Manitoba population of the Mapleleaf mussel⁽⁵⁾; however, sedimentation and nutrient loading have been identified as major threats to the Mapleleaf mussel population in the Red-Assiniboine drainage system. In-water works for the Project below the winter ice level that will affect potential Mapleleaf mussel habitat are estimated at 47.0 m².

The proponent proposes to undertake riparian revegetation to offset project effects on potential Mapleleaf mussel habitat, as described in Section 16.3. Due to the project area being located on private property and that there is no guarantee that the property owners won't alter/destroy vegetation that is planted for offsetting work, an alternate agreed upon location within City owned land will be used to fulfill the required offsetting for the project.

16.1 Geographic Coordinates

The approximate latitude and longitude coordinates of the offsetting location are 49°49'21.65" N and 97°08'41.07" W. The location is approximately 1 km upstream of the Riviera Outfall site on the same (west) bank of the Red River.

16.2 Site Plan

A site location plan showing the approximately 250 m² area for the proposed riparian revegetation offsetting works is provided in Appendix C.

16.3 Detailed Description of the Revegetation Works

Riparian reforestation in naturally forested habitat is accepted as a best practice for sediment control, bank stabilization and for moderating nutrient loading into aquatic habitat from overland run-off⁽⁶⁾. Using appropriate revegetation procedures, riparian areas can be efficiently restored using site-appropriate shrubs and tree specimens.

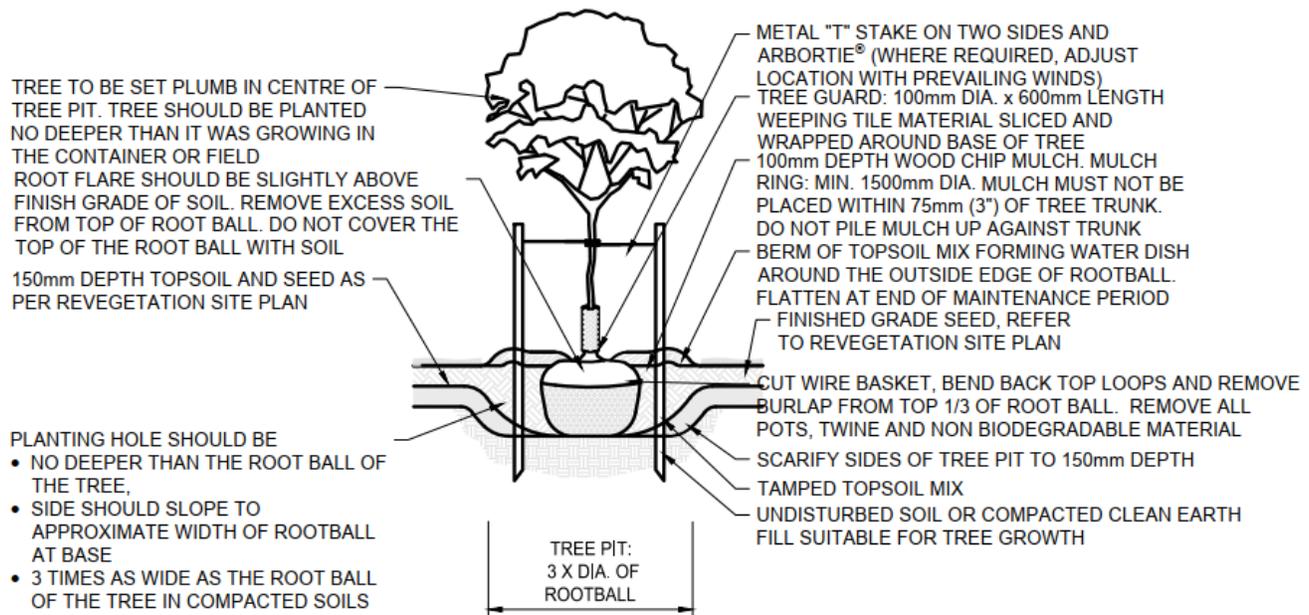
The planting design for the offsetting site seeks to improve the stability and coverage along the banks of the Red River, while not disturbing any of the existing or adjacent vegetation. The offsetting site is a 250 m² plot of land that is currently covered with existing vegetation, however, there is little to no existing riparian shrub or tree vegetation. Therefore, site-appropriate trees and shrubs will be planted in the area as offsetting to enhance riparian health. Preference will be given to flood tolerant species due to the site's susceptibility of flooding during spring melt and likely during heavy rainfall.

16.3.1 SHRUB AND TREE PLANTING

The site revegetation design includes planting a diverse mix of shrubs and trees endemic to the environment (plant hardiness zone 3) and observed along the banks of the Red River (Appendix D – Photos 7-9). Cottonwood and peach leaf willow will make up at a minimum 60% of the tree species that will be planted,

with basswood and Manitoba maple acceptable options to also be planted. Likewise, willow and dogwood shrubs will make up at a minimum 60% of the shrub species that will be planted, with nanny berry, rose, saskatoon and snow berry acceptable options to also be planted. It is proposed that 10 caliper trees (>75 mm caliper size), 12 container stock trees (5 gallon or larger container size) and 38 shrubs will be planted in the 250 m² riparian native revegetation area. The proposed plan will be to plant trees and shrubs directly into the soil and minimally disturb the stability and erosion control that the existing vegetation already provides at the site. To decrease the competition that the trees and shrubs will face in their establishing years, an area three-times the size of the plants root ball will be dug out and backfilled with soil and topped with bark mulch. This allows the plant to have sufficient space to establish their roots while not competing for resources. Details for the planting of trees and shrubs, including materials used and installation methods are shown below in Figure 1.

FIGURE 1: TYPICAL TREE PLANTING SECTION



As the shrubs and trees grow and begin to create shade through canopy expansion, conditions shift and become less suitable to existing undergrowth. As these conditions change, the forest will shift toward a community dominated by species that are better adapted to part-shade or diffuse light conditions, species more characteristically endemic to riparian forest environments.

16.3.2 LONG-TERM BENEFITS

Once established, the vegetation planted as offsetting for the Mapleleaf mussel habitat will serve to trap sediment and organic matter through physical obstruction, and intercept nutrient laden drainage water, sequestering the available nutrient in their live plant tissue. The riparian zone plantings can also result in secondary benefits, providing habitat for bird or other wildlife species, and creating a cooling effect on the soils and waters under their shade.

The riparian planting will consist of regionally suitable and site appropriate trees and shrubs as well as a variety of plant sizes and growth habits. This structural and functional diversity has many short and long term benefits to the rehabilitated landscape, beyond creating an interesting and engaging plant community. Primarily, this species diversity imparts some measure of resilience to the community. As we experience more frequent and more devastating outbreaks of invasive pests and diseases, the importance of having a multitude of plant species represented on the landscape becomes ever more apparent. Planting a variety of growth forms and growth habits can have the benefit of improving resource utilization, ensuring that productivity is maintained even under variable growing conditions. Changes in our climate will continue to occur over the coming decades and establishing diverse plantings will mitigate some of the risks to riparian health associated with these changes.

Finally, a diversity of above-ground growth forms will also create a diversity of rooting structures and types which can create a complex network of below-ground plant tissue. This diversity of rooting structures improves overall moisture use efficacy and can create a deep and effective mechanical stabilization of the soils against erosion and sediment loss.

16.4 Monitoring Measures

With all native revegetation projects long term success is directly tied to monitoring and maintaining the site through the establishment period. This is particularly true for revegetation projects that occur in highly modified landscapes, like urban centres. The revegetation of the offsetting site is designed to be self-sustaining in time, but early stage plant development must be protected. Measuring success or improvement can be undertaken through visual assessment, for example, notable signs of erosion on a worksite would be indicative of a potential failure in habitat offsetting that may require immediate attention. The appearance of expanded leafy growth and vertical height would indicate that the plants are establishing, and improvements have had the desired effect.

Monitoring will occur over a three year period with periodic monitoring being conducted during the course of the planting and establishment/maintenance phase to evaluate the effectiveness of revegetation activities. Field reviews will be conducted to assess the establishment of planted vegetation and to allow for properly timed corrective measures, such as remedial planting, which will be undertaken if and when required. A brief field report to record site observations complete with photos will be completed following each field review.

16.5 Contingency Measures

During the contractor's 1-year warranty period, the shrubs and trees are expected to have an 75% or better success rate. The Contract Administrator reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of the initial warranty period, leaf development and growth is not sufficient to ensure future survival.

Dead vegetation will be replaced per the appropriate specification during the next appropriate planting window. Following the end of the Contractor's warranty period, the proponent will be responsible for monitoring the success rate of the vegetation and will replace dead plant material, as necessary, to maintain the threshold of success. Should contingency measures need to be implemented, such as additional plantings to maintain the stated success rate, an additional year of monitoring will be implemented.

16.6 Adverse Effects on Fish and Fish Habitat

The offsetting program is not expected to have any adverse effects on fish and fish habitat and best practices described in Section 9.1 and 9.2 will be followed during construction.

16.7 Measures and Standards to Avoid or Mitigate the Adverse Effects

Mitigation measures described in Section 10 will be followed while implementing the offsetting plan.

16.8 Timeline for Plan Implementation

The proposed timeline to implement the offsetting works is as follows:

- Year 1 (2023) will be the planting year (trees and shrubs).
- Year 2 (2024) and Year 3 (2025) will be maintenance and establishment years.

16.9 Cost Estimate for Plan Implementation

The estimated cost for the proposed riparian revegetation as part of the offsetting works, as well as monitoring requirements and a 10% contingency is \$34,980 as outlined in Table 1.

TABLE 1: TOTAL COST OF OFFSETTING WORKS

ITEM	COST
Riparian Native Revegetation	\$ 17,800
Monitoring (3 years)	\$ 14,000
Sub-Total Cost of Offsetting Works and Monitoring	\$ 31,800
Contingency (10%)	\$ 3,180
Total Offsetting Costs for Letter of Credit	\$ 34,980

16.10 Access to Lands

There are no special requirements relating to access to lands to carry out this offsetting plan as the proposed offsetting works will all be conducted on land owned by the project proponent.

17.0 REFERENCES

1. North/South Consultants Inc. October 2020. City of Winnipeg Outfall Program Red River– Riviera Crescent– Aquatic Habitat Assessment.
2. Government of Canada. Species at Risk Public Registry. (2022). Found at, [Species at risk public registry - Canada.ca](https://www.sararegistry.gc.ca/)
3. Gurney, S. 1991. Proposed water quality objectives through Manitoba's watershed classification process: Red and Assiniboine rivers and their tributaries within and downstream of the City of Winnipeg. Water Quality Management Section, Environmental Management Division, Manitoba Environment, July 1991. iv + 92 p. + Appendix.
4. Watkinson, Douglas & Franzin, William & Podemski, C.. (2004). Fish and Invertebrate Populations of Natural, Dyked and Riprapped banks of the Assiniboine and Red Rivers, Manitoba.
5. COSEWIC. 2016. COSEWIC assessment and status report on the Mapleleaf *Quadrula quadrula*, Great Lakes - Upper St. Lawrence population and Saskatchewan - Nelson Rivers population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 86 pp. (https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Mapleleaf_2016_e.pdf).
6. Fisheries and Oceans Canada. 1993. Land Development Guidelines for the Protection of Aquatic Habitat. Department of Fisheries and Oceans.

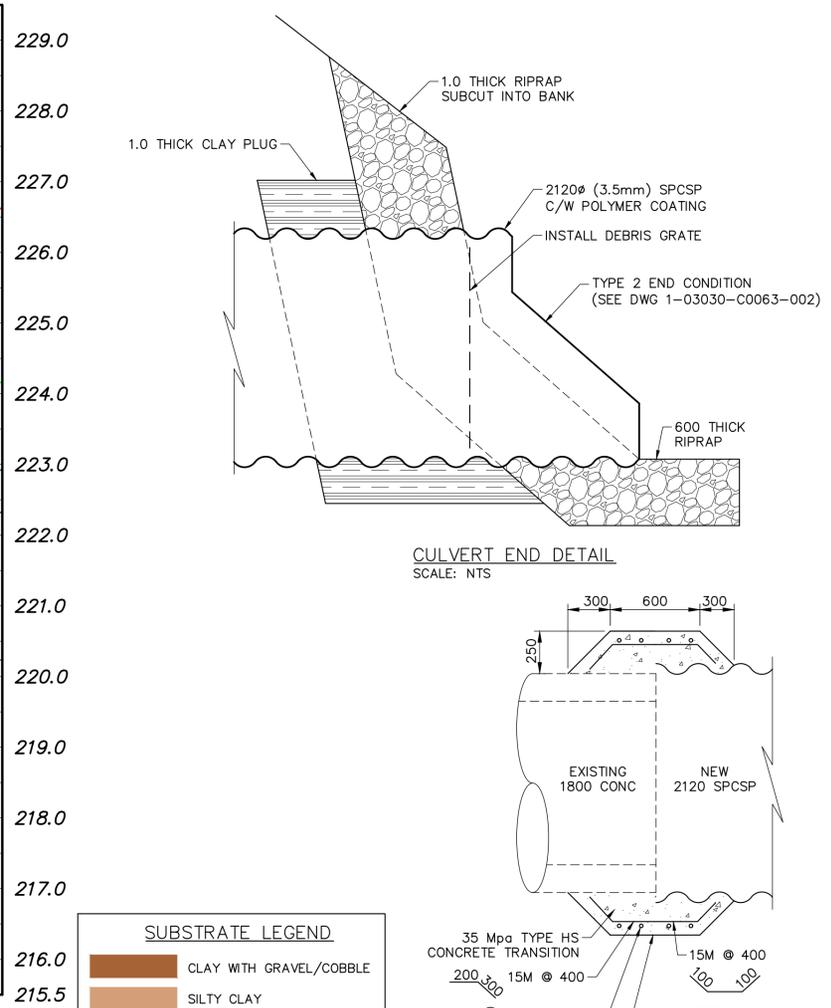
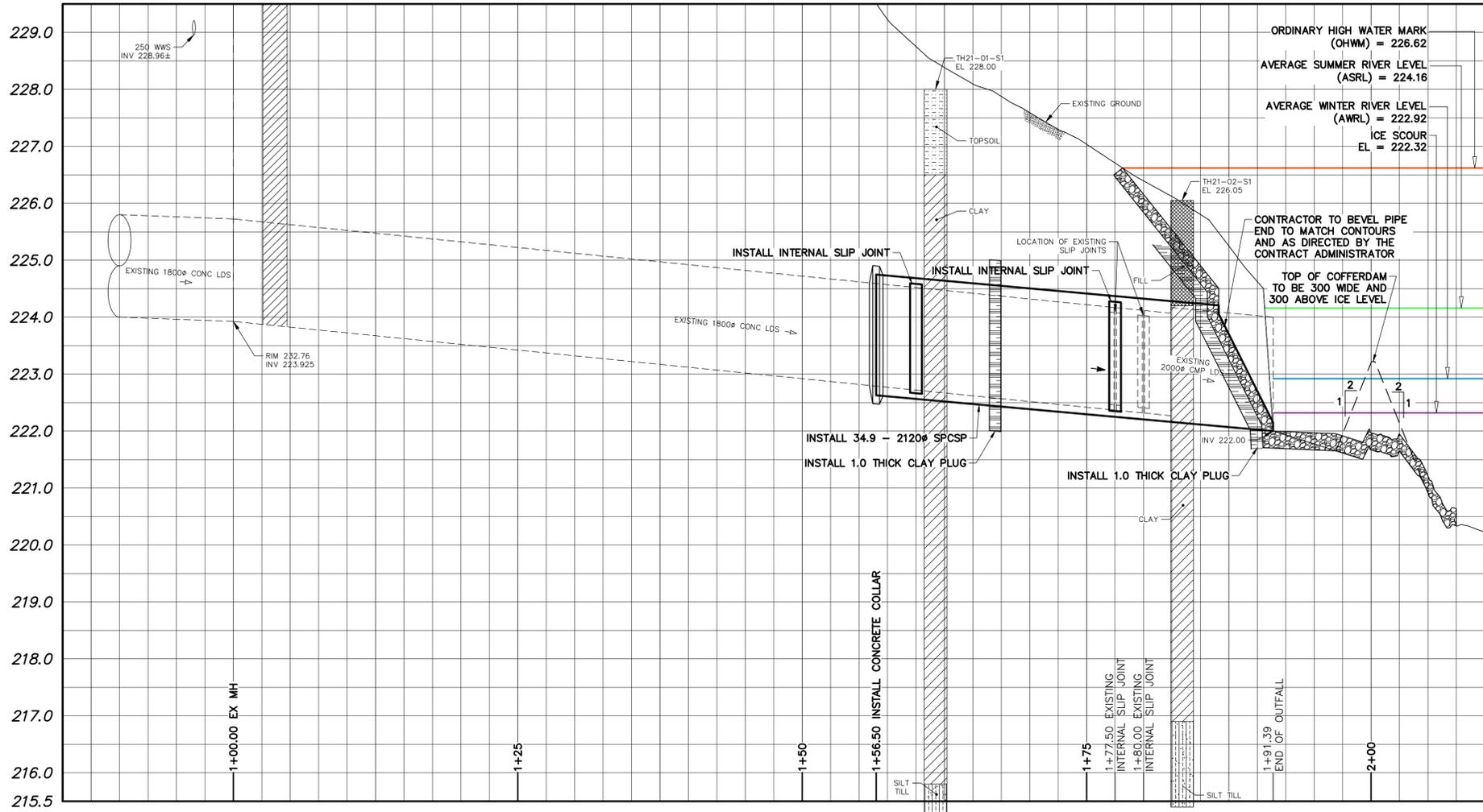
APPENDIX A

Financial Guarantee

(The City of Winnipeg is in the Process of Acquiring the
Financial Assurance)

APPENDIX B

Design Drawings



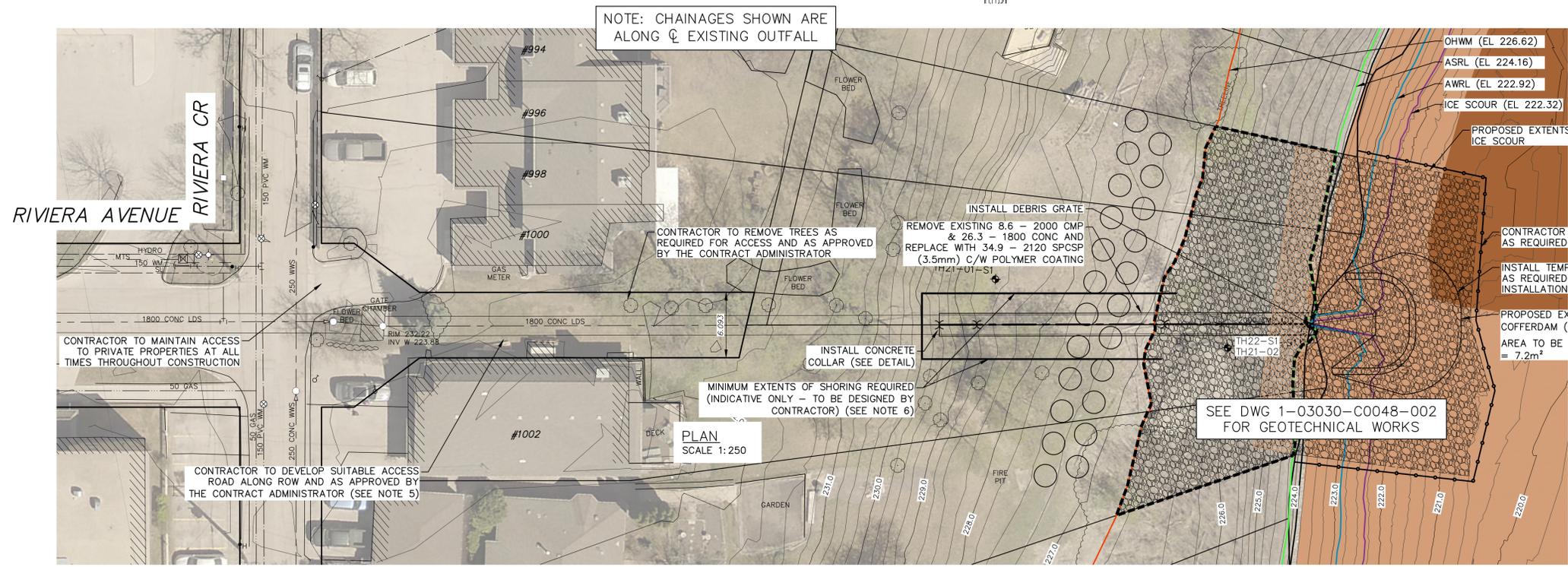
SUBSTRATE LEGEND

	CLAY WITH GRAVEL/COBBLE
	SILTY CLAY

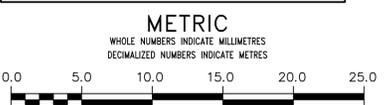
SUBSTRATE TYPES BELOW ICE SCOUR AFFECTED BY THE PROJECT

EXISTING SUBSTRATE	PERMANENT AREA (m ²)
CLAY WITH GRAVEL/COBBLE	47.0
SILTY CLAY	212.2
TOTAL AREA AFFECTED	259.2

- NOTES:**
- ALL EXCAVATED MATERIAL WITHIN 107.0 OF THE ASRL (AVERAGE SUMMER RIVER LEVEL) MUST BE REMOVED FROM SITE (NO STOCKPILING).
 - CONSTRUCT TEMPORARY CLAY COFFERDAM AT RIVER AS REQUIRED TO FACILITATE PIPE INSTALLATION.
 - CONTRACTOR TO PROTECT AND/OR REMOVE EXISTING TREES AS REQUIRED TO FACILITATE ACCESS AND AS APPROVED BY THE CONTRACT ADMINISTRATOR. ALL TREES REQUIRING REMOVAL SHALL BE MARKED BY THE CONTRACTOR PRIOR TO CONSTRUCTION FOR REVIEW AND APPROVAL.
 - CONTRACTOR TO RESTORE SITE, INCLUDING ROAD, CURBS, AND LANDSCAPING FEATURES, TO PRE-CONSTRUCTION CONDITION.
 - CONTRACTOR IS ADVISED THAT TEMPORARY CONSTRUCTION ACCESS AGREEMENTS WITH ADJACENT PROPERTY OWNERS ARE EXPECTED TO BE IN PLACE AT TIME OF CONSTRUCTION. CONTRACTOR TO DEVELOP SUITABLE ACCESS ALONG 6.093 M WIDE ROW AND PRIVATE PROPERTIES AS REQUIRED TO FACILITATE CONSTRUCTION, HOWEVER SHALL MAKE EVERY REASONABLE EFFORT TO MINIMIZE CONSTRUCTION FOOTPRINT AND SURFACE DAMAGE. CONTRACTOR TO PROVIDE ACCESS PLAN AND EQUIPMENT LIST TO CONTRACT ADMINISTRATOR FOR REVIEW AND APPROVAL PRIOR TO STARTING CONSTRUCTION.
 - TO PROTECT SURROUNDING PROPERTY, SHORING IS TO BE DESIGNED AND SEALED BY A PROFESSIONAL ENGINEER. SHORING SHALL BE DESIGNED TO ACCOMMODATE AND PROTECT INTEGRITY OF ADJACENT ROCKFILL COLUMNS AS REQUIRED.



FOR INDEX PAGE SEE DWG 1-03030-D0009-001



WARNING

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

- NOTIFY THE GAS COMPANY OF THE PROPOSED LOCATION OF EXCAVATION.
- TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.

SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

LOCATION APPROVED UNDERGROUND STRUCTURES

SUPV. U/G STRUCTURES COMMITTEE DATE

NOTE:
LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

B.M. ELEV.	NO.	ISSUED FOR	DATE	BY
	A	ISSUED FOR	2020 XX XX	
		REVISIONS	DATE	BY

KGS GROUP

DESIGNED BY: NGV
DRAWN BY: GEL
SCALE: HORIZONTAL 1:250, VERTICAL 1:50
DATE: 2021 11 01

CHECKED BY:
APPROVED BY:
RELEASED FOR CONSTRUCTION DATE:

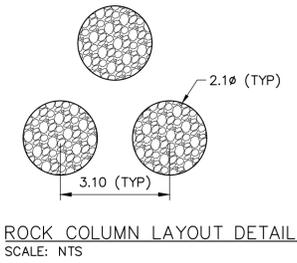
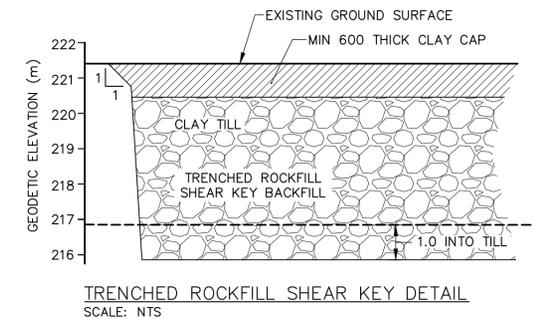
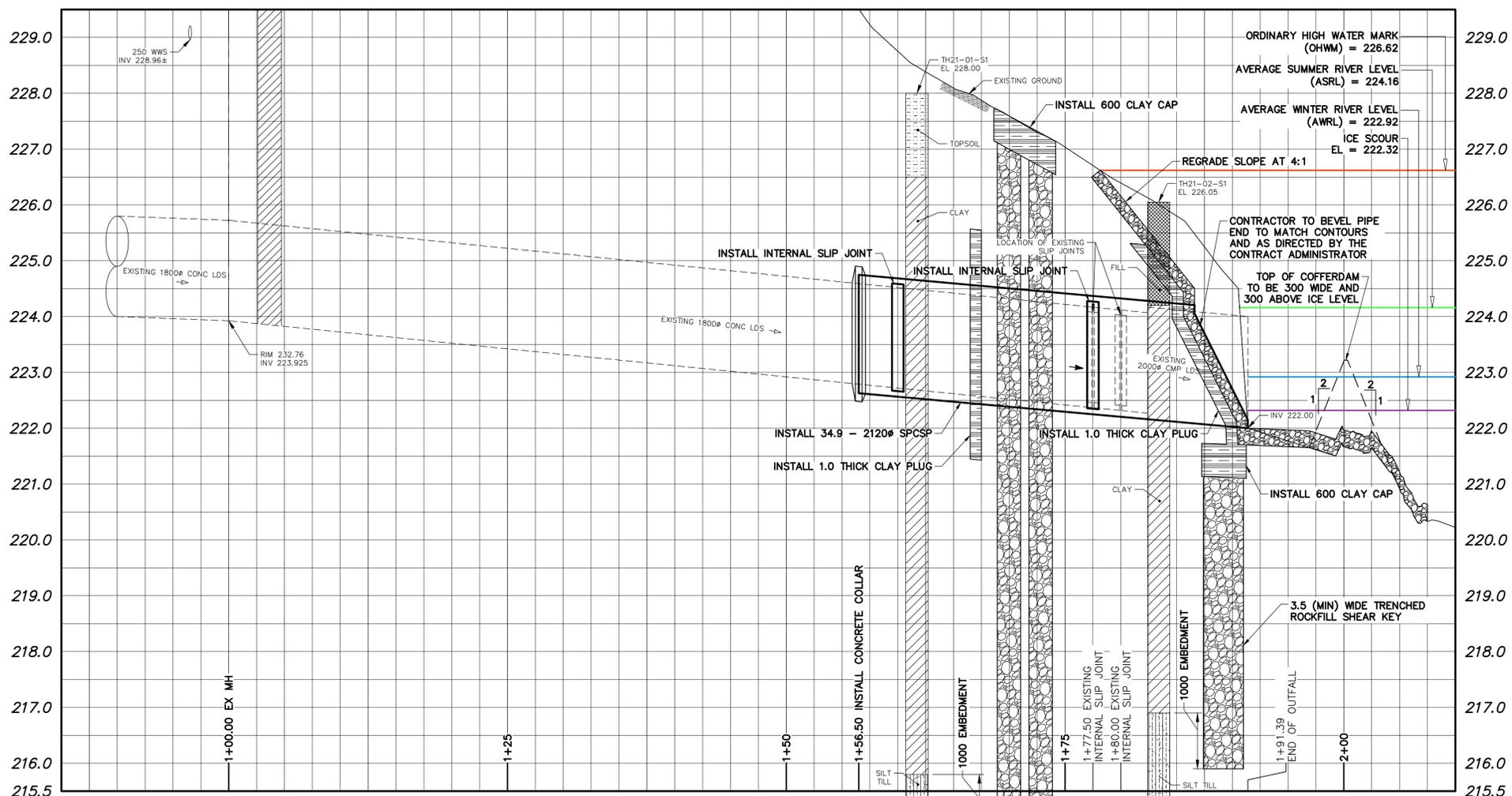
ENGINEER'S SEAL

CONSULTANT DRAWING NUMBER: 1-03030-C0048-001

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

2020-2021 OUTFALL PROGRAM
RENEWAL AND REHABILITATION
RIVIERA CRESCENT OUTFALL
PLAN AND PROFILE
S-MA70007648

SHEET 11 OF 27
CITY DRAWING NUMBER: 1-03030-C0048-001



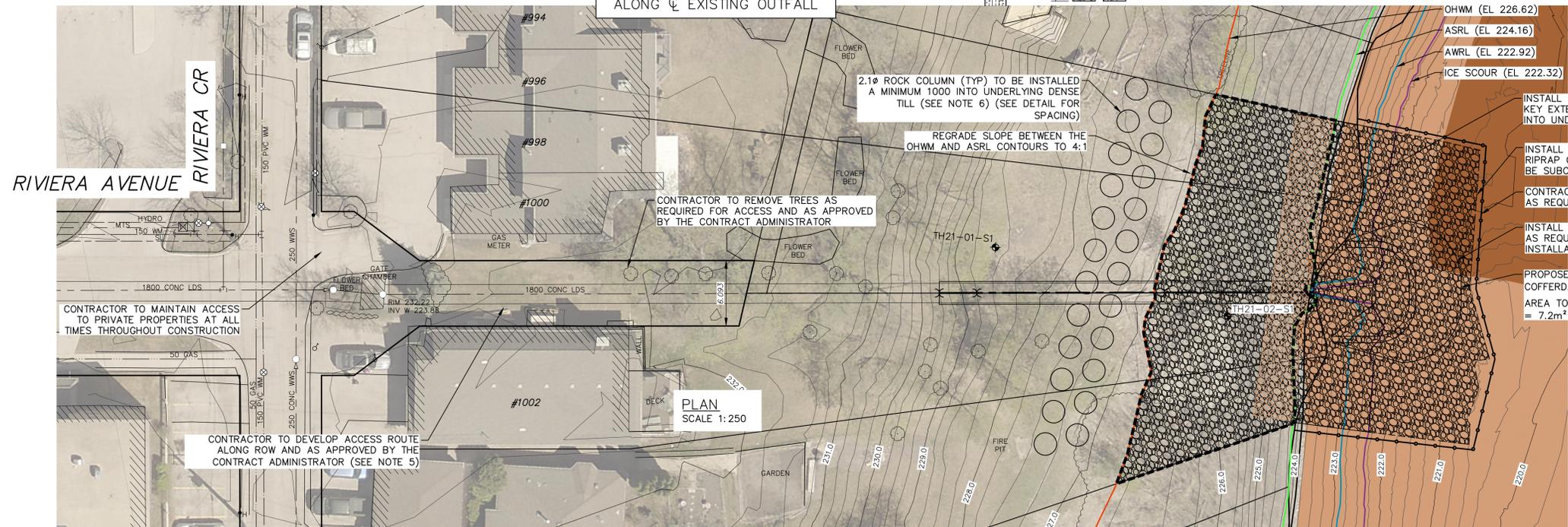
SUBSTRATE LEGEND

	CLAY WITH GRAVEL/COBBLE
	SILTY CLAY

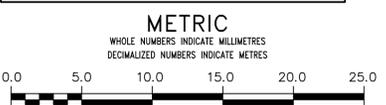
SUBSTRATE TYPES BELOW ICE SCOUR AFFECTED BY THE PROJECT

EXISTING SUBSTRATE	PERMANENT AREA (m ²)
CLAY WITH GRAVEL/COBBLE	47.0
SILTY CLAY	212.2
TOTAL AREA AFFECTED	259.2

- NOTES:**
- ALL EXCAVATED MATERIAL WITHIN 107.0 OF THE ASRL (AVERAGE SUMMER RIVER LEVEL) MUST BE REMOVED FROM SITE (NO STOCKPILING).
 - CONTRACTOR TO PROTECT EXISTING TREES DURING CONSTRUCTION.
 - CONTRACTOR TO RESTORE SITE, INCLUDING ROAD, CURBS, AND LANDSCAPING FEATURES, TO PRE-CONSTRUCTION CONDITION.
 - CONTRACTOR IS ADVISED THAT TEMPORARY CONSTRUCTION ACCESS AGREEMENTS WITH ADJACENT PROPERTY OWNERS ARE EXPECTED TO BE IN PLACE AT TIME OF CONSTRUCTION. CONTRACTOR TO DEVELOP SUITABLE ACCESS ALONG 6.093 WIDE ROW AND PRIVATE PROPERTIES AS REQUIRED TO FACILITATE CONSTRUCTION, HOWEVER SHALL MAKE EVERY REASONABLE EFFORT TO MINIMIZE CONSTRUCTION FOOTPRINT AND SURFACE DAMAGE. CONTRACTOR TO PROVIDE ACCESS PLAN AND EQUIPMENT LIST TO CONTRACT ADMINISTRATOR FOR REVIEW AND APPROVAL PRIOR TO STARTING CONSTRUCTION.
 - VIBRATION MONITORS SHALL BE INSTALLED AT ADJACENT PRIVATE PROPERTIES PRIOR TO CONSTRUCTION (ALLOWANCE INCLUDED IN CONTRACT).
 - CONTRACTOR SHALL VIBROCOMPACT ROCKFILL COLUMNS AND SHEAR KEY STARTING IN THE MIDDLE/AT PIPE ALIGNMENT AND WORK TOWARDS NORTH EXTENT. COLUMNS AND SHEAR KEY SOUTH OF THE PIPE ALIGNMENT SHALL BE VIBROCOMPACTED FOLLOWING THE NORTH HALF COMPACTION. VIBROCOMPACTION OF ROCKFILL COLUMNS AND SHEARKEY SHALL BE COMPLETED IN ADVANCE OF PIPE INSTALLATION WORKS.



FOR INDEX PAGE SEE DWG
1-03030-0009-001



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 21072 FOR DETAILS

LOCATION APPROVED UNDERGROUND STRUCTURES
SUPP. U/G STRUCTURES COMMITTEE DATE
NOTE:
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B.M. ELEV.	NO.	ISSUED FOR	DATE	BY
	A	ISSUED FOR	2020 XX XX	
		REVISIONS		

KGS GROUP

DESIGNED BY	NGV	CHECKED BY	
DRAWN BY	GEL	APPROVED BY	
SCALE:	HORIZONTAL 1:250 VERTICAL 1:50	RELEASED FOR CONSTRUCTION	
DATE	2021 11 01	DATE	

PLOT DATE: 2021 11 01

ENGINEER'S SEAL
CONSULTANT DRAWING NUMBER
1-03030-C0048-002

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

2020-2021 OUTFALL PROGRAM
RENEWAL AND REHABILITATION
RIVIERA CRESCENT OUTFALL
GEOTECHNICAL PLAN AND PROFILE
S-MA70007648

SHEET OF
CITY DRAWING NUMBER
1-03030-C0048-002

APPENDIX C

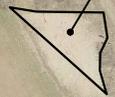
Offsetting Map



RED RIVER
FLOW

PLAZA DRIVE PARK

PROPOSED VEGETATION
(250m²)



PLAZA DRIVE

BISHOP GRANDIN BLVD (WEST)

BISHOP GRANDIN BLVD (EAST)



KGS
GROUP

APPENDIX D

Site Photographs



Photo 1: Toe of the bank looking upstream



Photo 2: Toe of the bank looking downstream



Photo 3: Mid-bank looking upstream (fencing around previous sink hole repaired March 2021)



Photo 4: Mid-bank looking towards Assiniboine River and downstream



Photo 5: Mid-bank looking towards top of the bank



Photo 6: Top of the bank looking towards 1002 Riviera Crescent residence



Photo 7: Looking downstream at the offsetting site (April 2022- flooded conditions)



Photo 8: Looking East at the Red River at the offsetting site (April 2022- flooded conditions)



Photo 9: Looking upstream at the offsetting site (April 2022- flooded conditions)

KGS
GROUP

Experience in Action



Subject: Riviera Crescent Outfall Mussel Relocation: SARA Permit #22-HCAA-02180

To: Shaun Moffat
KGS Group

From: Duncan Burnett
North/South Consultants Inc.

Date: 8 November 2022

Introduction

The City of Winnipeg requested professional consulting services in relation to the Riviera Crescent Outfall on the Red River in Winnipeg, Manitoba. KGS Group sub-contacted North/South Consultants (NSC) to provide aquatic environmental services relating to the project, including obtaining SARA (federal *Species at Risk Act*) and Live Fish Handling (provincial) permits, as well as the associated provincial ministerial exemption related to Manitoba's *Endangered Species and Ecosystems Act* (ESEA), and conducting a mussel relocation. Details of the mussel relocation are discussed below.

Methods

Permits

Prior to conducting the mussel relocation, NSC obtained the required federal and provincial permits to relocate mussels from the Riviera Crescent Outfall location. The permits included a SARA permit (Federal), Live Fish Handling Permit (Provincial), and a Ministerial Exemption associated with Manitoba's ESEA.

Mussel Relocation

The mussel relocation at the Riviera Crescent Outfall was conducted following similar methods described in Mackie et al. (2008). The survey was conducted within a prescribed search area (PSA) that included the project footprint where riprap will be placed below the ice scour level (~260 m²) in addition to a Risk Zone (RZ) that buffers the footprint. The total PSA for the project site was ~300 m², and the footprint was buffered by 5 m on the upstream and downstream side (as outlined in SARA Permit #22-HCAA-02180).

A semi-quantitative sampling approach was used for the Riviera Crescent mussel survey. The PSA was stratified into smaller search quadrats. The smaller search quadrats were marked with floats at the corners and their locations were determined using a survey-grade Trimble GPS capable of sub-meter accuracy. Each quadrat was searched (by touch) by divers. If any mussels were found by the divers, they were transferred to NSC staff on site before continuing to the next quadrat. Because of the water depth characteristics at this site, no mussel raking was conducted. Tubs filled with well oxygenated water were available to hold any mussels captured. Captured mussels were identified to species, measured for length, width and height with representative photographs recorded; photographs included end view, top view and lateral view. A suitable relocation site upstream of the PSA was chosen before the relocation.

Results

The Riviera Crescent Outfall mussel relocation was conducted on September 29, 2022 (Figure 1). Water temperature in the Red River at the site of the relocation increased from 14°C at the start of the survey to 15°C by the end. The relocation was conducted under the following permits:

Federal:

- SARA Permit #22-HCAA-02180

Provincial:

- Live Fish Handling Permit #51474193 with Ministerial Exemption

NSC field staff set up five search quadrats within the PSA (Figure 2; Photo 1). During the divers' search of the PSA, no live mussels were located in the five search quadrats (Photos 2-3). Empty valves collected by the divers during the survey included species such as Mapleleaf (*Quadrula quadrula*; Photo 4), Threeridge (*Amblema plicata*; Photo 5), Fatmucket (*Lampsilis siliquoidea*; Photo 6), and Pink Heelsplitter (*Potamilus alatus*; Photo 7).

References

Mackie, G., Morris, T.J., and Ming, D. 2008. Protocol for the detection and relocation of freshwater mussel species at risk in Ontario-Great Lakes Area (OGLA). Can. Manuscr. Rep. Fish. Aquat. Sci. 2790: vi +50 p.

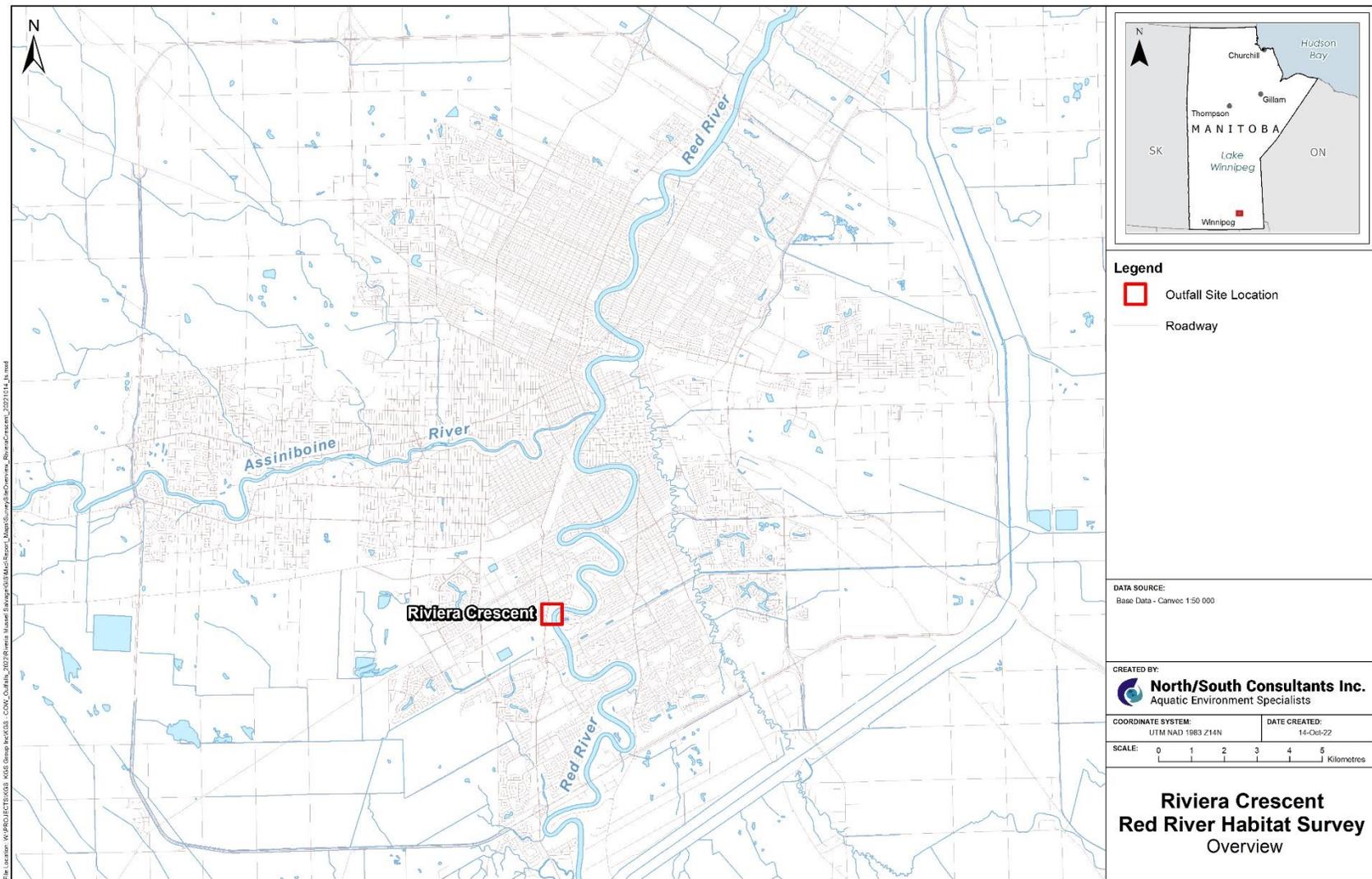


Figure 1. Riviera Crescent Outfall mussel relocation site location



Figure 2. Riviera Crescent Outfall Project search area showing numbered quadrats used during the mussel relocation.



Photo 1. Project search area showing marker buoys used to delineate quadrats.

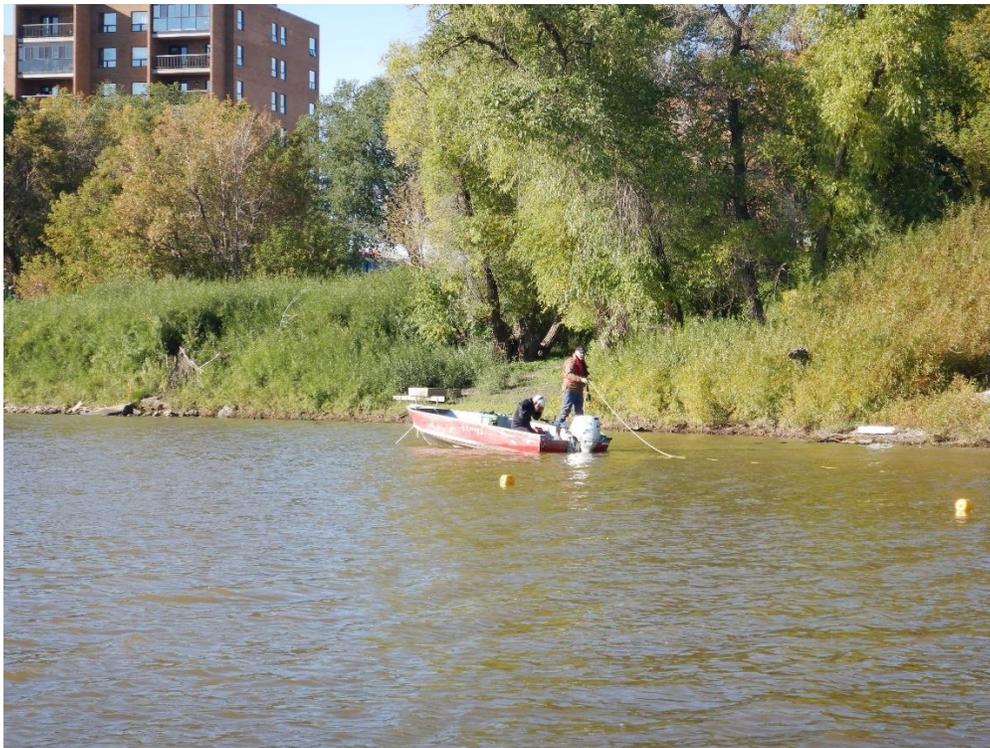


Photo 2. Divers conducting the mussel relocation at the Riviera Crescent Outfall location



Photo 3. Divers conducting the mussel relocation at the Riviera Crescent Outfall location



Photo 4. Empty Mapleleaf collected by divers during the Riviera Crescent mussel relocation



Photo 5. Empty Threeridge collected by divers during the Riviera Crescent mussel relocation



Photo 6. Empty Fatmucket with zebra mussel attached collected by divers during the Riviera Crescent mussel relocation



Photo 7. Empty Pink Heelsplitter collected by divers during the Riviera Crescent mussel relocation.