4.16 Priority Site #14 – Exposed Sanitary Crossing at Sifton Court

Priority Site #14 is located at the reach break between BR-1 and BR-3 of Blue Ridge Creek. Upstream of the reach break the channel is highly engineered, with a rectangular channel cross-section defined by a concrete channel bed with gabion basket or armourstone retaining walls lining the banks. There is a sanitary sewer crossing upstream of the reach break. The 300 mm diameter sewer is encased in concrete, with the encasement exposed in the concrete bed of the channel (**Figure 4-79**, **Figure 4-80**). Water appears to drain underneath the exposure, which may be indicative of washout or piping underneath the encasement. Should the pipe become fully undermined across the length of the channel, there is increased potential for slumping and structural failure. There are also concerns regarding the condition of the downstream sanitary sewer maintenance hole, located on the north side of the crossing a few meters behind a gabion basket retaining wall in the top of bank. The maintenance hole exhibits signs of degradation, with signs of erosion along the slope of the maintenance hole.

Downstream of the exposed sewer crossing, there is a pronounced, near vertical, drop in grade of over 2.0 m. The creek is held together at this grade change by a pile of large Boulders that act as a grade control structure (**Figure 4-81**). Downstream of this drop in grade, Reaches BR-3 and BR-4 confluence with the main branch of Blue Ridge Creek (**Figure 4-82**).

Figure 4-79: Exposure of the Concrete Encasement with Water Flowing into the Crack of the Encasement

Figure 4-80: View of the Engineered Channel Upstream of the Encasement Exposure

Figure 4-81: Large Drop Downstream of Encasement Exposure with Boulders Providing Grade Control

Figure 4-82: Blue Ridge Creek and Valley Setting Downstream of Boulder Pile

Sanitary Sewer parameters relevant to this priority site are summarized in **Table 4-17** with a drawing illustrating the existing conditions of the project site presented in **Figure 4-83**.

Table 4-17: Summary of Priority Site #14 Sanitary Sewer Parameters

Parameter	Sanitary Trunk Sewer
Toronto Water Asset ID	SL4029711
Year of Construction	1977
Diameter	300
Depth of Cover	0 m
Estimated Time to Contact	0 years
Erodibility of Adjacent Substrate	Low – engineered channel

4.16.1Priority Site #14 – Description of Restoration Alternatives

Alternative 1: Do Nothing – The sanitary sewer crossing will continue to be at risk of failure due to channel downcutting, washout of the material underneath the sewer encasement and the potential future failure of the downstream rock pile. Failure of the rock pile would likely cause rapid downcutting of the channel immediately upstream, potentially damaging the sewer where it crosses Newtonbrook Creek. Emergency works may need to be undertaken in the future if the sanitary sewer fails.

Alternative 2: Local Works – Apply channel engineering works for about 40 metres of channel length within reach BR-3, focused on a fixed engineered riffle centered overtop of the sanitary sewer crossing to provide a minimum 0.3 metres depth of cover. The riffle will be bounded on either side by a series of grouted armourstone ribs designed to provide grade control and facilitate the pronounced drop in channel elevation downstream of the sewer crossing. Engineered pools will be constructed at the upstream and downstream extents of the proposed local works solution allowing for a smooth transition into existing channel conditions. Implementation of this solution also includes replacement of the concrete channel lining with roundstone substrate and the failing gabion basket banks with new armourstone retaining walls. The slopes behind the armourstone retaining walls will be infilled and regarded to tie-into existing conditions and stabilized through the application of coir matting and restoration plantings. These works will tie-into the proposed TRCA Clarinda Drive erosion protection works at their downstream extents.

Alternative 3: Sub-Reach-Based Works – Apply natural channel design works for approximately 300 metres of channel length including riffle-pool morphology and engineered bank treatments. These works are intended to build the creek back up and stabilize this segment of Blue Ridge creek from a geomorphic perspective, thereby eliminating the need for a series of cascading armourstone ribs downstream of the sewer crossing. The proposed works will extend from the confluence of Reaches BR1 and BR2 to just upstream of the confluence between Reaches BR-1, BR-3, and BR-4. The proposed solution will establish a 1.0 metres depth of cover over the sanitary crossing, and will also have the added benefit of restoring the failed storm sewer outfall identified as Priority Site #13. Four (4) lateral erosion risks sites identified as Priority Sites #15, #21, #29, and #36 will also be addressed through a combination of minor channel realignment to increase the erosion buffer and implementation of engineered bank treatments in the form of armourstone retaining walls or vegetated buttresses. These works are intended to tie-into a second sub-reach-based works alternative designed to address priority sites #12, #23 & #40 by restoring the remaining downstream portion of Reach BR-1.

Preliminary concept drawings illustrating Alternative 2 and Alternative 3 are provided in **Figure 4-84**.

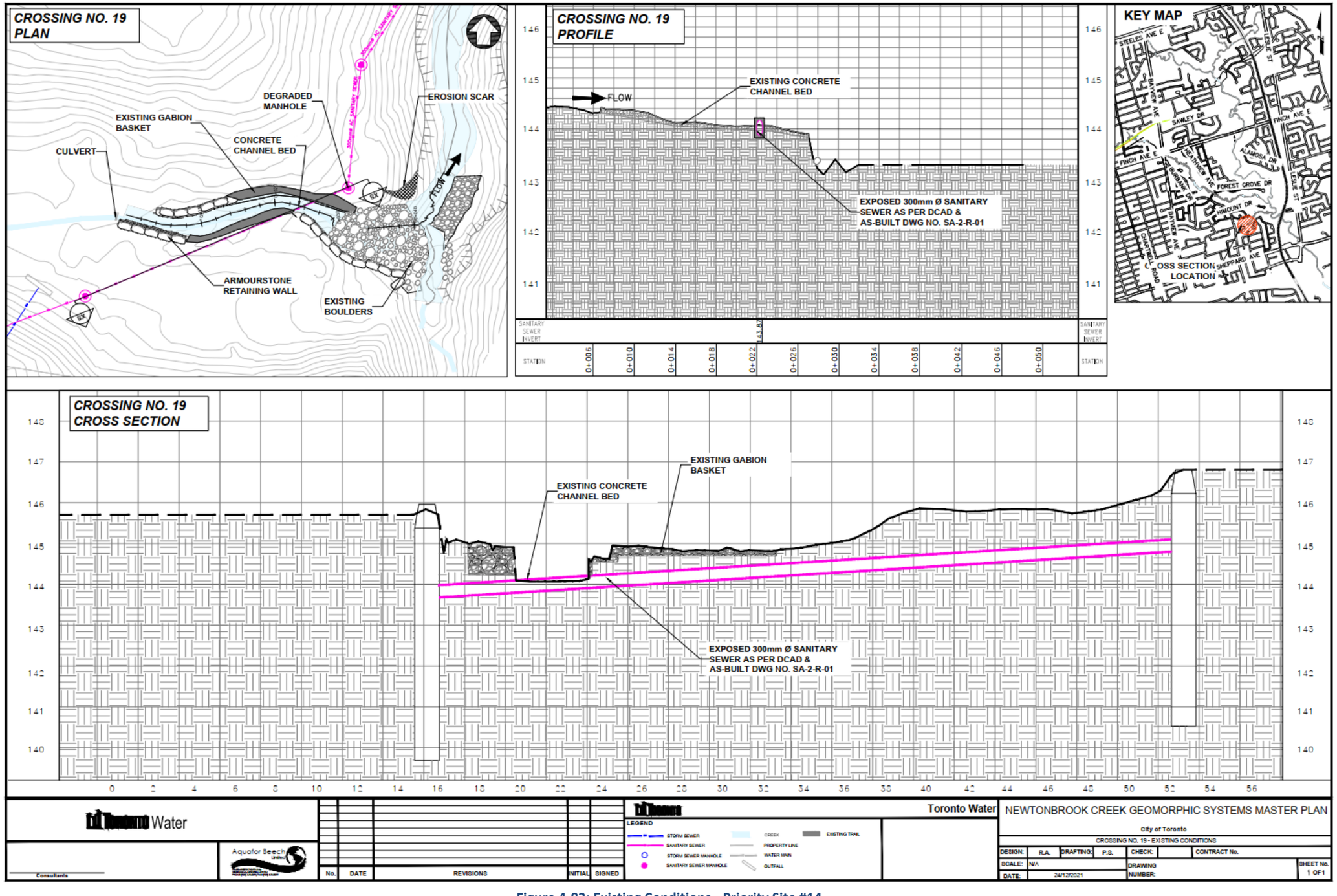

Figure 4-83: Existing Conditions - Priority Site #14

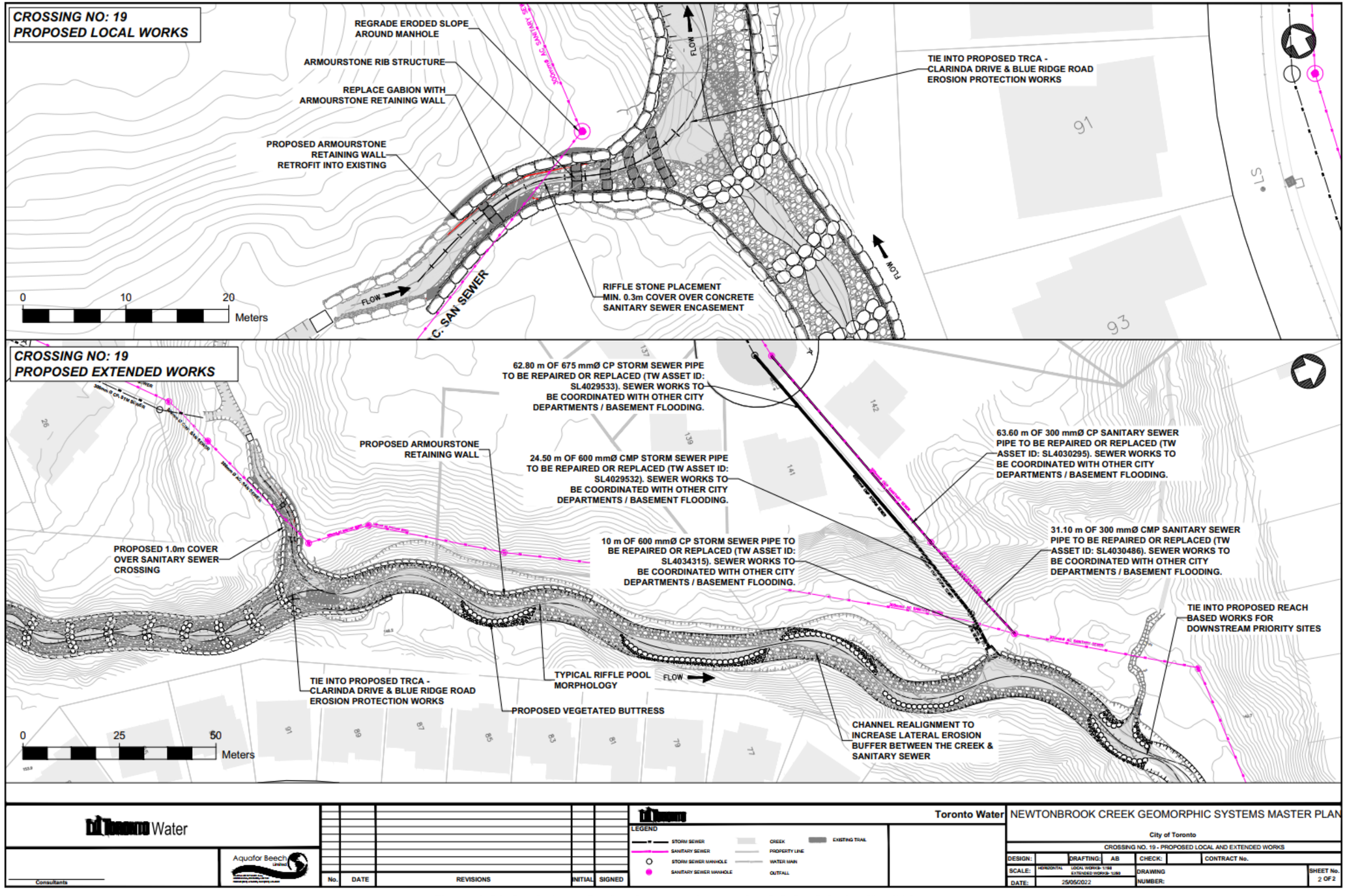

Figure 4-84: Preliminary Design Concepts Alternative 2 & 3 – Priority Site #14

4.16.2Priority Site #14 – Evaluation of Restoration Alternatives

Restoration Alternatives for Priority Site #14 were evaluated using the methodology outlined in **Section 4.2.** Based on this evaluation process, Alternative 3 - Sub-Reach-Based Works was selected as the preferred alternative.

4.16.3Priority Site #14 – Selection of the Preferred Alternative

As per the evaluation table, the Sub-Reach-Based Works option was selected as the preferred alternative for Priority Site #14 with a total score of 80.53/100. The local works solution was the second preferred alternative with a total score of 58/100 while the Do Nothing alternative was the least preferred alternative with a total score of 36.93/100.

Key elements of the Sub-Reach-Based Works alternative include:

- Removal of channel debris, failed erosion control structures (i.e., gabion baskets, armourstone walls, etc.), and failed Toronto Water Infrastructure (i.e., failed outfall and sewer pipe segments).
- Apply approximately 300 metres of channel restoration work using natural channel design principles to establish riffle-pool morphology.
- Provide 1.0 metres of cover overtop of the exposed sanitary sewer crossing.
- Mitigate four lateral erosion risk sites to sanitary sewer infrastructure (Priority Site #15 - SL4030293, Priority Site #21 - SL4030487, Priority Site #29 - MH4825114957, SL4030369, and Priority Site #36 - SL4030294), through minor channel realignment and the construction of engineered bank treatments (i.e., armourstone walls and vegetated buttresses).
- Benefit private properties by providing toe erosion protection at select locations.
- Repair/Replace approximately 97.30 metres of failed corrugated metal storm sewer pipe and 94.7 metres of failed sanitary sewer, maintaining the same general pipe alignment in planform (Priority Site #13 - OF4824214956). All sewer repair/replacement works must be coordinated with other City departments / basement flooding projects.
- Restoration of a failing slope through regrading and infilling of observed sinkholes and gullies with appropriately compacted fill materials. Apply additional slope stabilization measures (i.e., soil anchors, coir logs, etc.) as defined at the detailed design phase (Priority Site #13 - OF4824214956).
- Undertake Construction along a steep valley slope, including working between private properties on Citation Drive (Priority Site #13 - OF4824214956).
- Replace a failed storm sewer outfall (Priority Site #13 - OF4824214956). Construct an engineered scour pool with an armourstone lined outfall channel that transitions into the main branch of Blue Ridge Creek. Consider routing the outfall channel to transition into Blue Ridge Creek at an oblique angle to help mitigate scouring and erosion at the confluence.
- Retrofit/Repair degraded maintenance hole structures.
- Establish a geomorphically stable transition into existing channel conditions and a TRCA proposed channel restoration project to benefit private properties on Clarinda Drive at the upstream tie-in points.
- Transition into a second sub-reach-based works project downstream intended to address Priority Site #23 - SL4053177 and Priority Site #40 - SL4051741.

4.17 Priority Site #15 – Lateral Risk to Sanitary Sewer Downstream of Sifton Court

Priority Site #15, is located at the upstream extents of Reach BR-1, just downstream of the confluence between reaches BR-1, BR-3 and BR-4 of Blue Ridge Creek. This segment of Blue Ridge Creek is characterized by a steep channel gradient coupled with signs of active degradation and channel widening. The channel banks are primarily composed of highly erodible silt and sand rich gravel material, creating opportunities for significant bank erosion during high flow events.

At this priority site location, active bank erosion along an unarmored segment of the creek has reduced the lateral cover between the eroded channel bank and the sanitary sewer line to approximately 0.5 m. Reach BR-1 has an estimated lateral erosion rate of approximately 0.30 m/year, resulting in an estimated time to contact of 1.68 years. The location of this site along the outside of a relatively tight meander bend further exacerbates the degree to which the sewer line is vulnerable to lateral erosion, as evidenced by the Radius of Curvature to Width ratio of 4.49. It is highly recommended that at minimum, localized bank protection works be implemented at this site to prevent exposure, and potential failure, of the at-risk sewer. A photo illustrating the site-specific channel conditions and actively eroding northern bank is presented in **Figure 4-85**.

Figure 4-85: Degraded Channel Conditions at Priority Site #15. The Actively Eroding Westerly Bank has Created a Lateral Risk to a 300 mm Diameter Sanitary Sewer

Sanitary Sewer parameters relevant to this priority site are summarized in **Table 4-18** with a drawing illustrating the existing conditions of the project site presented in **Figure 4-86**.

Table 4-18: Summary of Priority Site #15 Sanitary Sewer Parameters

Parameter	Sanitary Trunk Sewer
Toronto Water Asset ID	SL4030293
Year of Construction	1977
Diameter	300
Lateral Depth of Cover	~0.5 m
Estimated Time to Contact	1.68 years
Condition of Bank Protection Works	N/A – No Bank Protection Works Present

4.17.1Priority Site #15 – Description of Restoration Alternatives

Alternative 1: Do Nothing – Over time as the channel continues to widen the sanitary sewer will become exposed. Given the height of the sewer within the bank, there is potential for the sewer to become undermined as the toe of the bank continues to erode. Future emergency works may be required if the exposed sewer begins to show signs of structural degradation (i.e., spalling, cracking, slumping, etc.).

Alternative 2: Local Works – Apply natural channel design works to realign the creek and increase the lateral erosion buffer between the channel and the sanitary sewer line. The natural channel design will establish riffle-pool morphology through the placement of engineered substrate. Adjustments to the longitudinal profile, planimetric alignment and typical channel dimensions will look to stabilize the creek from a geomorphic perspective. An armourstone retaining wall will also be constructed along the northern bank to provide additional lateral erosion protection to the 300 mm sanitary sewer that runs through the Blue Ridge Creek Corridor.

Alternative 3: Sub-Reach-Based Works – Apply natural channel design works for approximately 300 metres of channel length including riffle-pool morphology and engineered bank treatments. These works are intended to build the creek back up and stabilize this segment of Blue Ridge creek from a geomorphic perspective. The proposed works will extend from the confluence between Reaches BR-1 and BR-2 to just upstream of the confluence between Reaches BR-1, BR-3, and BR-4. The proposed works will look to realign the creek away from the sanitary sewer, and implement an armourstone retaining wall as bank protection works, in order to reduce the lateral erosion risk to the sanitary sewer. Implementation of this sub-reach-based works solution will also have the added benefit of restoring a failed storm sewer outfall identified as Priority Site #13, and protecting an exposed sanitary sewer crossing identified as Priority Site #14. Three (3) additional lateral erosion risks sites identified as Priority Sites #21, #29, and #36 will also be addressed through a combination of minor channel realignment to increase the erosion buffer and implementation of engineered bank treatments in the form of armourstone retaining walls or vegetated buttresses. These works are intended to tie-into a second sub-reach-based works alternative designed to address priority sites #12, #23 & #40 by restoring the remaining downstream portion of Reach BR-1.

Preliminary concept drawings illustrating Alternative 2 and Alternative 3 are provided in **Figure 4-87.**

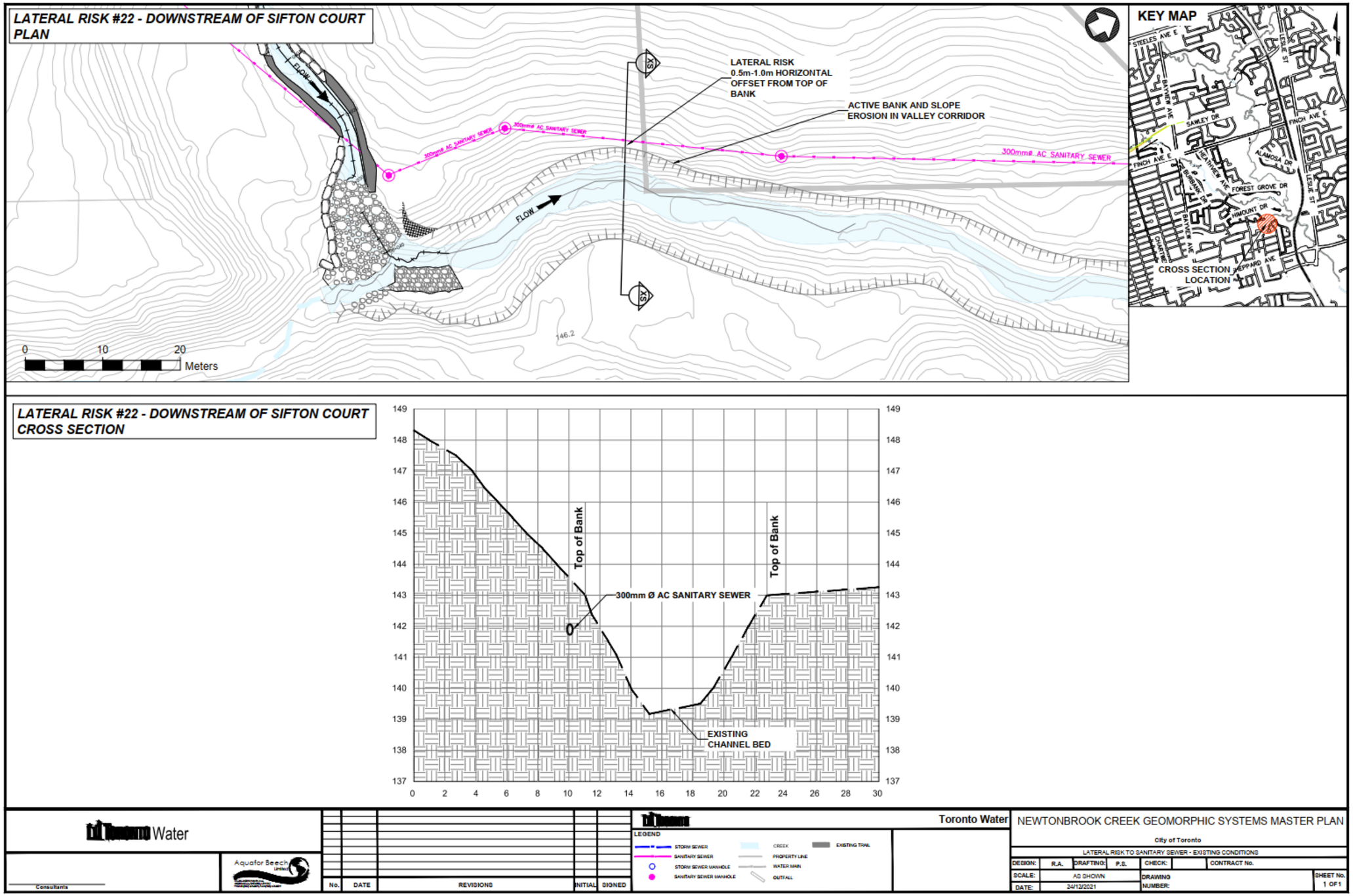

Figure 4-86: Existing Conditions – Priority Site #15

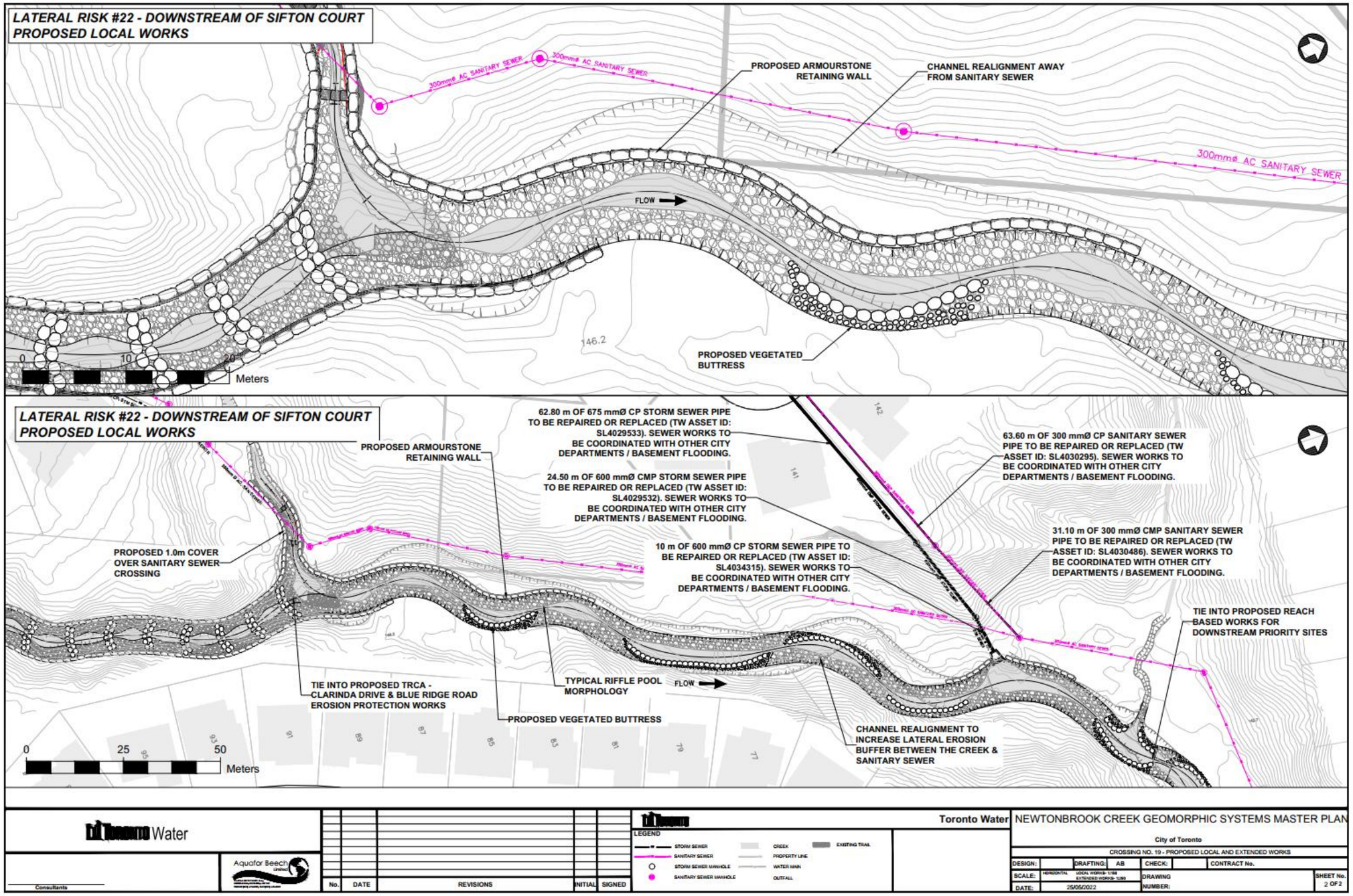

Figure 4-87: Preliminary Design Concepts Alternatives 2 & 3 – Priority Site #15

4.17.2Priority Site #15 – Evaluation of Restoration Alternatives

Restoration Alternatives for Priority Site #15 were evaluated using the methodology outlined in **Section 4.2.** Based on this evaluation process, Alternative 3 - Sub-Reach-Based Works was selected as the preferred alternative.

4.17.3Priority Site #15 – Selection of the Preferred Alternative

As per the evaluation table, the Sub-Reach-Based Works option was selected as the preferred alternative for Priority Site #15 with a total score of 80.53/100. The local works solution was the second preferred alternative with a total score of 61.73/100 while the Do Nothing alternative was the least preferred alternative with a total score of 40.93/100.

Key elements of the Sub-Reach-Based Works alternative include:

- Removal of channel debris, failed erosion control structures (i.e., gabion baskets, armourstone walls, etc.), and failed Toronto Water Infrastructure (i.e., failed outfall and sewer pipe segments).
- Apply approximately 300 metres of channel restoration work using natural channel design principles to establish riffle-pool morphology.
- Provide 1.0 metres of cover overtop of an exposed sanitary sewer crossing located upstream (Priority Site #14 - SL4029711).
- Mitigate three additional lateral erosion risk sites to sanitary sewer infrastructure (identified as Priority Sites #21, #29, and #36 in the Risk Assessment Report), through minor channel realignment and the construction of engineered bank treatments (i.e., armourstone walls and vegetated buttresses).
- Help benefit private properties by providing toe erosion protection at select locations.
- Repair/Replace approximately 97.30 metres of failed corrugated metal storm sewer pipe and 94.7 metres of failed sanitary sewer pipe, maintaining the same general pipe alignment in planform (Priority Site #13 - OF4824214956). All sewer repair/replacement works must be coordinated with other City departments / basement flooding projects.
- Restoration of a failing slope through regrading and infilling of observed sinkholes and gullies with appropriately compacted fill materials. Apply additional slope stabilization measures (i.e., soil anchors, coir logs, etc.) as defined at the detailed design phase (Priority Site #13 - OF4824214956).
- Undertake Construction along a steep valley slope, including working between private properties on Citation Drive (Priority Site #13 - OF4824214956).
- Replace a failed storm sewer outfall (Priority Site #13 - OF4824214956). Construct an engineered scour pool with an armourstone lined outfall channel that transitions into the main branch of Blue Ridge Creek. Consider routing the outfall channel to transition into Blue Ridge Creek at an oblique angle.
- Retrofit/Repair degraded maintenance hole structures.
- Establish a geomorphically stable transition into existing channel conditions and a TRCA proposed channel restoration project to benefit private properties on Clarinda Drive at the upstream tie-in points.
- Transition into a second sub-reach-based works project downstream intended to address Priority Site #23 - SL4053177 and Priority Site #40 - SL4051741

4.18 Priority Site #16 – Lateral Risk to Sanitary Sewer at Heathview and Page Avenue

Priority Site #16 is located approximately 200 metres upstream of the Forest Grove Road Crossing, along Reach N2 of Newtonbrook Creek, where a 675 mm diameter sanitary trunk sewer runs parallel to the creek. Ongoing erosion along the outside edge of the meander bend, on the north side of the creek, has created a lateral erosion risk to both the sanitary sewer as well as the adjacent multi-use trail system. This segment of the creek is unprotected and the bank is composed of highly erodible materials.

The estimated depth of lateral cover is approximately 4.00 metres with a projected time to contact of 15.61 years. Given that this priority site is located on the outside edge of a tight meander bend, there is significant potential for exacerbated rates of localized erosion, thereby increasing the overall lateral risk to both the sanitary trunk sewer and the multi-use trail. It is strongly recommended that at minimum, localized engineered bank works be implemented to provide erosion control protection. A photo illustrating the site-specific channel conditions and actively eroding bank is presented in **Figure 4-88**.

Figure 4-88: Degraded Channel Conditions at Priority Site #16. The Actively Eroding Bank has Created a Lateral Risk to the Adjacent 675 mm Sanitary Sewer

Sanitary Sewer parameters relevant to this priority site are summarized in **Table 4-19** with a drawing illustrating the existing conditions of the project site presented in **Figure 4-89**.

Table 4-19: Summary of Priority Site #16 Sanitary Sewer Parameters

Parameter	Sanitary Trunk Sewer
Toronto Water Asset ID	SL4033585
Year of Construction	1960
Diameter	675
Lateral Depth of Cover	~4.00 m
Estimated Time to Contact	15.61 years
Condition of Bank Protection Works	N/A – No Bank Protection Works Present

4.18.1Priority Site #16 – Description of Restoration Alternatives

Alternative 1: Do Nothing – Over time as the channel continues to widen the sanitary sewer will become exposed. Given the height of the sewer within the bank, there is potential for the sewer to become damaged as the toe of the bank continues to erode. Future emergency works may be required if the exposed sewer begins to show signs of structural degradation (i.e., spalling, cracking, slumping, etc.). Continued widening of the channel also represents a significant risk to the multi-use trail system at this priority site. As the banks continue to erode, the trail system may become undermined creating risks to public safety.

Alternative 2: Local Works – Apply natural channel design works for a length of approximately 100 metres along Reach N2, to realign the creek and increase the lateral erosion buffer between the channel and the sanitary sewer line. The natural channel design will establish riffle-pool morphology through the placement of engineered substrate. Adjustments to the longitudinal profile, planimetric alignment and typical channel dimensions will look to stabilize the creek from a geomorphic perspective. Vegetated buttresses will be constructed along the outside edge of each meander bend to provide additional lateral erosion protection to the 675 mm sanitary trunk sewer and the adjacent pedestrian trail system. Slopes behind the proposed channel works will be infilled with approved materials as needed, regraded to tie-into existing conditions and then stabilized through the application of coir-matting and restoration plantings.

Alternative 3: Sub-Reach-Based Works – Apply extended natural channel design works for approximately 240 metres of channel length with riffle-pool morphology and engineered bank treatments. Adjustments to the longitudinal profile, planimetric alignment and typical channel dimensions will look to stabilize the creek from a geomorphic perspective. The proposed works will look to realign the creek away from the sanitary sewer & multi-use trail, and will also implement a series of armourstone retaining walls and vegetated buttresses as bank protection works, in order to further reduce the lateral erosion risk to the sanitary sewer & multi-use trail system. Implementation of this sub-reach-based works solution will have the added benefit of eliminating the sharp bend in the existing channel alignment that leads into the Forest Grove Drive culverts, establishing a smoother transition that should improve conveyance, reduce backwatering and mitigate inlet scour. Selection of this alternative would also address an additional lateral risk site, identified as Priority Site #18, as part of the same sub-reach-based works project. Roughly 220 metres of trail would also be re-built / restored as part of these proposed works.

Preliminary concept drawings illustrating Alternative 2 and Alternative 3 are provided in **Figure 4-90.**

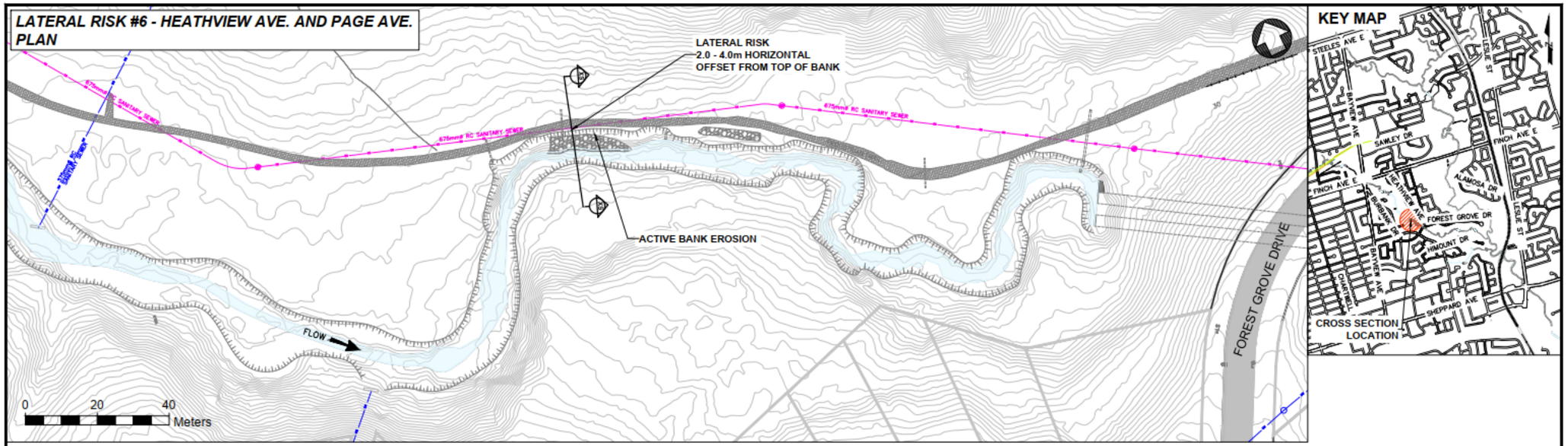

Figure 4-89: Existing Conditions – Priority Site #16

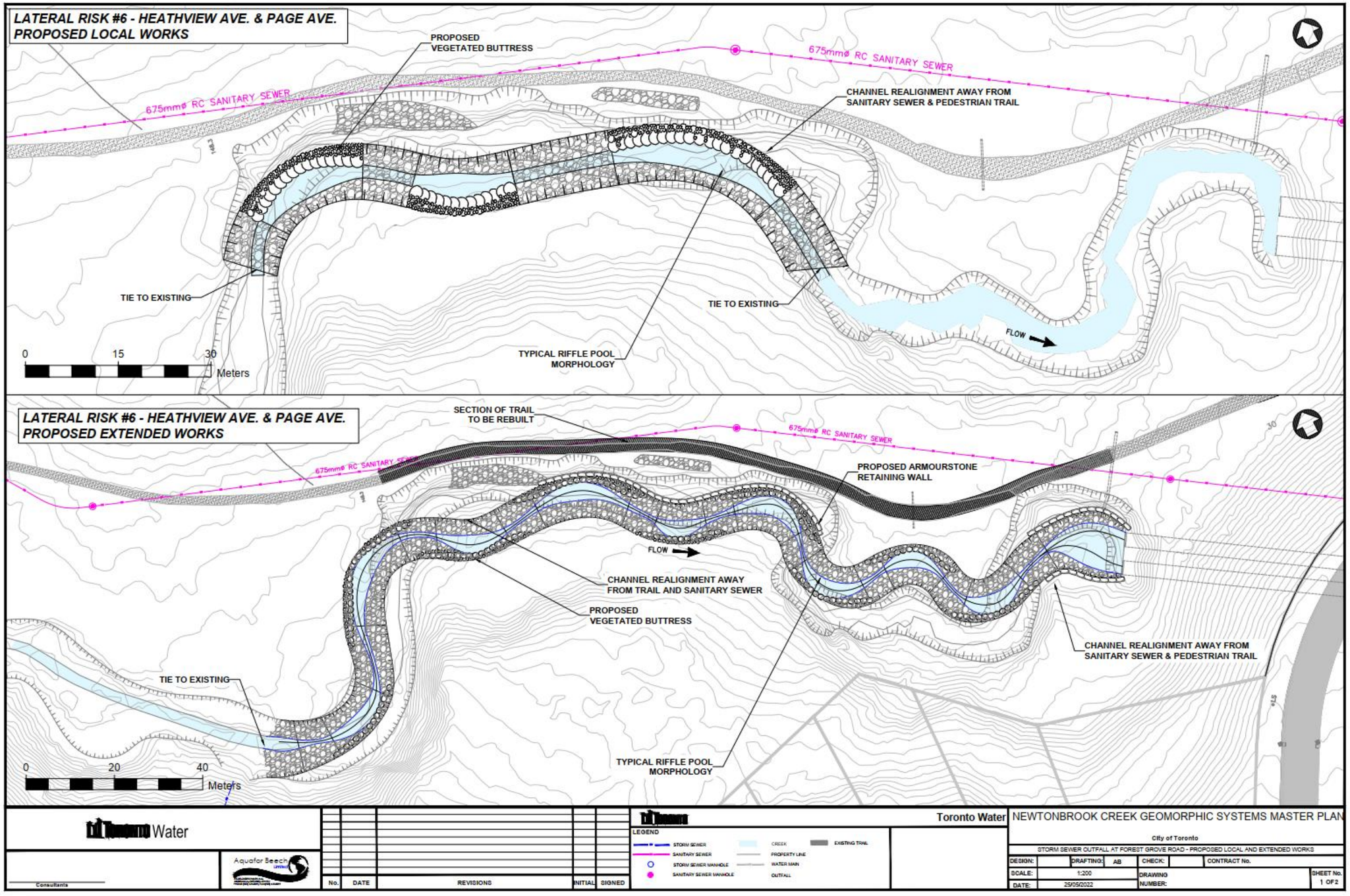

Figure 4-90: Preliminary Design Concepts Alternatives 2 & 3 – Priority Site #16

4.18.2Priority Site #16 – Evaluation of Restoration Alternatives

Restoration Alternatives for Priority Site #16 were evaluated using the methodology outlined in **Section 4.2.** Based on this evaluation process, Alternative 3 - Sub-Reach-Based Works was selected as the preferred alternative.

4.18.3Priority Site #16 – Selection of the Preferred Alternative

As per the evaluation table, the Sub-Reach-Based Works option was selected as the preferred alternative for Priority Site #16 with a total score of 80.73/100. The local works solution was the second preferred alternative with a total score of 68.47/100 while the Do Nothing alternative was the least preferred alternative with a total score of 42.33/100.

Key elements of the Sub-Reach-Based Works alternative include:

- Removal of channel debris, and any remnants of failed erosion control structures (i.e., gabion baskets).
- Apply approximately 240 metres of channel restoration work using natural channel design principles to establish riffle-pool morphology.
- Where feasible, lower and regrade channel banks to restore floodplain connectivity.
- Infill erosion scars using compacted native materials or approved engineered fill as determined at the detailed design phase.
- Mitigate the identified lateral erosion risk to sanitary sewer infrastructure through channel realignment.
- Address an additional lateral erosion risk site to sanitary sewer infrastructure (Priority Site #18 - SL4034031) through a combination of channel realignment works and the construction of an armourstone retaining wall to provide bank erosion protection.
- Undertake 220 metres of trail restoration work upstream of Forrest Grove Drive, including minor adjustments to the trail alignment in planform.
- Selectively apply vegetated buttress and armourstone retaining wall bank treatments to mitigate lateral erosion risks to the multi-use trail system and private properties.
- Establish a geomorphically stable transition into existing channel conditions upstream.
- Apply channel realignment works to reduce the sharp bend at the entrance to the Forrest Grove Drive Culvert, thereby establishing a smoother and more geomorphically stable transition into the downstream culvert with the intent of reducing scour and improving conveyance hydraulics.
- Apply restoration plantings to compensate for construction-related vegetation removals and to help stabilize regraded slopes.

4.19 Priority Site #17 – Lateral Risk to Sanitary Sewer Upstream of Maxome Avenue

Priority Site #17 is located approximately 150 metres upstream of the Maxome Avenue Road Crossing, within Reach N4 of Newtonbrook Creek. Two sanitary sewer lines, 675 mm and 750 mm in diameter, run through the Newtonbrook Creek valley corridor in this reach resulting in a number of crossings and lateral risk sites. At this priority site, ongoing erosion of the channel banks has reduced the estimated depth of lateral cover between the edge of the channel and the 675 mm diameter sanitary sewer to roughly 0.10 m. While the depth of lateral cover is minimal, the channel bank is protected by a coating of engineered rip-rap. The rip-rap protection works along the top of the bank have washed out, leaving only the toe of the bank protected.

Positioned along the outside edge of a meander bend, this bank is particularly vulnerable to lateral erosive forces. Factoring in the existing rip-rap bank protection, the estimated time to contact is 15.97 years. However, it is highly probable that if the rip-rap lining the toe of the bank begins to wash out the bank will begin to erode more rapidly, potentially resulting in the exposure of the sanitary sewer. A photo illustrating the site-specific channel conditions and actively eroding bank is presented as **Figure 4-91**.

Figure 4-91: Degraded Channel Conditions at Priority Site #17. The Actively Eroding Bank has Created a Lateral Risk to a 675 mm Diameter Sanitary Sewer.

Sanitary Sewer parameters relevant to this priority site are summarized in **Table 4-20** with a drawing illustrating the existing conditions of the project site presented in **Figure 4-92**.

Table 4-20: Summary of Priority Site #17 Sanitary Sewer Parameters

Parameter	Sanitary Trunk Sewer
Toronto Water Asset ID	SL4032958
Year of Construction	1989
Diameter	675
Lateral Depth of Cover	~ 0.10 m
Estimated Time to Contact	15.97 years
Condition of Bank Protection Works	Poor – Minimal Rip-Rap Protection at the Toe of Bank

4.19.1Priority Site #17 – Description of Restoration Alternatives

Alternative 1: Do Nothing –The estimated depth of the sewer at this location, indicates the sewer is positioned below the existing channel bed affording the sewer both lateral and vertical cover. Nevertheless, over time as the channel continues to widen & deepen, and the rip-rap bank protection continues to fail, the sanitary sewer may become exposed. Future emergency works may be required if the exposed sewer begins to show signs of structural degradation (i.e., spalling, cracking, slumping, etc.).

Alternative 2: Local Works – Apply natural channel design works for a length of approximately 40 metres along Reach N4, including minor realignment of the channel to increase the lateral erosion buffer between the channel and the sanitary sewer line. The natural channel design will establish riffle-pool morphology through the placement of engineered substrate. Adjustments to the longitudinal profile, planimetric alignment and typical channel dimensions will look to stabilize the creek from a geomorphic perspective. An armourstone retaining wall, with vegetated boulder toe protection, will be constructed along the outer bend to provide additional lateral erosion protection to the two sanitary sewer lines. Slopes behind the proposed channel works will be infilled with approved materials as needed, regraded to tie-into existing conditions and then stabilized through the application of coir-matting and restoration plantings.

Alternative 3: Sub-Reach-Based Works – Apply extended natural channel design works for approximately 350 metres of channel length with riffle-pool morphology and engineered bank treatments. Adjustments to the longitudinal profile, planimetric alignment and typical channel dimensions will look to stabilize the creek from a geomorphic perspective. The proposed works will look to realign the creek away from the sanitary sewer and will also implement a series of armourstone retaining walls and vegetated buttresses as bank protection works, in order to further reduce the lateral erosion risk to the sanitary sewer infrastructure. This proposed design would also address an additional lateral erosion risk to sanitary sewer infrastructure at priority site #30, while increasing the depth of cover over three (3) sanitary sewer crossings at priority sites #32, #33, and #35 by a minimum of 1.0 metres when compared with existing conditions. This would translate to increasing the depth of cover from approximately 0.32 metres to 1.32 metres at priority site #32, from 2.70 metres to 3.70 metres at priority site #33 and from 0.60 metres to 1.60 metres at priority site #35. As with Alternative #2, Slopes behind the proposed channel works will be infilled with approved materials as needed, regraded to tie-into existing conditions and then stabilized through the application of coir-matting and restoration plantings.

Preliminary concept drawings illustrating Alternative 2 and Alternative 3 are provided in **Figure 4-93.**

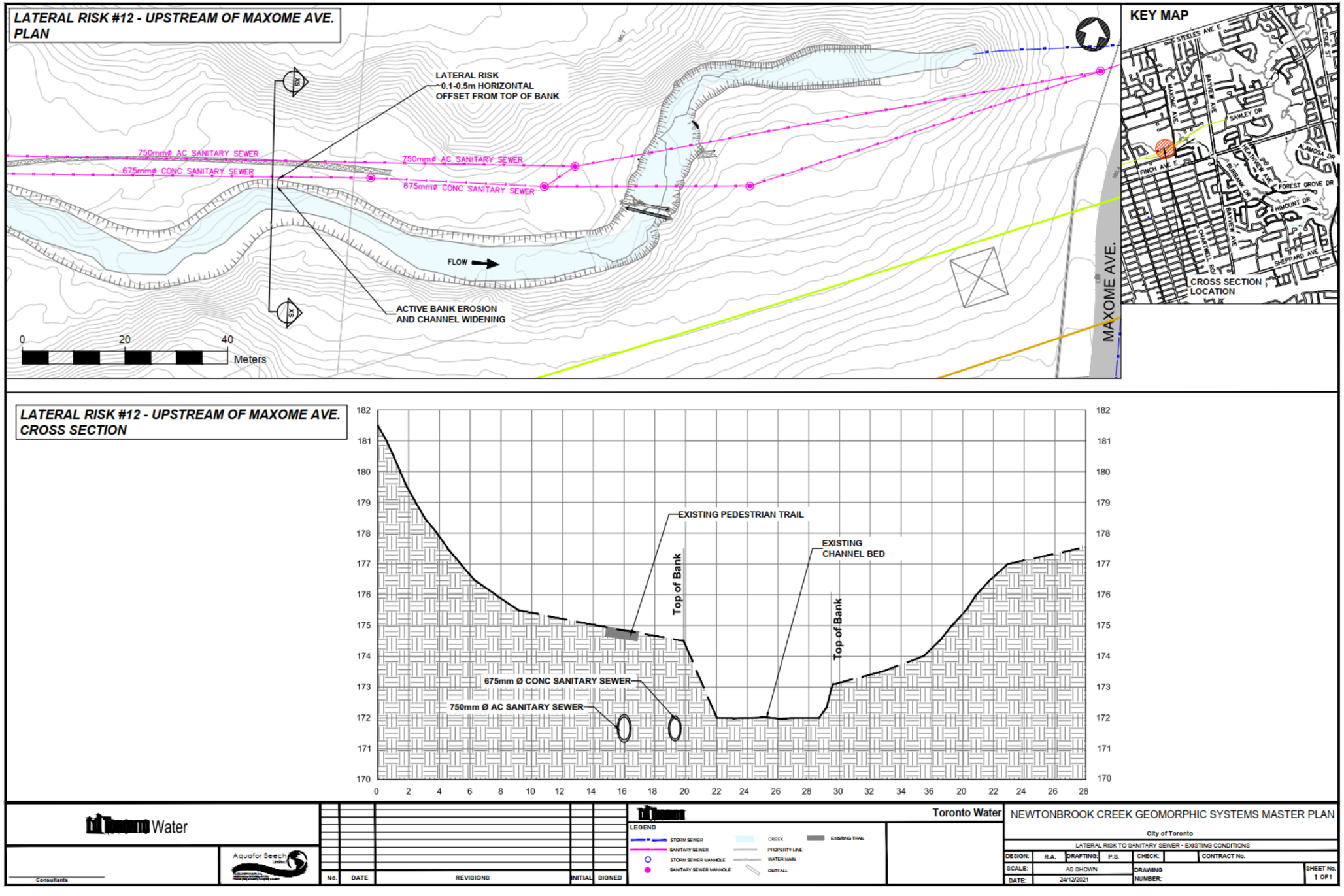

Figure 4-92: Existing Conditions – Priority Site #17

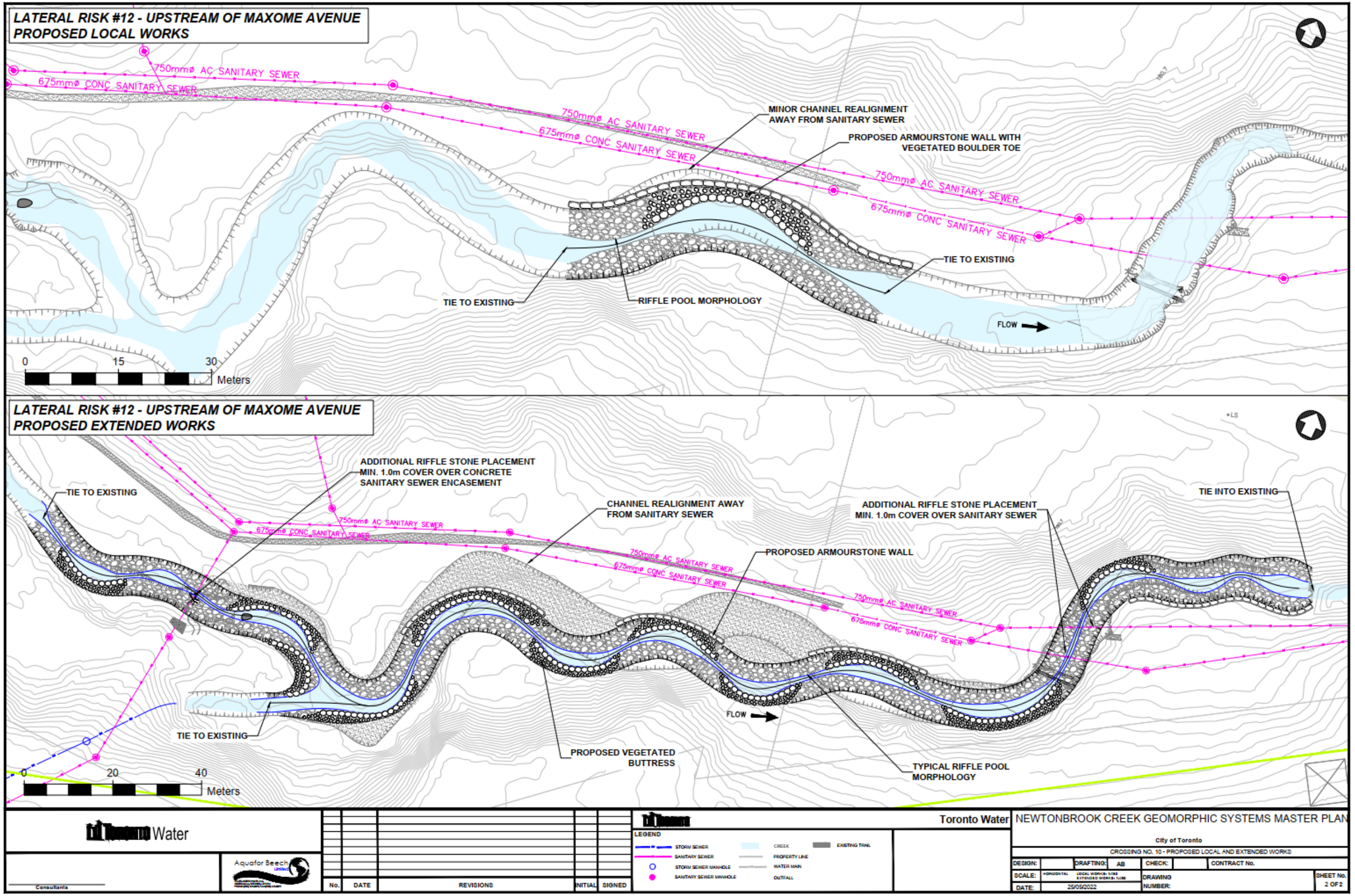

Figure 4-93: Preliminary Design Concepts Alternatives 2 & 3 – Priority Site #17

4.19.2Priority Site #17 – Evaluation of Restoration Alternatives

Restoration Alternatives for Priority Site #17 were evaluated using the methodology outlined in **Section 4.2.** Based on this evaluation process, Alternative 3 - Sub-Reach-Based Works was selected as the preferred alternative.

4.19.3Priority Site #17 – Selection of the Preferred Alternative

As per the evaluation table, the Sub-Reach-Based Works option was selected as the preferred alternative for Priority Site #17 with a total score of 80.53/100. The local works solution was the second preferred alternative with a total score of 67.73/100 while the Do Nothing alternative was the least preferred alternative with a total score of 40.93/100.

Key elements of the Sub-Reach-Based Works alternative include:

- Removal of channel debris, and any remnants of failed erosion control structures (i.e., gabion baskets, washed out rip-rap, etc.).
- Apply approximately 350 metres of channel restoration work using natural channel design principles to establish riffle-pool morphology.
- Where feasible, lower and regrade channel banks to restore floodplain connectivity.
- Infill erosion scars using compacted native materials or approved engineered fill as determined at the detailed design phase.
- Mitigate the identified lateral erosion risk to sanitary sewer infrastructure through a combination of channel realignment works and the construction of an armourstone retaining wall with vegetated buttress toe protection.
- Address an additional lateral erosion risk site to sanitary sewer infrastructure (Priority Site #30 - SL4033490, MH4918613545, SL4031888) through channel realignment and the construction of bank protection works (i.e., armourstone retaining wall).
- Selectively apply vegetated buttress and armourstone retaining wall bank treatments to mitigate lateral erosion risks to the multi-use trail system.
- Increase the depth of cover over three (x3) buried sanitary sewer crossings by a minimum of 1.0 metres (Priority Site #32 - SL4031698, Priority Site #33 - SL4031698, and Priority Site #35 - SL4032961).
- Establish a geomorphically stable transition into existing channel conditions at the upstream and downstream tie-in points
- Apply restoration plantings to compensate for construction-related vegetation removals and to help stabilize regraded slopes.