

APPENDIX E

Recommended Plant List

RECOMMENDED PLANT LIST FOR RANGE POINT DEVELOPMENT SITE

Key	Common Name	Botanical Name
STREET TREES		
NWP	Northwest Poplar	<i>Populus x jackii 'Northwest'</i>
ASP	Assiniboine Poplar	<i>Populus 'Assiniboine'</i>
AMC	Amur Cherry	<i>Prunus maackii</i>
WEB	Weeping Birch	<i>Betula pendula 'Youngii'</i>
WPB	White Paper Birch	<i>Betula papyrifera</i>
DECIDUOUS TREES		
TRA	Trembling Aspen	<i>Populus tremuloides</i>
BAP	Balsam Poplar	<i>Populus balsamifera</i>
WPB	White Paper Birch	<i>Betula papyrifera</i>
CONIFEROUS TREES		
WHS	White Spruce	<i>Picea glauca</i>
LOP	Lodgepole Pine	<i>Pinus contorta latifolia</i>
SHRUBS		
REC	Red Currant	<i>Ribes triste</i>
LAT	Labrador Tea	<i>Ledum groenlandicum</i>
HBC	High Bush Cranberry	<i>Viburnum trilobum</i>
SOA	Soapberry	<i>Sheperdia canadensis</i>
SHC	Shrubby Cinquefoil	<i>Potentilla fruticosa</i>
PWR	Prickly Wild Rose	<i>Rosa acicularis</i>
ROD	Red Osier Dogwood	<i>Cornus stolonifera</i>
WOW	Wolf Willow	<i>Elaeagnus commutata</i>
GROUNDCOVERS/PERENNIALS		
LIN	Lingonberry	<i>Vaccinium vitis-idaea</i>
COY	Common Yarrow	<i>Achillea millefolium</i>
KIN	Kinnikinnick	<i>Arctostaphylos uva-ursi</i>
CRJ	Creeping Juniper	<i>Juniperus horizontalis</i>
COJ	Common Juniper	<i>Juniperus communis</i>

APPENDIX F

Engineering Technical Memorandum

Issue Date:	May 31, 2023	File No.:	AERIS
To:	Jane Koepke	Previous Issue Date:	N/A
From:	Kirsten Hogan, P. Eng.	Project No.:	2021-2117-00
Client:	Groundswell Planning		
Project Name:	Range Point Joint Master Plan (KDFN and YG)		
Subject:	Conceptual Site Servicing - Design Brief		

1 INTRODUCTION

Associated Engineering (Associated) was retained by Groundswell Planning (GP) to develop a conceptual site servicing plan for the proposed subdivision on Kwanlin Dün First Nation (KDFN) Settlement Parcel C-15B and Government of Yukon (YG) Lot 262-6, located in the Range Point neighbourhood in Whitehorse, Yukon. The conceptual servicing plan was developed based on the proposed lot layout and zoning, design criteria outlined in the City of Whitehorse Servicing Standards Manual (SSM 2020) and best management practices. The purpose of this memo is to summarize the proposed servicing plan. It is important to note that the servicing presented is conceptual and subject to change once the design criteria are confirmed during the detailed design stage. Construction cost estimates have been provided under separate cover.

2 LOT CLEARING AND GRADING

Lot clearing and grading is completed in new developments to ensure that surface water drains from each lot without causing a buildup of water on adjacent lots. The lot clearing and grading plan is designed to work with the existing land contours and to retain as much of the natural vegetation and forest cover as possible.

The existing topography of the development area is generally sloped from the southeast to the northwest towards McIntyre Creek. The area is mostly forested, with a series of trails present. The site is constrained by Northland Park to the south, an escarpment to the west, and Range Road to the north and east. To facilitate drainage, pre-grading of the development area will be required. A conceptual grading plan was developed and is shown in Figure 1-2, attached to this memo. The grading plan was designed to minimize earthworks, tie into the existing elevations surrounding the development area, and minimize tree clearing where possible. Based on the conceptual model created, it is anticipated that the site could potentially be a cut/fill balance. It is expected some imported material will still be required if unsuitable ground conditions are discovered. The cut/fill volumes and ground conditions will be confirmed during the detailed design.

Clearing will be required across most of the development area to facilitate pre-grading work to ensure proper drainage. All road rights-of-way will require clearing a minimum of 5 m into adjacent lots to provide space for lot service pipes and room for equipment to work. Based on experience in the Whistle Bend development, most lots smaller than approximately 800 m² will likely be completely cleared either during development or building construction. The key drivers of lot clearing include:

- Pre-grading for drainage requirements: the City of Whitehorse will likely require that pre-grading efforts bring lots to within 0.3 m of final grade.

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- Construction requirements: once pre-grading is complete at property boundaries, some lots will have a small stand of trees remaining near the centre of the lot. These trees are often removed for building construction. Some developers choose to remove all trees on small lots during pre-grading to increase efficiency.

Opportunities will likely exist to leave trees in place on the larger high-density multi-family lots, in green spaces, and parks. The actual clearing limits will be determined during detailed design based on the approved grading plan.

If phased development is planned over several years, it is recommended that each phase is cleared within 1 year prior to deep utilities and surface works construction to allow time for an existing ground survey and avoid excessive erosion and material migration. Additional clearing is generally included during construction to facilitate pre-grading and overall stormwater management.

3 WATER DISTRIBUTION SYSTEM

A water distribution system is typical within urban municipalities and is proposed for this development. The system consists of an underground network of pipes and valves providing water to the public that is safe for human consumption. The system water pressures are designed to be adequate for domestic uses and fire protection.

The subdivision water distribution system will be serviced from the existing 450 mm watermain within the Range Road right-of-way. This watermain is anticipated to have sufficient capacity for the subdivision's needs. Two watermain tie-in connection points are proposed to provide more pressure, improved water quality through water re-circulation, and redundancy if a section of the water distribution system requires servicing. The proposed water distribution system for the development will be located in the road right of way and is shown in Figure 1-1 attached to this memo. A water model will be needed during detailed design to determine the required pipe diameters for fire flow and pressure requirements.

4 SANITARY SEWER SYSTEM

The proposed sanitary sewer system consists of a network of underground pipes that collect and carry sewage from bathrooms, sinks, kitchens, and other plumbing components within the development to an offsite location where the wastewater can be properly treated. The pipes are sloped and rely on gravity to convey the flow to a centralized location, before being pumped through an existing piping system to the offsite wastewater treatment facility.

The existing sanitary sewer main near the proposed development is located approximately 550 m to the south of the development area near the intersection of Range Road and Crow Street. Due to topography and the depth of the existing sewer, it is not feasible to tie into this existing main by gravity flow. A sanitary lift station and force main will be required to service the development.

Lift station design can vary depending on the requirements of the operator, and the lift station can be housed in a building, a small enclosure, or primarily underground. The lift station for Range Point will become part of the sanitary system operated by the City of Whitehorse. Based on experience in the Whistle Bend development, the City of Whitehorse generally prefers lift station buildings for cleaning and maintenance purposes.

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The proposed location of the lift station and alignment of the force main is shown in Figure 1-4, attached to this memo. The proposed alignment of the force main is within the Mountain View Drive right-of-way, following the perimeter of the Northland Park Development. It is anticipated that the force main will be a minimum of 150 mm in diameter. Utilizing the design criteria within the SSM, the estimated peak flow rate into the lift station is 20 L/s; this value will need to be reviewed and confirmed during detailed design. The alignment of the force main should also be reviewed during detailed design to determine if it will affect the tree buffer between Northland Park and Mountain View Drive. An easement approximately 6 m wide will be required for the forcemain.

The development will be serviced by a gravity sewer system to collect and convey wastewater to the proposed lift station, as shown in Figure 1-1 appended to the memo. The sanitary sewer pipe network will be located within the roadway right-of-way, buried a minimum of 2.8 m deep or insulated as required, have a maximum manhole spacing of 110 m, and a minimum pipe diameter of 200 mm. Utilizing the design criteria within the SSM to estimate peak sanitary flow rates and Manning's equation, it is anticipated that pipe diameters greater than 200 mm will not be required.

5 STORMWATER MANAGEMENT

Stormwater management is required to ensure runoff is collected, conveyed, and discharged appropriately to prevent any harmful effects to the development or the surrounding areas. Best practices for managing stormwater focus on matching the pre-development discharge conditions in terms of flow rates, water quality, and discharge locations to ensure downstream properties and watercourses are unaffected by the development. To reduce the risk of erosion and sediment loading downstream of the development, stormwater is proposed to be collected and conveyed through an underground gravity sewer system into a dry pond prior to discharging at the pre-development flow rate. The City of Whitehorse requires that the storm sewer system, including the pond, is designed for a 1:5 year design storm event.

The residential development will introduce impervious surfaces, create more direct drainage routes, and eliminate small depressions that could store water. As a result of these changes, the stormwater discharge rates will be greater post-development. The proposed dry pond will limit discharge to the 1:5 year pre-development discharge rate and will be sized to temporarily store the difference between the pre-development and post-development flow rates. This will ensure that there is no increase in flow rate in the downstream drainage paths as a result of the development. The pond will typically remain dry, however, it will temporarily hold water during storm events due to a control structure restricting outflow. The temporary ponding will provide retention time to allow any sediment that accumulates in stormwater to deposit within the pond instead of being discharged downstream. The pond will be designed to have a maximum depth of 3.0 m during the 1:5 year storm event using the Rational Method and will include an emergency overflow structure to safeguard the parcels of land surrounding the pond. The pond will discharge via a pipe to Range Road, into either the south or north ditch, before continuing overland towards McIntyre Creek. Discharging into the north ditch of Range Road will require additional piping to cross under the road structure. Figure 1-3, appended to this memo, outlines the conceptual pond and discharge location options to service the development.

Stormwater is proposed to be collected and conveyed through an underground gravity sewer system to the stormwater pond, as shown in Figure 1-1 appended to this memo. A geotechnical investigation will be required to confirm ground conditions in the area of the stormwater pond prior to detailed design.

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The pipe network will be located within the road right-of-way and green space where required. The Rational Method was used to determine conceptual pipe sizes to accommodate minor storms (1:5 year return period) based on the proposed zoning. Major storms (1:100 year return period) will be conveyed overland on the roadway before discharging at the outlets shown on Figure 1-2. The downstream drainage paths of the major storm outlets should be reviewed during detailed design to determine if any erosion protection is required for conveyance of 1:100 year storms. It is important to note that the proposed major storm outlets discharge into the existing City of Whitehorse stormwater conveyance system, including existing ditches and swales.

6 SNOW MANAGEMENT

Snow clearing and removal will be required to provide vehicular and pedestrian accessibility throughout the development in winter months. The City and individual lot owners will share snow clearing and removal responsibilities as per the City's Snow and Ice Control Policy and the Maintenance Bylaw. The City will be responsible for clearing public roadways, pathways and sidewalks, whereas individual lot owners and strata corporations will be responsible for the sidewalk along their lot frontage and snow within their lot including but not limited to private roadways, driveways, paths, and parking lots.

Snow cleared from the public roads and sidewalks will be temporarily stored on City boulevards before conditions warrant removal. No on-site snow storage site will be provided for this development. Snow is anticipated to be hauled to either the City's Kulan Industrial or Two-Mile Hill storage sites when removal is warranted. Lot owners will be responsible for storing snow within their lot and hauling excess snow to the City's Robert Service Snow Site at their own expense. Clearing or stockpiling snow from private lots onto the City streets or boulevards will be strictly prohibited.

7 WATER, SANITARY, & STORMWATER SERVICES

To provide lot owners connection to the water, sewer, and stormwater systems within the development, service pipes will be extended from the mains into the lots. All lots will be provided with recirculating water and sanitary services stubbed up to 1 m into the property, as per the SSM (2020). Stormwater services are proposed to only be supplied to high-density multi-family or commercial, industrial facilities to accommodate discharge from private stormwater systems. The minimum water, sanitary, and stormwater service sizes for the classified lots are provided in Table 7-1 below. The exact service sizes will need to be determined during detailed design based on the expected demand.

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Table 7-1 Minimum Service Sizes

Lot Type	Water Supply	Water Recirculation	Sanitary	Stormwater
Single/Duplex	25 mm	20 mm	100 mm	-
Medium Density Multi-Family	50 mm	20 mm	150 mm	-
High Density Multi-Family	150 mm	150 mm	150 mm	300 mm
Commercial/Institutional	150 mm	150 mm	150 mm	300 mm

8 ROADWAYS

Roadways will conform to the standard cross sections and right of way widths within the City’s SSM based on road classification in order to provide uniformity within the municipality. The roads within the development area are classified as urban local residential. The following right-of-way (ROW) widths have been proposed throughout the Range Point Subdivision:

- Local Roads – 20.0 m
- Paved pathway – 3.0 m

Examples of the proposed road cross-sections and a conceptual signage plan for the development are shown in Figure 1-5 and Figure 1-6, respectively, attached to this memo. The road cross section provides boulevard space for snow storage along one side of the driving surface, and a sidewalk for pedestrian traffic along the opposite. On-street parking is not shown on the conceptual drawings.

The table below summarizes typical road, sidewalk, and trail structures utilized in similar developments within Whitehorse. Based on the available geotechnical information, it is anticipated that similar road structures will be required for this development. Road structures will be confirmed during detailed design based on the site-specific geotechnical information.

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Table 8-1 Potential Roadway Structures

Item	Structure Details
Local - 20.0 m	1300 mm – pit run gravel sub base 200 mm – 50 mm crushed gravel sub base 150 mm – 20 mm crushed gravel base course 75 mm asphalt
Sidewalk	1400 mm – pit run gravel sub base 200 mm – 20 mm crushed gravel base course 125 mm concrete (175 mm concrete at commercial, lane and private crossings)
Paved trail – 3.0 m	300 mm – pit-run gravel subbase. 200 mm – 50 mm crushed gravel sub base 150 mm – 20 mm crushed gravel base course 50 mm asphalt

9 POWER & TELECOMMUNICATIONS

Shallow utilities, such as power and fibre optic lines, are required to service the development. Street lighting and power services will run underground and be provided by ATCO Electric Yukon, while telephone and cable or fibre optic will be provided by NorthwTel. The power and telecommunications utilities both follow road alignments. Utility easements or rights-of-way must be acquired when the services are located outside the road limits. The power distribution requires a looped system to ensure no loss of service. Shallow utilities will need to be coordinated to have no conflicts with water and sanitary services to lots.

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10 CLOSURE

The services provided by Associated Engineering in the preparation of this memo were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering

Prepared by:

Reviewed by:



Evan Latos, P. Eng.
Project Engineer

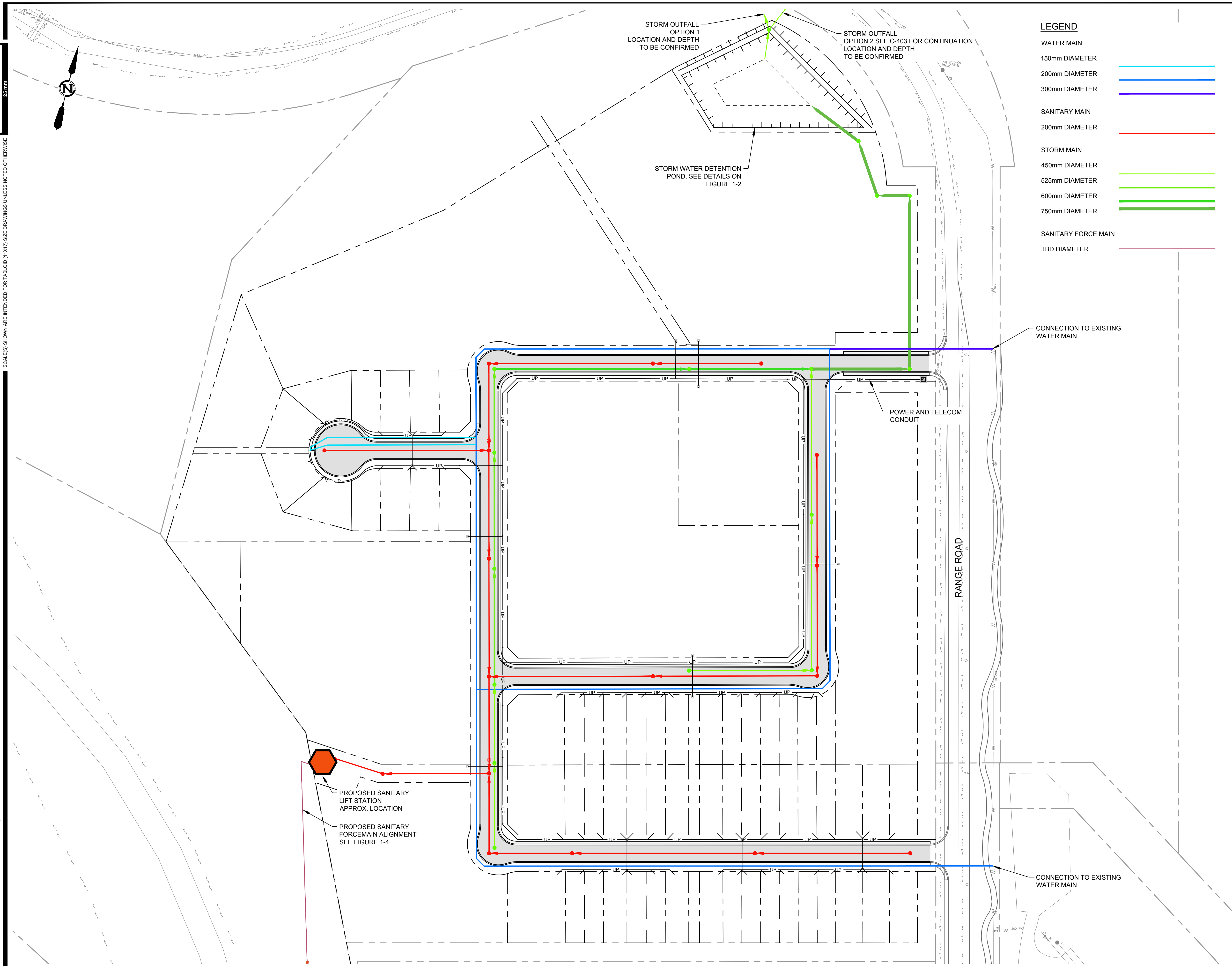
Kirsten Hogan, P.Eng.
Project Manager

EL/KH

IF NOT 25 mm ADJUST SCALES

SCALE(S) SHOWN ARE INTENDED FOR TABLOID (11X17) SIZE DRAWINGS UNLESS NOTED OTHERWISE

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WATER MAIN	
150mm DIAMETER	
200mm DIAMETER	
300mm DIAMETER	
SANITARY MAIN	
200mm DIAMETER	
STORM MAIN	
450mm DIAMETER	
525mm DIAMETER	
600mm DIAMETER	
750mm DIAMETER	
SANITARY FORCE MAIN	
TBD DIAMETER	



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FIGURE 1-1

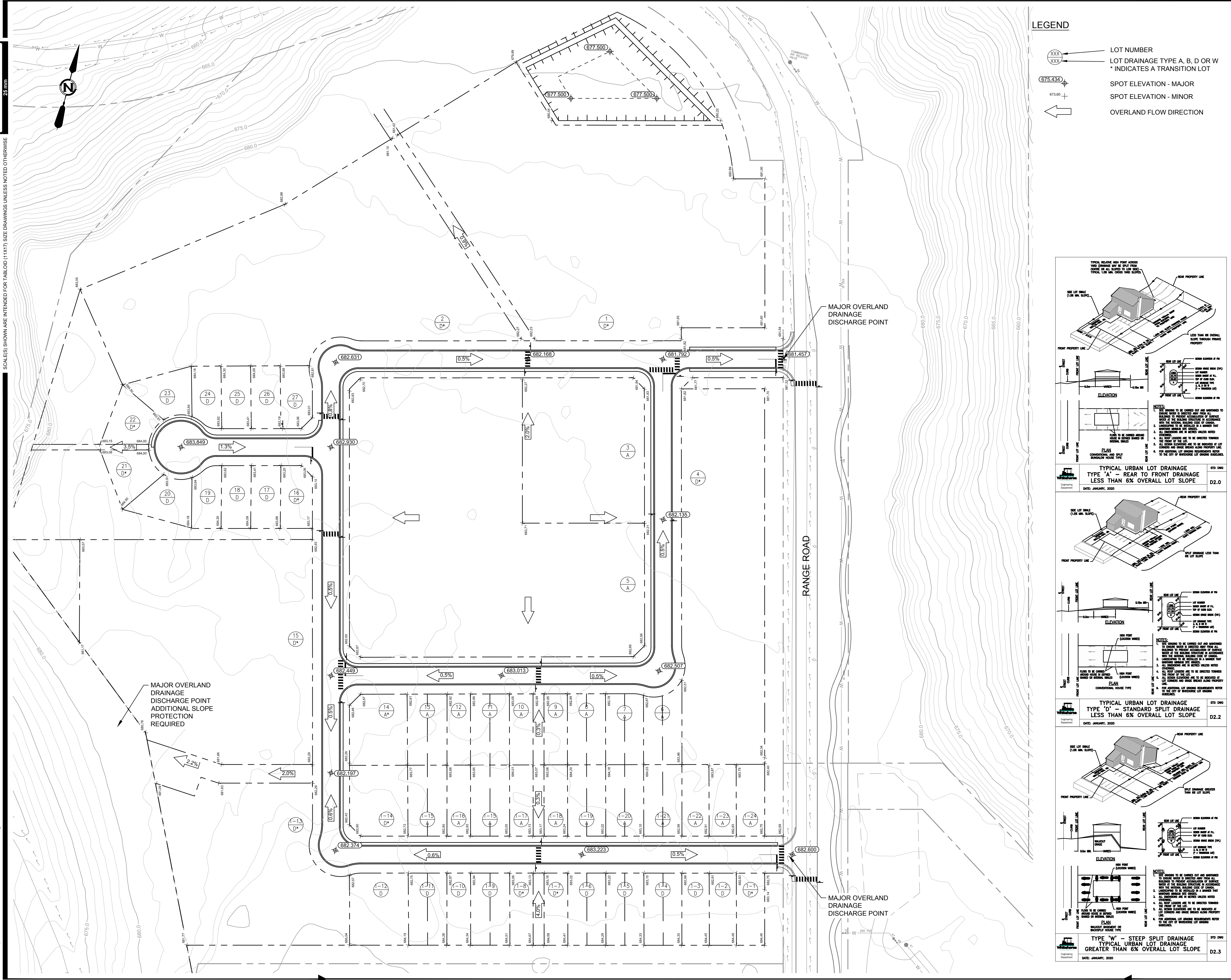
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CIVIL
SITE SERVICING

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DATE	2023APR13
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 SCALES SHOWN ARE INTENDED FOR TABLOID (11X17) SIZE DRAWINGS UNLESS NOTED OTHERWISE



LEGEND

- LOT NUMBER
- LOT DRAINAGE TYPE A, B, D OR W * INDICATES A TRANSITION LOT
- SPOT ELEVATION - MAJOR
- SPOT ELEVATION - MINOR
- OVERLAND FLOW DIRECTION

TYPICAL URBAN LOT DRAINAGE TYPE 'A' - REAR TO FRONT DRAINAGE LESS THAN 6% OVERALL LOT SLOPE STD DWG D2.0
 DATE: JANUARY, 2020

NOTES:

- SEE DRAWING TO BE CARRIED OUT AND INSTALLED TO THE PROPERTY LINE.
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TYPICAL URBAN LOT DRAINAGE TYPE 'D' - STANDARD SPLIT DRAINAGE LESS THAN 6% OVERALL LOT SLOPE STD DWG D2.2
 DATE: JANUARY, 2020

NOTES:

- SEE DRAWING TO BE CARRIED OUT AND INSTALLED TO THE PROPERTY LINE.
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TYPICAL URBAN LOT DRAINAGE TYPE 'W' - STEEP SPLIT DRAINAGE TYPICAL DRAINAGE GREATER THAN 6% OVERALL LOT SLOPE STD DWG D2.3
 DATE: JANUARY, 2020

NOTES:

- SEE DRAWING TO BE CARRIED OUT AND INSTALLED TO THE PROPERTY LINE.
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FOR DISCUSSION
NOT FOR CONSTRUCTION

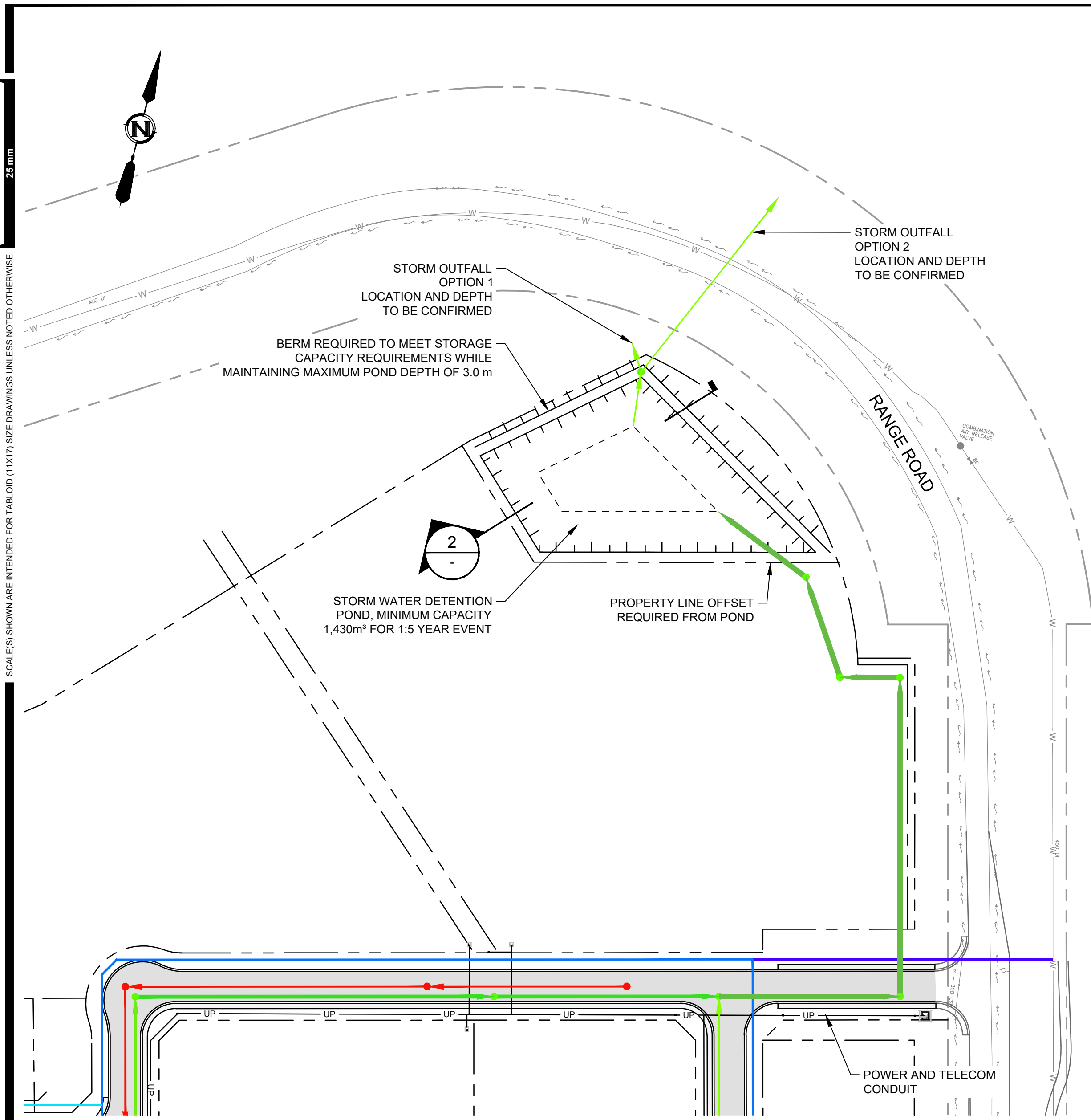
FIGURE 1-2
 Kwanlin Dün First Nation & YUKON GOVERNMENT

CIVIL
 LOT GRADES

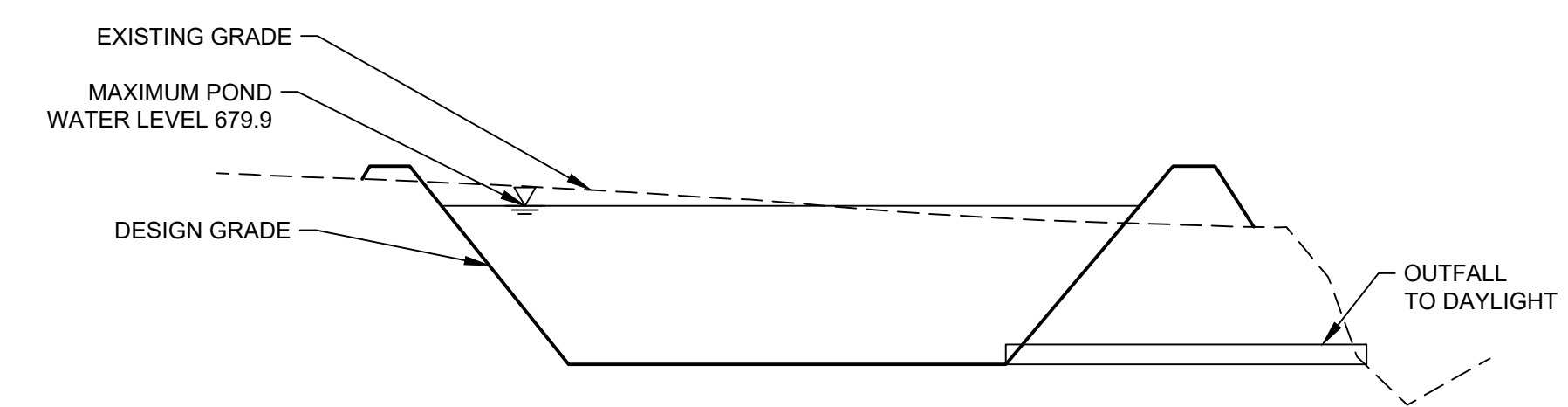
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DATE 2023APR13
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DESCRIPTION ISSUED FOR DISCUSSION

IF NOT 25 mm ADJUST SCALES

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1 PLAN
STORM POND 1:1000



2 SECTION
STORM POND H 1:500 V 1:100

STORAGE REQUIREMENT NOTES:

- PRELIMINARY POND SIZING DETERMINED UTILIZING THE RATIONAL METHOD AND THE PROPOSED CONCEPTUAL GRADING AND STORM SYSTEM.
- THE POND IS PROPOSED TO FUNCTION AS A DRY POND; NO PERMANENT STORAGE WILL BE CREATED TO ACCOUNT FOR THE INCREMENTAL INCREASE IN RUNOFF DUE TO THE INTRODUCTION OF IMPERVIOUS SURFACES.
- OUTLET CONTROL WILL BE PROVIDED TO LIMIT THE POND RELEASE TO THE 1.5 YEAR PRE-DEVELOPMENT PEAK DISCHARGE RATE.
- 1.5 YEAR PEAK PRE-DEVELOPMENT FLOW RATE IS ESTIMATED TO BE 22 L/s BASED ON THE SIZE OF THE DEVELOPMENT AND DESIGN CRITERIA UTILIZED ON SIMILAR DEVELOPMENTS.
- THE REQUIRED STORAGE VOLUME TO ATTENUATE THE POST DEVELOPMENT 1.5 YEAR STORM EVENT IS 1,430 m³ WHICH INCLUDES A 35% INCREASE IN VOLUME TO ACCOUNT FOR CLIMATE CHANGE.
- THE ABOVE VALUES ARE CONCEPTUAL AND WILL NEED TO BE CONFIRMED DURING DETAILED DESIGN.

CONCEPTUAL DESIGN NOTES:

- CONCEPTUAL FOOTPRINTS BASED ON THE FOLLOWING DESIGN CRITERIA:
 - 4:1 SIDE SLOPES
 - MINIMUM BERM TOP WIDTH: 3.0 m
 - TOTAL DEPTH OF POND: 3.0 m
 - FREEBOARD: 0.6 m

LEGEND

WATER MAIN	
150mm DIAMETER	
200mm DIAMETER	
300mm DIAMETER	
SANITARY MAIN	
200mm DIAMETER	
STORM MAIN	
450mm DIAMETER	
525mm DIAMETER	
600mm DIAMETER	
750mm DIAMETER	

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FIGURE 1-3

Kwanlin Dün First Nation & YUKON GOVERNMENT

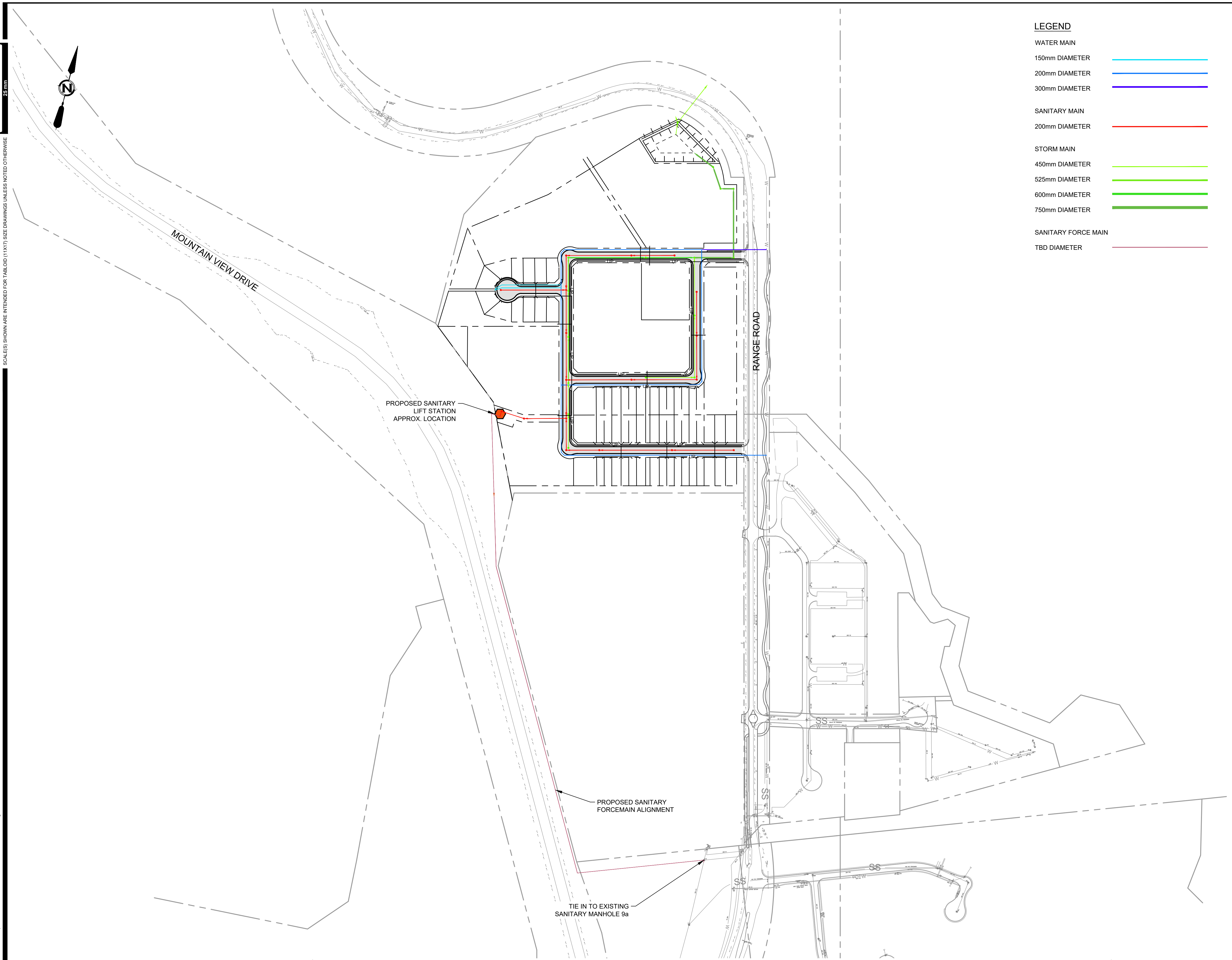
CIVIL
STORM POND DETAILS

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DATE	2023APR13
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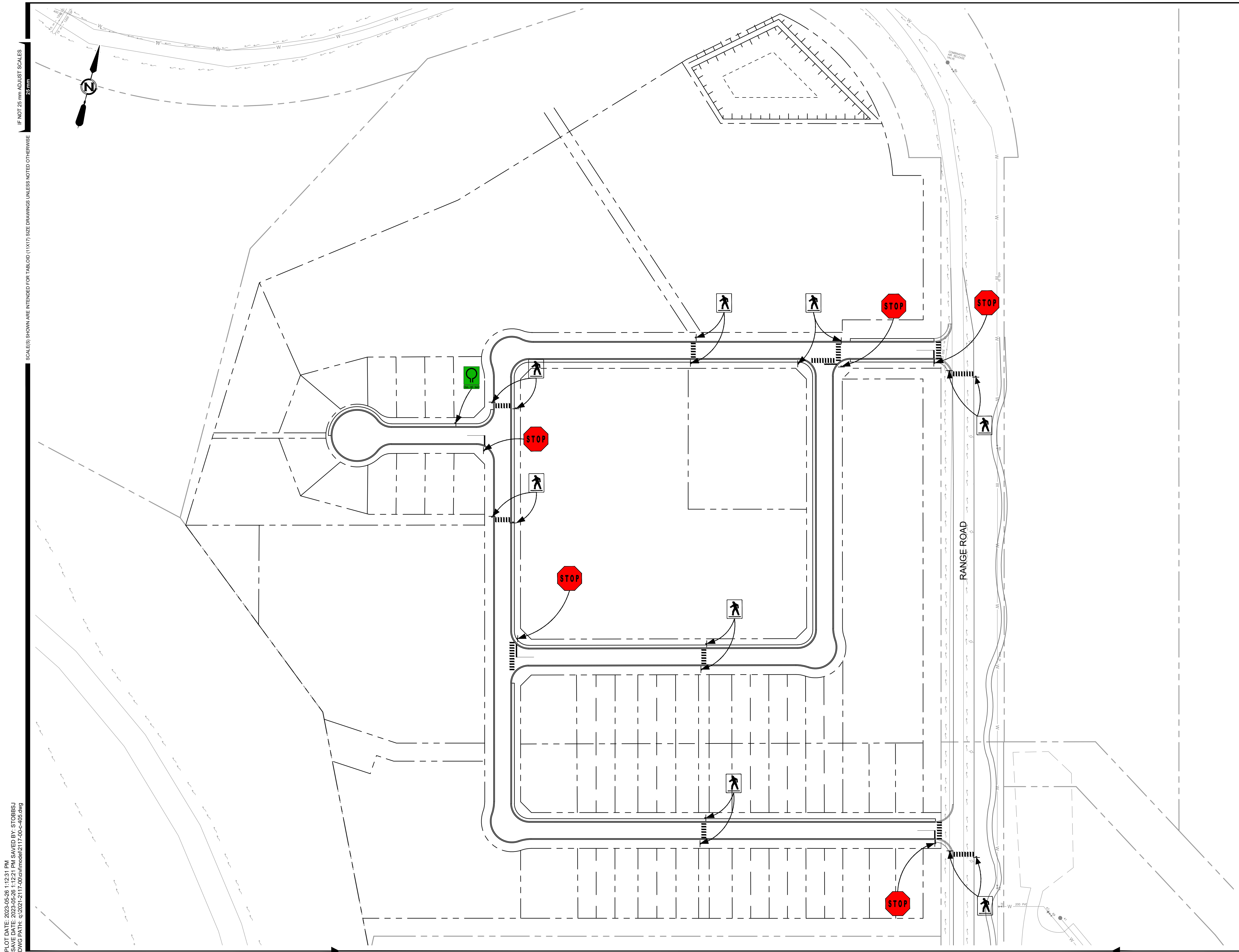
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SANITARY MAIN	
200mm DIAMETER	
STORM MAIN	
450mm DIAMETER	
525mm DIAMETER	
600mm DIAMETER	
750mm DIAMETER	
SANITARY FORCE MAIN	
TBD DIAMETER	



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FIGURE 1-4
Kwanlin Dün First Nation &
YUKON GOVERNMENT
CIVIL
SANITARY FORCEMAIN ALIGNMENT

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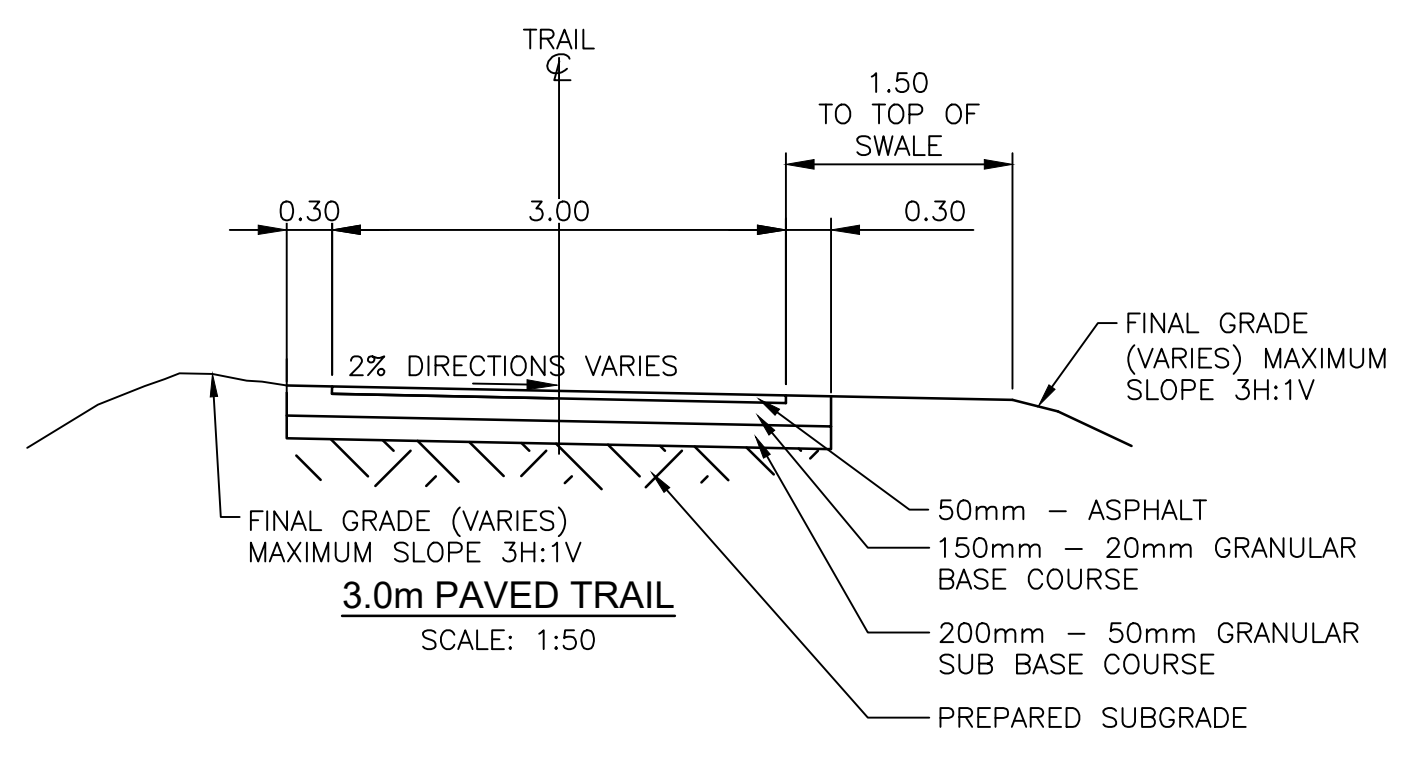
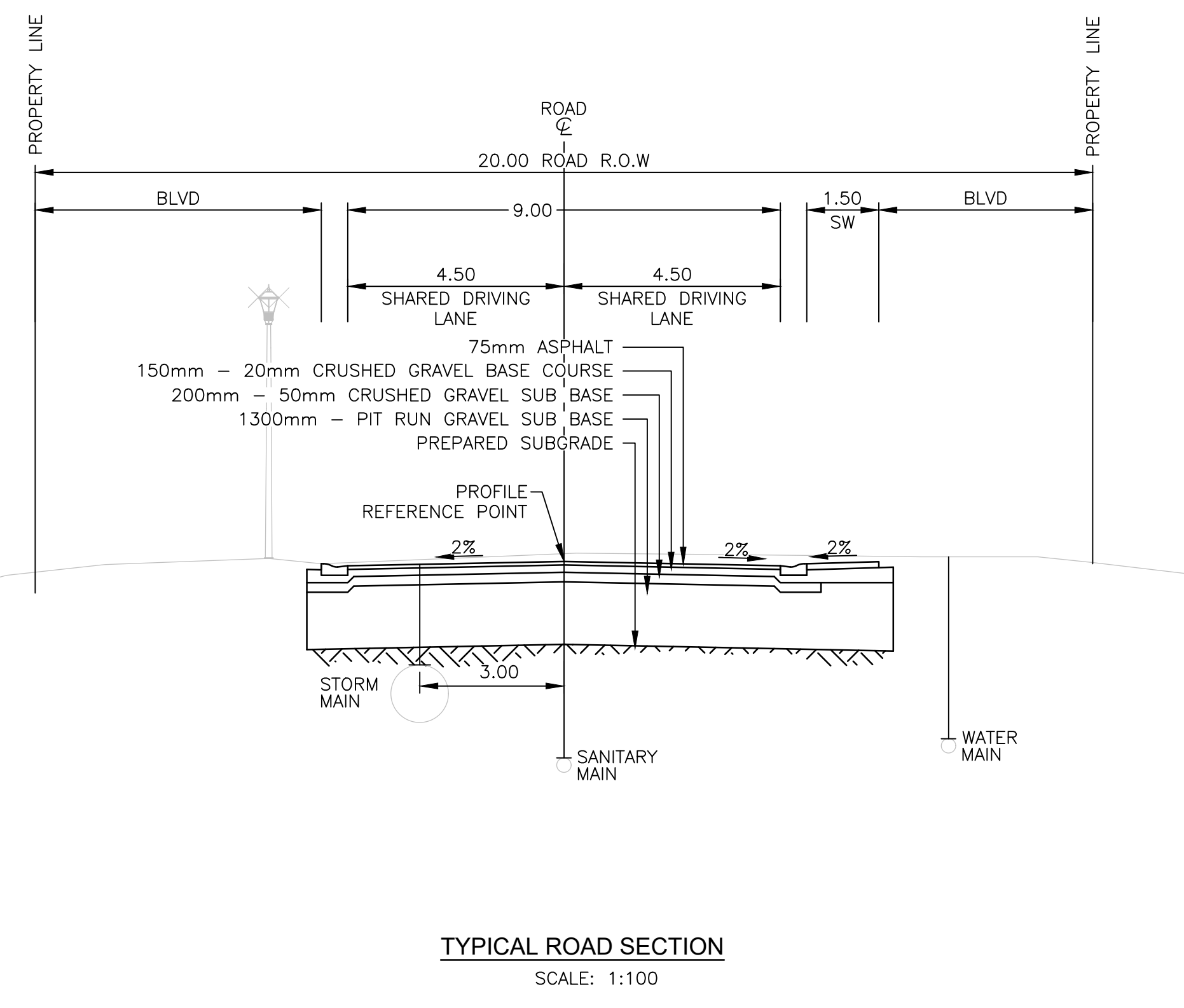
FIGURE 1-5
Kwanlin Dün First Nation &
YUKON GOVERNMENT

CIVIL
TRAFFIC SIGNAGE

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FIGURE 1-6
Kwanlin Dün First Nation &
YUKON GOVERNMENT
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TYPICAL CROSS SECTIONS

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