UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Chancellor Boulevard and East Mall Intersection Redesign

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University of British Columbia

CIVL 446

April 7th, 2025

UBC Campus and Community Planning
The University of British Columbia
Vancouver, BC V6T 1Z4

April 7, 2025

Dear UBC Campus and Community Planning Team,

Capstone Consulting Ltd. is pleased to submit our Detailed Design Report for the redesign of the Chancellor Boulevard and East Mall intersection at the University of British Columbia. This report has been prepared as part of the CIVL 446 Capstone Design Course at UBC.

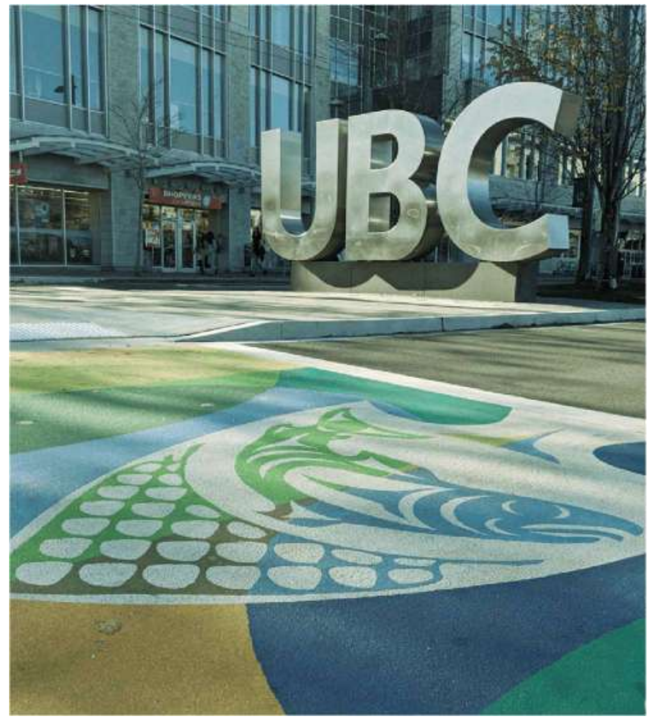
Our goal was to redesign the intersection to better support pedestrian, cyclist, and vehicle safety while creating a gateway to campus. After conducting site visits, technical analyses, and working closely with stakeholders, our team developed a design that addresses current challenges, such as vehicle speeds, poor visibility, and inadequate stormwater management.

The final design features protected active transportation infrastructure, reduced lane widths, bioretention swales, and a signature gateway sign—balancing function, safety, and sustainability within the site constraints. The redesign of the Chancellor Boulevard-East Mall intersection will be a four-legged signalized protected intersection. The intersection includes crosswalks along all intersection legs to allow safer bike and pedestrian crossings. The largest change made to the intersection included condensing the intersection by bringing the south leg eastward, significantly shortening crossings. The intersection provides dedicated sidewalks and bike lanes, providing ample separation between active transportation and traffic. This report outlines our methodology, design rationale, and implementation plan, including risk mitigation strategies and a detailed construction schedule. With consideration of environmental sustainability and stakeholder engagement, our design reflects a comprehensive approach to responsible campus development.

We appreciate the opportunity to work on this meaningful project and hope that our proposed redesign meets your expectations. Please find the full report enclosed, and we look forward to your feedback.

Sincerely,

Team 9 – Capstone Consulting Ltd.
CIVL 446 – Capstone Design Project
The University of British Columbia



Chancellor Boulevard and East Mall Intersection Redesign

UBC Campus and Community Planning

Final Detailed Design Report

CIVL 446 2024W – Team 9

Capstone Consulting Limited

April 7, 2025

CAPSTONE CONSULTING

EXECUTIVE SUMMARY

The redesign of the current Chancellor Boulevard-East Mall intersection will be a four-legged signalized protected intersection. The intersection includes crosswalks along all intersection legs to allow safer bike and pedestrian crossings. The largest change made to the intersection included condensing the intersection by bringing the south leg eastward, significantly shortening crossings. The intersection provides dedicated sidewalks and bike lanes, providing ample separation between active transportation and traffic.

The design meets client criteria by prioritizing active transportation, improving safety through traffic calming, and enhancing intersection intuitiveness. Raised concrete barriers at corners protect pedestrians and cyclists from right hooks. Reduced lane widths and curb radii help to slow cars down their turns and as they move through the intersection. Aligning intersection legs closer to 90 degrees provides a more typical intersection design, improving intersection familiarity for all users.

Further, the design meets projected transportation demands (peak hour volume of 950 vehicles in 20 years), with minimal vehicle delays to achieve a level of service (LOS) of A in the AM and B in the PM. Queue lengths formed were deemed acceptable, as they do not cause blockages at adjacent intersections and driveways.

The client has requested the design of an eight-metre-tall sign that establishes the intersection as a prominent gateway to campus. After consideration of precedent examples, Capstone Consulting has developed a mixed-material structure composed primarily of reinforced concrete, featuring pressure-treated timber and steel accents. Integration with existing campus architecture was prioritised, providing a sense of unity and significance to the area.

The proposed rainwater management system plans to mitigate cliff erosion issues by retaining rainwater onsite. After thorough consideration of an underground retention tank and implementation of rainwater reuse, it was decided that these systems would not be efficient or economically feasible. As such, our rainwater system will consist of green infrastructure. The main storage component is an infiltration swale with retention capabilities, recommended as the most sustainable and efficient solution.

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1.0 SITE INTRODUCTION

1.1 SITE OVERVIEW

The intersection of Chancellor Boulevard and East Mall connects to several key areas around the University of British Columbia (UBC) Point Grey campus. The project site is fronted by Regional Park to the north, Chancellor Place Neighborhood to the east, and the UBC campus to the south and to the west (Figure 1).

Figure 1: Project Site

1.2 SITE DESIGN CONSTRAINTS AND ISSUES

Several factors have influenced the development of the detailed design. One of the main challenges is the irregular geometry of the intersection. The skewed layout, due to the angles at which the approach legs meet, limits design flexibility. Additionally, the property lines at the Northeast and Southeast corners and the perimeter of Pacific Spirit Park are in close proximity to the intersection. This significantly reduces the available space for geometric improvements or the addition of infrastructure such as wider sidewalks, corner radii adjustments, or dedicated turning lanes. As a result, such constraints in combination made it infeasible to achieve a 90-degree intersection (known as normalization of the intersection). Normalization is typically preferred to improve driver sight lines and simplify navigation of the intersection.

Another key constraint is the risk of cliff erosion near the site. According to the UBC Stormwater Management Plan (SMP), infiltration-based stormwater systems are discouraged in this area due to the presence of weak slopes. As a result, all stormwater runoffs must be retained and managed on-site to prevent further destabilization of the slope. This constraint has influenced the preliminary water management approach and limits the types of green infrastructure that can be implemented.

Sightline visibility is also a concern at the northeast corner of the intersection, where tall bushes obstruct views for drivers and cyclists approaching from multiple directions. This vegetation limits the ability to see oncoming traffic and pedestrians, particularly when turning or crossing the intersection. Improving visibility at this corner will be important for enhancing safety and ensuring all users have adequate time to react.

Despite these limitations, the proposed design aims to create a safer and more user-friendly intersection by reallocating space and refining vehicle paths where possible, while ensuring that stormwater is managed responsibly in accordance with site-specific geotechnical constraints.

1.3 PROJECT AND DESIGN OBJECTIVES

The redesign of the Chancellor Boulevard and East Mall intersection is a key step towards improving the accessibility and safety of the UBC campus. The intersection, currently used as a minor entry point, incorporates highway-style design elements that challenge urban mobility. With its facilitation of high travel speeds, large and unintuitive layout, and lack of accommodation for active modes of transportation, the current East Mall intersection design fails to meet modern design standards and user expectations.

The primary objective of our project is to improve active transportation in the area, promote sustainability, and enhance safety for all road users. Capstone Consulting makes sustainability a key pillar and heavily emphasises user safety and comfort for all modes of transportation. The redesign aims to follow British Columbia Ministry of Transportation and Infrastructure (BC MoTI) standards to create a safe, accessible, and ecologically mindful gateway to the UBC campus.

1.4 TEAM CONTRIBUTIONS TO DETAILED DESIGN

The following table details each team member's contributions to the development of the detailed design and the preparation of this report.

Table 1: Team Member Contributions

Team Member	Task Type	Tasks
Matthew Buss	Report	Intersection Analysis - Synchro, Gateway Design, Service Life Maintenance Plan
	Design	Intersection Analysis - Synchro, Gateway Design, Structural Gateway Calculations, Gateway Details
Ting Fei	Report	Letter of Transmittal, Stakeholder Consultation Plan, Cross Sections and Grading, Erosion Settlement Control Plan
	Design	CIVIL 3D Corridor, Notes, Grading, Sample Line Plan View, Profile View, Section Views
Sharar Islam	Report	AutoTURN Analysis, Signage and Pavement Markings
	Design	Signage and Paint Plan, 3D Renderings
Catherine Munro	Report	Executive Summary, Design Rationale, Design Overview, Design Constraints/Issues, Volume Projections, Service Life Maintenance Plan, Methodology, Active Transportation, Overall Report Review, Utility Coordination
	Design	Projected Volume Analysis, Standards Drawings, Service Maintenance Life Plan, Class A Cost Estimate
Peter Tesson	Report	Gateway Design, Construction Phasing and Traffic Management, Project Schedule, Risk Assessment
	Design	Project Management (Construction Schedule, Phasing, Project Charter, Traffic Management Plans), Gateway Design, Gateway Geotechnical Calculations
Adelaide Zhang	Report	Design Overview, Design Rationale, Rainwater Management Plan, Active Transportation, Utility Coordination
	Design	Final Intersection Design, Rainwater Management Design, Rainwater Calculations, Drawings (Key Plan, Signage and Pavement Markings, Rainwater Detail, Overall Drawing Review)

2.0 FINAL INTERSECTION DESIGN

2.1 DESIGN OVERVIEW

The final intersection redesign is a signalized protected intersection (see Figure 2). Geometrically, the intersection footprint has been significantly condensed by shifting the south leg eastward. This adjustment allowed us to implement pedestrian crosswalk at reduced lengths while ensuring no driver sightline issues. On the south side of the intersection, elevated bike lanes are separated from pedestrian sidewalks with flush concrete strips, while grass boulevards and concrete medians provide protection from vehicle traffic. On the north side, space and tie-in constraints require the use of multi-use pathways. Existing bike lanes integrate smoothly into the design through bike ramps. The gateway sign, located on the southwest intersection leg, features lightweight steel letters spelling "UBC," secured to a steel frame and mounted on a concrete column with welded steel plate connections. The rainwater management system includes a bioretention swale with daylighted storage in the southwest green space and a rain garden in the east leg median for added infiltration capacity.

Figure 2: 3D Model of Detailed Design

2.2 DESIGN RATIONALE

Aside from following design standards such as adhering to BC MoTI and emergency response requirements and minimizing tree loss, it is critical to ensure the design meets all client and stakeholder criteria. The table below provides justification for design elements and how design features address the client criteria. See Table 2 for a summary of key design components.

Table 2: Rationale for Key Design Components

Client Criteria	Design Feature(s) that Address the Criteria	Justification
Improve Intersection Intuitiveness for All Users	Condensed intersection	The intersection is less askew, more intuitive, and has improved sightlines for vehicle users.
Reduce Speeding Caused by Highway-like Design	Reduced curb radii at intersection corners	Lowers vehicle speeds, ensuring motorists navigate turning movements more cautiously.
	Narrowed road widths (3.5 m)	Reduces vehicle speeds and removes the highway-like existing conditions, increasing overall intersection safety.
Enhance Pedestrian and Cyclist Safety and Prioritize Active Travel Modes	Reduced crosswalk lengths (less than 20m)	Allows for shorting crossing times, reducing the amount of time cars and pedestrians are interacting.
	Dedicated bike lanes and crossings (2m)	High-visibility markings clearly delineate bike movements and spaces where cyclists have priority; reduces vehicle-cyclist interaction.
	Raised concrete medians	Provides cyclists protection from vehicle right-turn movements and minimizes vehicle-cyclists conflicts by providing dedicated bike lanes.
Create a Welcoming Gateway to UBC Campus	Gateway design placed in a highly visible area	Meets the 8-metre height requirement and effectively welcomes travellers to the UBC campus.
Retain all Rainwater on Site	Bioretention Swale, Raingarden, and Front Green Boulevards	Retains stormwater for 100-year storm event with additional capacity. Front green boulevards protect the bike lane from vehicle traffic, while capturing and treating stormwater.

3.0 METHODOLOGY

3.1 ASSESSMENT OF CURRENT SITE CONDITIONS

Repeated site assessments were conducted throughout each project phase to understand existing conditions. The first site visit confirmed that the current intersection has a two-way stop on the Northbound and Southbound approaches. Immediate issues included: a median placed in the centre of the intersection, making it difficult for Southbound vehicles to travel straight through the intersection; poor sightlines on the North leg of the intersection creates safety concerns, especially for vehicles approaching at high speeds; lack of active transportation infrastructure; and no pedestrian crosswalks.

Following site assessment, we reviewed quantifiable data. Review of LiDAR data provided for this project showed a steep northward slope across the intersection, with a minimum right-of-way width of 33 m. ICBC Collision data recorded 12 vehicle collisions between 2019-2023, a relatively high rate compared to other local intersections. One pedestrian- vehicle collision was recorded at the intersection a little west of the crosswalk.

Existing traffic count data was used to predict future demands at the intersection (see Section 5.2.1) as well as provide an idea of traffic volumes. High 4-hour vehicle volumes along Chancellor Boulevard warranted to design for a signalized intersection. Geotechnical reports and borehole logs were used to assess foundation support and drainage conditions at the site. The investigation revealed that the subsurface at UBC has a significant layer of glacial till. Due to its low permeability, this layer presents drainage challenges at the project site.

3.2 REGULATORY PROVISIONS

Permits that are required to have the design approved and advanced to construction should be applied early to not cause delays in the schedule. Permits required for this project have been listed below (Table 3). Regulations and design guidelines will be monitored closely to ensure current design and construction standards are being met through the project.

Table 3: Summary of Anticipated Permits Required

Permit/Review	Approval By:	Description
Development and Building Permits	UBC Campus + Community Planning	Required for significant intersection changes (covers environmental consideration, ensures the intersection aligns with campus' transportation goals)
Streets and Landscape Permit	UBC Campus + Community Planning	Required for any changes, excavation or construction on the land
Electrical Work Permits	Technical Safety BC	Required if new traffic signals or streetlights are being installed
Notice of Project	WorkSafe BC	Required for projects involving significant construction activity
Traffic Management Plan	UBC Campus + Community Planning	Required if construction will significantly disrupt traffic
Highway Use Permit	Ministry of Transportation and Infrastructure	Required for construction that affects access to any provincial roads near UBC (ex. University Boulevard, Marine Dr.)

3.3 STANDARDS AND SOFTWARE

Multiple standards and software were used to achieve the final design. Refer to Table 4 for a summary of the standards used and Table 5 for the software used.

Table 4: Design Standards Used

Design Standard	Purpose
BC MoTI Design Standards	Compliance with design standards, design development and guidance, and design drafting
BC MoTI Traffic Management Manual for Work on Roadways 2020	Guidelines for traffic management and control in work zones ensuring protection of workers and the safe and efficient movement of road users through the work zone.
BC MoTI Cost Estimate Guidelines	Used for Class A cost estimate for roadworks and utility construction
Manual of Standard Traffic Signs and Pavement Markings	Provides standard sign designs, sizes, and placement guidelines to ensure consistency, visibility, and effectiveness of traffic control devices throughout the roadway network.

Design Standard	Purpose
City of Vancouver Engineering Design Manual 2019	Compliance with local design standards, rainwater storage capacity calculations, design development and guidance, and design drafting
City of Vancouver Standard Detailed Drawings 2019	Drawing package, detailed design specifications, and grading design
UBC Integrated Stormwater Management Plan	Rainwater design development and guidance
BC Building Code 2018	Climatic and Seismic Data for gateway design
CSA A23.3	Design of concrete structures

Table 5: Design Software Used

Software	Purpose
Autodesk AutoCAD	2D Engineering Drawings
Autodesk Civil3D	Grading and Corridor Design
SketchUp 2025	3D Intersection Model
Autodesk Inventor	3D UBC Gateway Sign Model
Microsoft Project	Gantt Chart Project Schedule
Synchro	Intersection Analysis
Lumion	3D Rendering

3.4 INDIGENOUS CONSULTATION PLAN

The University of British Columbia (UBC) Vancouver-Point Grey campus and University Endowment Lands are located on the traditional, ancestral, and unceded territories of the xʷməθkʷəy̓ əm (Musqueam) people. As such, engaging with the Musqueam Indian Band was essential to ensure Indigenous perspectives and cultural sensitivities were respected in the detailed intersection design. We developed an Indigenous Consultation Plan specifically to involve the Musqueam community in this project.

UBC's Indigenous Strategic Plan (ISP) served as the main guide for the consultation plan. As the framework of Indigenous engagement and reconciliation, the ISP outlines methods for fostering Indigenous inclusion through seven overarching goals and 37 actions. The methods applicable to Capstone Consulting's Indigenous stakeholder consultation plan can be found in Figure 3.

The ISP guided the incorporation of cultural protocols and Indigenous communication styles into our consultation. The foundational principles of the ISP ensures the process respects Indigenous values, acknowledges the impacts of colonialism, and aims to repair historical wrongs. This ensures that the Musqueam community will play an active role in the project as we consider Indigenous perspectives on environmental sustainability, traditional land stewardship, and cultural practices in the design processes. The ISP framework will also align the consultation with the United Nations Declaration of Rights of Indigenous Peoples (UNDRIP) and the Truth and Reconciliation Commission of Canada's Calls to Action.

Moreover, the ISP highlights the importance of building genuine, long-term relationships with Indigenous communities. As such, a consultation plan driven by the ISP will emphasize early and continuous engagement with Indigenous stakeholders. It will be vital to maintain ongoing communications throughout the project lifecycle, sharing progress and outcomes with Indigenous communities. We will take accountability to ensure that the Indigenous consultation process will lead to tangible actions and changes that reflect the feedback and needs of Indigenous stakeholders. We hope to foster a mutually beneficial relationship between University Endowment Lands and Indigenous communities that result in long-term partnerships that continue beyond the immediate project.

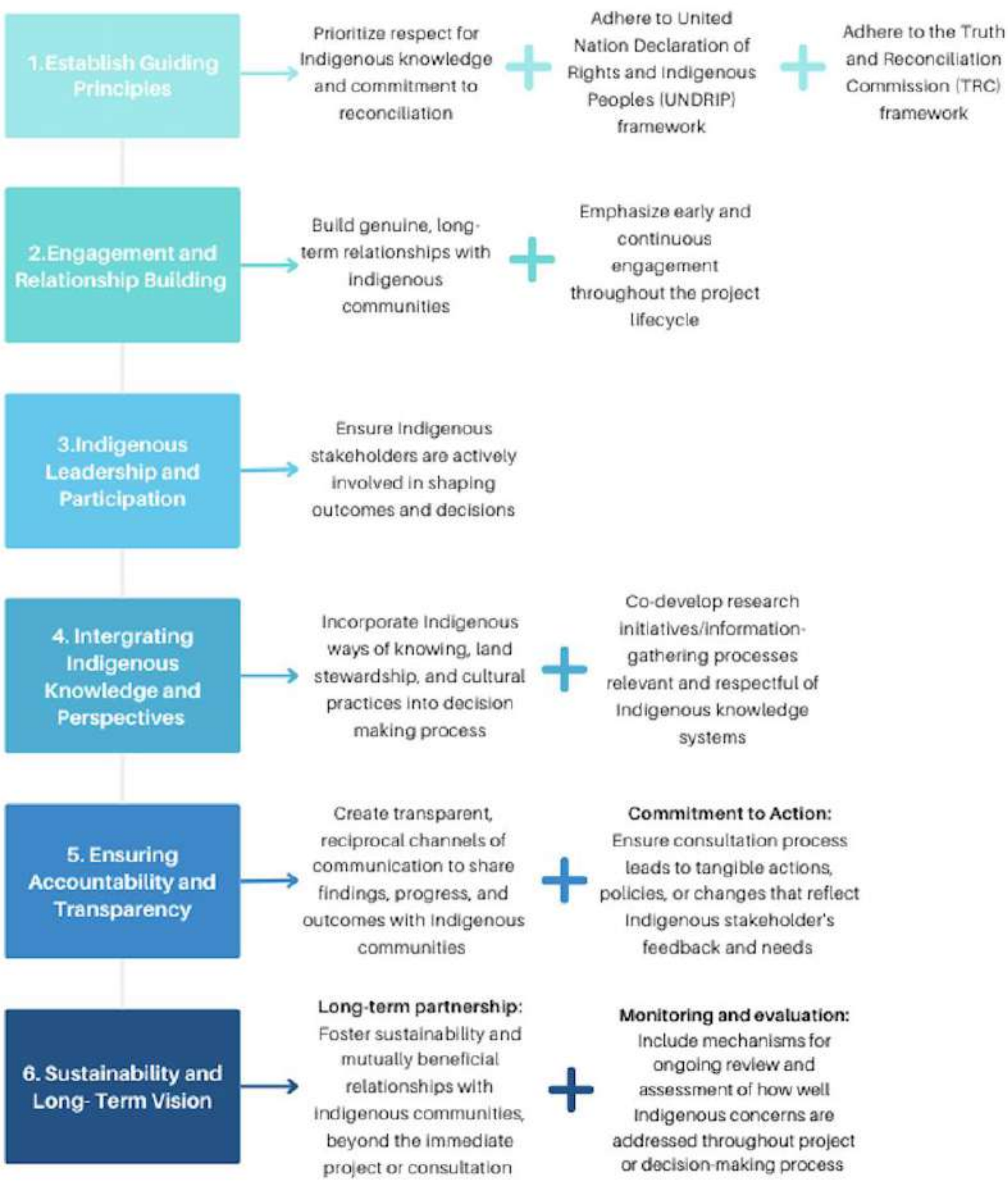


Figure 3: Indigenous Stakeholder Consultation Plan

3.5 PUBLIC CONSULTATION PLAN

To ensure our design effectively addresses community needs, we will implement a comprehensive Public and Community Consultation Plan. Collaboration with UBC Campus and Community Planning (C+CP), which oversees campus development, will guide the establishment of a consultation timeline and ensure effective community outreach.

The plan will progress through multiple phases to address various aspects of stakeholder engagement and project development. The first phase will focus on identifying issues and assessing community needs by gathering feedback on existing intersection challenges and other concerns. This input will be analyzed to highlight priorities and preferences, shaping the project's design objectives. A transportation plan advisory committee will review the findings, provide additional input, and ensure that any gaps in the engagement process are addressed. If necessary, the first phase will be repeated to refine the objectives.

The second phase will emphasize direct stakeholder engagement and the integration of feedback. Public open houses will present the project, detailing its potential impacts and benefits while allowing attendees to provide direct feedback. Online consultations, including surveys, forums, email updates, newsletters, and social media outreach, will broaden participation and ensure accessibility for all community members. The feedback collected during this phase will be summarized in newsletters and formal reports shared with stakeholders and integrated into the project's design and implementation plan.

Pre-construction coordination with stakeholders will occur in the third phase. Building on earlier engagements, this phase will focus on developing a construction timeline in collaboration with UBC C+CP and ensuring all affected parties receive timely communication. During the construction phase, the project team will work with UBC to disseminate relevant information, such as lane closures and detours, before and during each stage of construction. Communication efforts will specifically target nearby residents, intersection users, adjacent landowners, and building occupants, while also utilizing public channels like the project website to keep the broader community informed.

The final phase will focus on a post-construction education campaign. This campaign will ensure safe and efficient use of the intersection through a combination of road signage, community flyers, online resources, and staged construction that allows drivers to become familiar with the new infrastructure as it develops. Educational efforts will begin with construction and continue for at least four months after the roundabout becomes operational.

4.0 INTERSECTION DESIGN

4.1 GEOMETRIC DESIGN

Key features include a compacted intersection with narrowed travel lanes (3.5 meters typ.) that improve driver sightlines. Thie reduced lane widths reduce vehicle speeds, improve pedestrian visibility, and shorten crossing distances. Left-turn bays are introduced on all approaches except the westbound leg of NW Marine Drive, enhancing operations by separating turning movements from through-traffic lanes and reducing congestion.

Raised medians at intersection corners facilitate safe turning movements, and provide space for traffic control devices, lighting, and serves as a pedestrian waiting area before the crosswalk. Reduced curb radii further enhance safety by forcing drivers to slow down during turning movements while accommodating large vehicles such as I-BUS and WB-20 trucks. These elements together create an intersection that balances operational functionality with multi-modal accessibility. Figure 4 illustrates the geometric design of the intersection; Table 6 describes the geometric design characteristics.

Figure 4: Plan View of Intersection Geometric Design

Table 6: Geometric Design Elements

Geometric Design Elements	NW Marine Drive (West Leg)	NW Marine Drive (North Leg)	Chancellor Blvd. (East Leg)	East Mall (South Leg)
Road Class	Primary Arterial	Primary Arterial	Primary Arterial	Collector
Posted Speed (km/hr)	50	50	50	30
No. of Approach Lanes	3	3	2	3
Dedicated Left Turn Lane	Yes	Yes	No	Yes
Vehicle Lane Width (m)	3.5 (EB Through) 3.5 (EB Left) 3.5 (WB Through)	3.8 (SB Through) 3.5 (SB Left) 3.5 (NB Through)	3.5 (WB) 3.5 (EB)	3.5 (NB Through) 3.5 (NB Left) 3.5 (SB Through)
Bicycle Lane Present	Yes (both directions)	Yes (SB)	Yes (both directions)	Yes (both directions)
Bicycle Lane Width (m)	2.0 with 1.5m boulevard (EB) 4.0 MUP with 1.5m buffer (WB)	N/A (NB) 3.0 MUP (SB)	2.0 with 1.5m boulevard (EB) 4.0 MUP with 1.5m buffer (WB)	2.0 with 1.5m boulevard (NB) 2.0 with 1.5m buffer (SB)
Median Present	Yes	Yes	Yes	Yes

4.2 ACTIVE TRANSPORTATION

The proposed intersection design integrates a range of features aimed at enhancing safety, comfort, and accessibility for active transportation users. The design aligns with best practices and City of Vancouver standards to promote walking and cycling as viable, convenient, and safe modes of travel.

Pedestrian and cyclist crossings are fully signalized, providing dedicated and protected movement phases that eliminate conflicts with turning vehicles. To mitigate the risk of right-turn vehicle-cyclist collisions, raised concrete islands at intersection corners physically separate cyclists and pedestrians from vehicles at high-conflict zones (see Figure 5). Reduced curb radii further increase safety by encouraging lower vehicle turning speeds. This gives drivers more time to react to cyclists and pedestrians crossing the intersection.

Figure 5: Raised Concrete Corner Barrier

Bike lanes, each 2 metres in width, are elevated to the adjacent sidewalk and separated from the pedestrians via a flush concrete strip. Raised bike lanes increase cyclist visibility and reinforcing separation from vehicle traffic. Bike ramps are provided at strategic locations to maintain smooth transitions between the existing cycling network and the proposed intersection infrastructure (Figure 6). In combination with green-painted bicycle crossings, these elements help guide cyclists intuitively and clearly through the conflict zones.

Figure 6: Bike Ramp Transition

Crosswalk lengths have been minimized to less than 20 m through geometric design refinements, reducing pedestrian exposure to traffic and shortening crossing times. Concrete barriers and rain garden boulevards provide additional horizontal separation between travel lanes and active transportation routes, enhancing user safety while contributing to stormwater management and streetscape quality.

Best practice design principles were applied throughout the intersection layout. All curb ramps are designed with letdowns and tactile warning strips to support accessibility for individuals with mobility and visual impairments. Audible pedestrian signals will follow City of Vancouver signal specifications, providing unique sound cues for each crossing direction to aid wayfinding. On the northeast corner, where private-owned vegetation currently impedes pedestrians clearly locating the crosswalk, a wayfinding tiles will be installed to guide visually impaired users to navigate the crossing safely (see Figure 7). Additionally, yield-to-pedestrian signage will warn cyclists.

Figure 7: Bike Lane Letdowns and Wayfinding Tiles

4.3 CROSS SECTIONS AND GRADING

The proposed road cross section follows the City of Vancouver design standards for local and residential streets and lanes, selected based on East Mall's classification as a collector road and its anticipated loading conditions. The pavement structure consists of a 35 mm asphalt concrete (AC) surface course over a 40 mm AC lower course, providing a durable and smooth riding surface.

Beneath the asphalt, a 150 mm granular base is included for structural support, placed over a 300 mm granular subbase to distribute loads and improve drainage (see Drawing 21). This configuration is capable of supporting the required structural capacity to accommodate regular vehicle traffic, including transit and service vehicles, while maintaining durability, ease of maintenance, and alignment with municipal design practices.

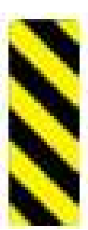
The slope design for the intersection follows the 2019 City of Vancouver Design Manual to ensure proper drainage and accessibility. Sidewalks throughout the project area are designed with a consistent 2% cross slope to promote surface runoff while maintaining pedestrian comfort and compliance with accessibility standards. For the roadway, the north, east, and west legs incorporate a 2% crown slope, directing runoff toward the curbs to minimize water pooling at the centerline. Due to the unique grading conditions along the southern leg, a 4% cross slope is applied to direct surface runoff toward the west side, toward the location of the bioretention swale. Where new construction ties into existing surfaces, a 0.5:1 cut slope and a 2:1 fill slope are used to ensure stable transitions and minimize soil displacement, aligning with both safety considerations and local design practices (see Drawings 8-11).

4.4 SIGNAGE AND PAVEMENT MARKINGS

The signage and pavement marking plan for the proposed intersection, detailed in Drawing 12, aligns with BC MoTI Traffic Signs and Pavement Markings Manual while addressing specific design needs. Key elements are summarized in Table 7.

Table 7: Sign Descriptions

Sign Code	Description	Placement/Guidelines
 **Yield to Bicycle Lane Users (R-056-7e)**	Indicates that vehicles must yield to two-way bicycle and multi-use traffic crossing the vehicle path. The green panel with bike and diamond symbols	▪ Typically installed where a right-turning vehicle crosses a bi-directional bike lane or multi-use path. ▪ Used in locations where drivers must yield before merging across or into an active transportation route.

Sign Code	Description	Placement/Guidelines
	designates a protected or dedicated active transportation corridor.	▪ Ensures clear priority for vulnerable road users and helps reduce collision risk at crossing points. ▪ In this drawing, it is used at key merge points—such as the Chancellor Blvd right-turn channel and near East Mall crossings—to reinforce yielding behavior for turning vehicles.
 **Shared Pathway Ends (B-R-102-Ta B-R-102-Tb)**	Indicates the termination of a shared pathway where pedestrian and cyclist traffic must separate or yield.	▪ Located at multi-use pathway transitions (e.g., north-east and west of the NW Marine Drive and East Mall intersection). ▪ Used to clarify changes in active mode priority or separation.
 **Object Marker (W-54 R)**	Marks obstructions on the roadway that are located on the motorist's right.	▪ Placed to align with the inside edge of the obstruction. ▪ Provides clear warning of objects that encroach on the traveled roadway, such as raised medians or barriers.
 **Stop Line Sign (RB-25)**	Identifies the location where vehicles must stop at a stop-controlled intersection.	▪ Installed on East Mall facing northbound traffic. ▪ Used where the stop line may not be intuitive or easily visible to approaching drivers.

4.5 INTERSECTION ANALYSIS

4.5.1 PROJECTED VOLUME ANALYSIS

Turning movement counts from AM and PM peak hours were collected in early November. These traffic volume counts (see Appendix A) were projected to 2045, as stated in the Ministry of Transportation and Infrastructure's document, Planning and Designing Access to Developments, an intersection design should have a maximum design life of 20 years. These volumes were used in Synchro modelling to determine queue lengths and delay times (see Section 4.5.2).

To predict future traffic volumes, trends in population at the UBC was considered along the campus' mode share. UBC Campus and Community Planning has predicted that from 2021 to 2041, there would be a population growth of 13,000 students enrolled at UBC and an increase of 11,500 residents in the UBC neighbourhood (see Table 8). Assuming the population growth to increase linearly per year, this would average to 1225 people increase per year. This growth trend directly relates to the number of daily person trips to and from UBC. However, there are other factors such as the modal share on campus to determine the projected number of vehicle users. According to UBC's collected data, there has been a downward trend in the number of single-use vehicles on campus. The measured linear decrease is 400 people per year. Considering all these factors, it was determined there would be a 1.4% increase per year in traffic volumes.

Table 8: Population Growth Calculations

Population Growth	2021	2041	Population Change Per Year
Residents in UBC Neighbourhoods	12500	24000	575
Student Enrollment	47294	60294	650
Mode Share	**1997**	**2012**	**Population Change Per Year**
SOV	45000	39000	-400
Cycling	1600	1800	825

$$Total\ growth\ in\ vehicles = 575 + 650 - 400 = 825\,\frac{veh}{year}$$

$$Total\ \%\ growth\ in\ vehicles = \frac{825}{12500 + 47294} = \mathbf{1.4\%/year}$$

$$Total\ growth\ in\ active\ transportation = \frac{13.33\ cyclist/year}{1600\ cyclists} = \mathbf{0.83\%/}\boldsymbol{year}$$

To determine pedestrian and cyclist projected volumes, the mode share of cyclist and pedestrians was used as well as the population growth trends. Overall, there is a decrease in cyclist volumes, however, in more recent years there has been a steady increase. Therefore, only more recent years were used to determine the projected cyclist volumes. Overall, an increase of 0.83% per year was used to determine future cyclist and pedestrian volumes (see calculations above).

4.5.2 SYNCHRO ANALYSIS

Synchro traffic modeling software was utilized to analyze the performance of a signalized intersection with a focus on optimizing both vehicle flow and pedestrian safety. Through detailed simulations, Synchro provided estimates of maximum queue lengths for each approach under varying traffic volumes and signal timing scenarios. Additionally, the software's pedestrian modeling capabilities allowed for evaluation of pedestrian walking times, ensuring compliance with accessibility standards and enhancing safety. By balancing vehicle demand with adequate walk and clearance intervals, Synchro helped develop an optimized signal plan that reduced vehicle queues while improving pedestrian crossing opportunities.

Our design specifications meet the BC Supplement to the TAC Geometric Design Guide and the City of Vancouver Design Manual (CoV EDM 2019). The intersection was designed to accommodate a peak hour traffic flow of 950 vehicles per hour. The maximum vehicle delay in the intersection was determined to be 12.3 seconds per vehicle, inducing level of services of A and B for AM and PM peak hours, respectively. These levels of services are acceptable as they represent the most ideal traffic flow conditions for the intersection,

Signal phasing is optimized to ensure smooth vehicle and cyclist flow while maximizing pedestrian crossing time. Pedestrians are allocated 26 seconds to cross Chancellor Boulevard, providing ample time within the 35-second green phase. The signal operates under a semi-actuated, uncoordinated control system, keeping the northeast and southwest legs in the green phase until a user is detected on East Mall, a minor road. However, green phase will be given to the minor road every three cycles to account for user and equipment errors.

Average cycle length was found to be 60 seconds, and 15% of cycles were found to have green time skipped for the minor roads. This meant that green time continued on the major roads until a user was detected on the minor road. Maximum cycle length was found to be 80 seconds, and minimum cycle length was 26 seconds. A signal phasing diagram is shown is Appendix B. Table 9 below summarizes cycle lengths.

Table 9: Intersection Phase Signal Times

Percentile	Cycle Time (s)	Green Time for Major Roads (s)	Green Time for Minor Roads (s)
10th Percentile	35	35	0
50th Percentile	53	39	7
Maximum	80	37	26

The maximum queue length in the SW leg (AM peak) towards the UBC campus is 92.6 meters and on the NE leg (PM peak) away from the UBC campus is 80.9 meters. (Refer to Table 10) These queue lengths are considered acceptable, as they do not obstruct adjacent intersections or driveways. The table below highlights the control delay per vehicle, as well as queue lengths.

Table 10: Intersection Level of Service and Queue Lengths

Peak Hour	LOS	Projected Peak Hour Volume (Veh/Hr)	Control Delay (s / vehicle)	Maximum Queue Length (m)	Average Queue Length (m)
AM (8AM – 9AM)	**A**	470	8.3	92.6 m	31.0 m
PM (4PM – 5PM)	**B**	950	12.3	80.9 m	38.3 m

4.6 AUTOTURN ANALYSIS

As part of the detailed design for the Chancellor Boulevard & East Mall intersection, turning movement analysis was refined using AutoTURN and Vehicle Tracking software (see Appendix C). These tools modeled the full swept paths and overhangs for critical turning movements, validating the geometry against operational and safety requirements.

4.6.1 DESIGN VEHICLES

The detailed design incorporates the I-BUS and WB-20 (Figure 8) design vehicles. As stated in the BC Supplement to TAC Geometric Design Guide, "At a minimum, all turning movements should accommodate emergency vehicles; I-BUS, the TAC Inter-city bus is representative of such vehicles.

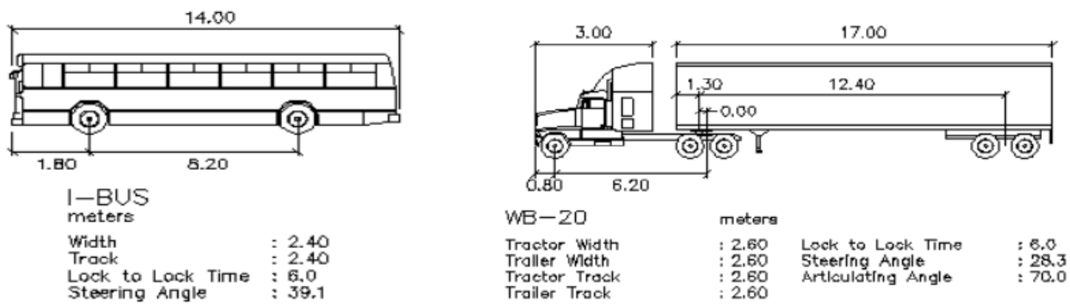


Figure 8: Design Vehicle Dimensions (TAC Geometric Design Guide for Canadian Roads, 2019)

These vehicles' turning radii were carefully considered to accommodate safe and efficient navigation through the intersection. For the I-BUS, a minimum outside front wheel turning radius of 19.8 m was chosen for vehicle speeds from 15–25 km/h (see Figure 9), while the WB-20 truck with higher speeds of 25–35 km/h required a minimum outside front wheel turning radius of 22.3 m.

DESIGN VEHICLE	I-BUS	WB-15 (BC)	WB-20	LLT
SPEED	minimum radius(1) of outside front wheel			
0-15 km/h	15.2	13.7	14.5	13.6
15-25 km/h	19.8	17.7	17.7	17.7
25-35 km/h	19.8	22.3	22.3	22.3

Figure 9: Design Vehicle Minimum Radii

These design parameters directly affected the design of curb radii, lane widths, and the geometry of left-turn bays to allow larger vehicles to negotiate the intersection without encroaching into adjacent lanes or compromising safety in any other manner. By applying the TAC standards, the intersection would support transit vehicles, emergency vehicles, and heavy trucks while sustaining the overall safety and efficiency of the layout for all road users.

4.6.2 TURN CONFLICT RESOLUTION

A major focus of the detailed design was addressing conflicts between eastbound (EB) and westbound (WB) right-turning vehicles and opposing through traffic, particularly for emergency vehicles requiring unobstructed movement.

To accommodate this:

- Rollover curbs were implemented on the south leg of the intersection;
- These curbs allow private vehicles to yield additional space by mounting the curb in situations where a large emergency vehicle needs turning clearance;
- This design strategy minimizes geometric expansion while maintaining operational flexibility; and
- The right-turn lanes were also widened and swept paths were validated to ensure that both I-BUS and WB-20 vehicles can turn without crossing into oncoming lanes or encroaching on pedestrian zones.

All turning paths were reviewed to ensure compliance with TAC design speed and envelope standards. This guarantees:

- Emergency vehicles can clear the intersection safely;
- Buses and freight vehicles can navigate without lane encroachment; and
- The design supports the long-term operational needs of both transit and goods movement while integrating active transportation.

4.7 UTILITY COORDINATION

Given the scope of the intersection redesign, including the complete lateral shift of the south intersection leg, significant utility coordination is required to ensure no service conflicts and minimize conflicts during construction. The following sections outline considerations and proposed approaches for sewer tie-ins, street lighting, and street furnishings. See the Detailed Design Drawing Package for design specifications, proposed locations of new utilities, and construction information about utility coordination.

4.7.1 SEWER TIE-IN CONNECTIONS

The intersection realignment necessitates the relocation and reconstruction of storm sewer catch basins. It is the contractor's responsibility to locate and coordinate with the municipal utilities department to determine the exact location of existing underground utilities. This step will be essential to avoid damaging existing utilities during excavation and construction.

Existing catch basins within the construction area will be removed and disposed of. Where new catch basins are installed, catch basin leads will tie into existing storm system, as per CoV design standards. Geotechnical and topographic surveys will guide invert design and trenching to avoid utility clashes and ensure positive drainage through the intersection.

4.7.2 STREET LIGHTING

Street lighting will be upgraded and repositioned to align with the new intersection geometry and to meet CoV illumination standards for safety and visibility. Proposed lighting poles are located to match the shifted alignment and installed at pedestrian crossings, corners, and midblock locations as needed to ensure even light distribution (see Drawings 3-4).

Light selection was guided by CoV's lighting specs, with an emphasis on energy-efficient LED fixtures and smart controls where feasible. Pole placement has been coordinated with the location of other surface infrastructure, such as traffic signal poles, curb ramps, and bike lanes, to avoid conflicts.

4.7.3 STREET FURNISHINGS

Street furnishings will be updated and repositioned to enhance user experience and reflect the revised urban design of the intersection. Existing infrastructure within the project area will be removed and replaced with new street furnishings consistent with CoV streetscape guidelines.

New locations will be selected based on pedestrian desire lines and opportunities for passive surveillance. All furnishings will be located outside the pedestrian clear zone and will not obstruct sightlines or conflict with accessible infrastructure.

5.0 RAINWATER MANAGEMENT PLAN

5.1 DESIGN SPECIFICATIONS

The rainwater management plan was designed to manage a 100-year storm event, which requires 720 m^3 of storage (see Section 5.2 for calculation methodology).

The recommended rainwater management strategy uses a retention and infiltration-based approach with green infrastructure across the site. The southwest green space will host the main retention system - a bioretention swale. The swale provides 1262 m^3 of storage through surface ponding, bioretention soil, and a subsurface drain rock, exceeding our 720 m^3 requirement. The east medium features a raingarden which provides an addition 174 m^3 of storage. Key aspects of the bioretention swale are as follows:

- Surface and Subsurface Storage: A drain rock reservoir provides subsurface storage, with an impermeable fabric lining the perimeter to allow ponding. The maximum ponding level is 0.3 m, and safely drains away within 48 hours. Infiltration occurs only at the swale bottom. meeting CoV retention requirements.
- Overflow Management: A precast concrete lawn basin at the reservoir top safely redirects excess water, preventing surface backup in low-permeability native soils (<15 mm/hr).
- Water Quality Improvement: Water infiltrates through bioretention media, filtering contaminants and improving water quality.
- Curb Cut Inlet & Pretreatment: Covered curb cut inlets direct roadway runoff into the swale, while sediment basins reduce erosion and sediment load.

This infiltration-based design effectively manages stormwater on-site while avoiding the economic and logistical challenges of retention tanks. See Table 11 for design specifications.

Table 11: Rainwater Retention System Design Summary

Design Variable	Value
System Details	
Catchment Area	1.5 ha
Total Storage Capacity	1436 m^3
Infiltration Rate	3 mm/hr
Bioretention Swale	
Subsurface Storage Medium	Bioretention Soil: 55% course sand, 25% silty loam, 20% compost
Maximum Ponding Depth	0.3 m
Overflow Mechanism	Precast concrete lawn basin as per CoV STD DWG. S11.3
Sediment Control Mechanism	Pretreatment sediment basin at the top of the reservoir as per CoV STD DWG. GI12.6
Retention Mechanism	Impermeable liner with non-woven geotextile along trench walls
Raingarden	
Raingarden Vegetation (Common Name)	Cattails, Bulrush, Iris, Plantain, Common Reed, Sedge, Giant Mana Grass
Maximum Ponding Depth	0.15 m

5.2 STORAGE VOLUME CAPACITY

Due to UEL's lack of stormwater standards, calculations were performed with guidance from CoV regulation, the closest neighboring municipality. The required storage volume was calculated as per the City of Vancouver Building By-law (VBBL) dated July 23, 2019 and the City of Vancouver (CoV) Engineering Design Manual (EDM). Modified rational method was used to determine the required storage volume, represented by the area between the inflow and outflow hydrographs. The EDM informed runoff coefficients for different surfaces, which was used to develop composite runoff coefficients. Likewise, values from CoV's 2014 IDF curve for a 5-year return period and 2100 IDF curve for a 100-year return period were used for pre-development, and post development calculations, respectively. (See Appendix E for the modified rational method calculations).

The VBBL requires the maximum of the following conditions to be the required storage volume:

1. The peak flow rate discharged to the storm system under post-development conditions shall not be greater than the peak flow rate discharged under predevelopment conditions.

2. For green infrastructure, the first 48mm of rainwater in a 24-hour period from the site area shall be detained, and the detention volume requirement shall be calculated as the volume of water that would be present if water 48mm deep covered the entire site. This volume may be reduced by any combination of retention practices by subtracting rainwater capture potential, which is calculated as rainwater storage potential in growing medium multiplied by the medium volume, plus as applicable the storage volume within a subsurface reservoir layer and the volume infiltrated into the subgrade during a 24-hour period.

Condition two was the governing storage volume (720 m^3, opposed to 282 m^3 from condition one). The 720 cubic metres was then reduced by the retention methods outlined in Section 5.1 to 0 cubic metres, thus removing the requirement for a storage tank. Detailed calculations and relevant assumptions are outlined in Appendix E.

6.0 GATEWAY DESIGN

6.1 DESIGN SPECIFICATIONS

The client has requested the design and construction of an eight-metre-tall sign that establishes the intersection as a prominent gateway to campus. After consideration of various precedent examples, Capstone Consulting has developed a mixed-material structure composed primarily of reinforced concrete. Light-weight stainless steel letters typographically spell “UBC”, like existing models found on Point Grey and Robson Square campuses (Figure 10). The letters are hollow and secured by a steel frame interior, fixed to the concrete column through steel plates, anchor bolts and welded connections.

Figure 10: Gateway Sign

The sign features pressure-treated timber accents for contrast. Placed atop its foundation, visitors or nearby students may use it as seating. The foundation itself will be embedded 1 m deep into the fill to ensure geotechnical stability.

6.2 STRUCTURAL CAPACITY

Structural calculations were done to check the capacity of the sign. While no live load is present on the sign, snow load and dead load were considered when doing the structural calculations, as well as the self-weight of the sign. The first step was determining the snow load that acts on the sign. The climatic data of the area was found using BCBC 2018 Appendix C, giving a snow load (S_S) of 1.9 kPa and a rain load (S_R) of 0.3 kPa. Using these values and the importance factors, the ULS was found to be 1.81 kPa, the value used as the snow load for the design. The self-weight of concrete was assumed to be 23.5 kN/m^3, while the self-weight of the steel signage was assumed to be 78.5 kN/m^3.

The letters are to be welded onto steel plates embedded on the concrete column. Steel welded connection calculations were performed to find the optimal weld lengths to hold the letters in place. A factor of safety of 2 was used in the calculation of the weld lengths. The weld lengths were found to be 75mm. Calculations can be found in Appendix F. The concrete column was designed to be 6m tall, holding both snow load as well as the three steel letters. The total factored load acting on the column was found to be 111.3 kN. Four vertical bars of 10M reinforcement were found as the optimal reinforcement for this column, meeting the minimum reinforcement as stated in the building code. Calculations can be found in Appendix F.

Wind and seismic loading were also considered for the sign. The wind load on the freestanding sign structure was calculated using a wind pressure of 0.48 kPa, based off calculations shown in Appendix C and the British Columbia Building Code. With a projected face area of 9 m^2 (based on a 6 m height and 1.5 m width) and a drag coefficient of 1.3 for flat vertical surfaces, the resulting horizontal wind force was estimated at 5.62 kN. Seismic force acting on the sign was similarly found by using seismic information provided in the BCBC. A fundamental period of approximately 0.238 seconds was estimated based on the structure's height of 8 metres, and the corresponding interpolated spectral acceleration was found to be 0.851. With a total factored structural weight of 799.48 kN, and assuming an importance factor of 1.0 and a force modification factor of 1.5, the resulting seismic base shear is approximately 289.9 kN.

Table 12 below summarizes the loads that the gateway sign was designed to withstand.

Table 12: Gateway Sign Loading Summary

Load Type	Load (kN)
Snow Load	14.7
Wind Load	9.4
Seismic Load	289.9
Self-Weight	571.6

6.3 GEOTECHNICAL CAPACITY

Effective stress analysis was employed to verify the soil was capable of carrying the loads induced by the gateway design. Applying Meyerhof's Formula, an extension of Terzaghi's bearing capacity theory, an ultimate bearing capacity of 1759 kPa was determined. Compact silty sand was conservatively chosen, in accordance with the most recent geotechnical assessment of the area (Piteau Associates, 2002). The allowable bearing capacity was found to be 880 kPa, satisfying the 508 kPa stress applied by the structure.

Due to the generally limited soil information provided to Capstone Consulting, some values were assumed to be typical, namely, shear strength parameters and soil cohesion. All references were appropriately cited in the geotechnical calculations, which can be found in Appendix G. The general contractor is strongly advised to confirm current soil conditions are in corroboration with data to ensure accuracy of the capacity check.

A factor of safety rating of 2 classifies this as a “low risk significant” structure. The absence of a groundwater table suggests that any settlement will more than likely occur immediately opposed to slow consolidation. This is beneficial to the construction process, as it reduces delays and early signs of possible failure can be detected. Saturation, however, remains contingent on the success of the rainwater management solution. Under saturated conditions, compact silty sand is at risk of reduced shear strength and effective stress.

7.0 PROJECT MANAGEMENT

7.1 CONSTRUCTION PHASING AND TRAFFIC MANAGEMENT

The BC MoTI 2020 Traffic Management Manual for Work on Roadways prioritizes safety, efficiency, and minimal disruption in work zones. To facilitate these standards, construction work will be completed in three primary phases (see Figure 11).

Figure 11: Construction Phase Plan

The scope of Phase 1 focuses on East Mall and its approach. Serving as the critical path activity for the entire intersection project, reconfiguring the road geometry involves extensive excavation work making it impractical to maintain partial access during construction. A full road closure will ensure the safety of the public– particularly vulnerable road users– while maximizing productivity as crews may work continuously without needing to reopen lanes during shifts. Pedestrians and cyclists will be diverted to Iona Drive, guided by a temporary modular walkway. There is also the option to utilize the existing adjacent walkway through Chan Centre; both routes have been highlighted in the traffic management plan (see Drawings 17-20). Considering the street's low traffic volumes, there will be minimal impact to regular traffic with several detours possible (i.e. West Mall, Theology Mall). Emergency response services will not be impacted, as UBC's dispatch stations are all located south of the project site.

Another notable aspect of this stage is the installation of rainwater management system, in the form of a bioretention swale as detailed in Section 5.0. These activities require large quantities of soil and subsurface materials to be transported to and from the site. As such, a designated staging area has been allocated to Iona Drive beside the site trailer, minimizing the possibility of a spillover where trucks may impede traffic.

Phases 2 and 3 focus on exterior and interior lane work, respectively. Work will be performed in roughly 50-meter-long segments to ensure minimal disruption to traffic. Phase 2 concentrates on overhauling the sidewalks and installing raised bike lanes. A traffic management plan has been provided for a typical midblock and intersection segment. These layouts feature ample signage from all directions ensuring road users are aware of the work activity areas, with clear direction to designated detours. Pedestrians are diverted to the opposing sidewalks as necessary. Two-way traffic is permitted in most cases except for specific instances when the road width is too small, as is the case with NW Marine Drive (north).

Lastly, the interior lanes will be regraded and surfaced according to specifications. Each section requires two lifts; each lift being a layer of subsurface material as prescribed in Section 4.3. Like Phase 1 and its reconfiguration of East Mall, Phase 3 involves heavy excavation. However, a full road closure is considered unfeasible, given the large traffic volumes associated with this arterial route. As such, vehicle flow will be single lane alternating with work performed primarily in the evening. Traffic is directed by a minimum of two traffic control persons, with the use of Automated Flagger Assistance Devices (AFADs) as necessary. This structure follows a successful precedent BC MoTI paving operation along Chancellor Boulevard and Marine Drive, worked on during the summer of 2024.

7.2 CONSTRUCTION SCHEDULE

Pre-construction activities commence April 14, 2025– two weeks prior to groundbreaking of Phase 1. Final material procurement and site permitting will take place to ensure construction activities occur as scheduled, adhering to all regulatory requirements. Reconfiguring East Mall's road geometry is the critical path activity for this project, since obtaining approvals for additional street use permits rely on restoring traffic. UBC's academic calendar and its anticipated traffic volumes were taken into consideration. Final exams for Term 2 of UBC's Winter Session are conducted until April 27, with graduation ceremonies held in the adjacent Chan Centre until May 29, 2025. The full road closure may have a moderate impact on accessibility of these events. However, clear signage and direction to Rose Garden Parkade aim to minimize confusion, further addressed in Risk Assessment (see Section 7.3).

Phases 2 and 3 occur during UBC's summer session, which also sees increased visitation to nearby parks like Wreck Beach. Due to the nature of paving work, traffic may need to be reduced to single-lane alternating thus necessitating nightwork. Project closeout (i.e. quality control, finishes) and demobilization will take three weeks with project completion on August 13, 2025, totalling a duration of 100 days. See Figure 13 for a summary of the schedule, and Appendix E for a complete construction schedule.

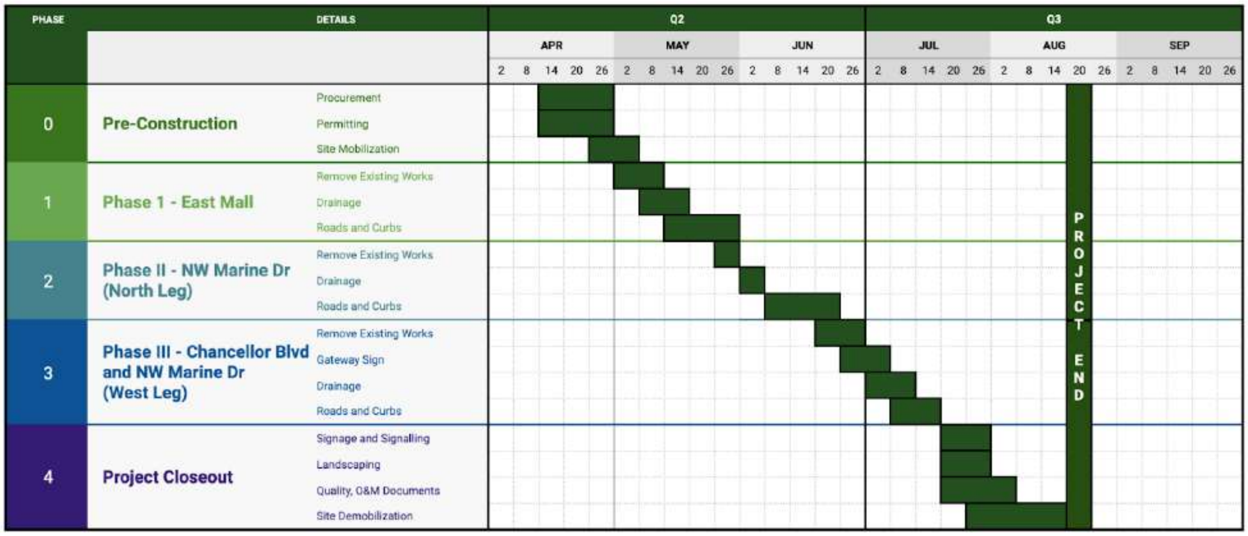


Figure 12: Construction Schedule Summary

7.3 RISK ASSESSMENT

A comprehensive risk assessment was conducted to identify potential issues that may arise throughout the lifecycle of the project. Capstone Consulting, alongside the elected general contractor, will continue to monitor these risks, implementing contingency plans where possible. Refer to Appendix I for the project charter, containing a complete risk matrix and grading schematic.

Currently, significant risks hinge on regulatory compliance and stakeholder concerns. Complexities of the project site arise from its irregular geometry. Although a thorough simulation of vehicle swept paths has been conducted (see Section 4.5.2) it remains probable that a spatial condition is unfulfilled. In such an outcome, the consequences would be dire– hence a 'Critical' status has been assigned for the general contractor to closely examine throughout the construction process. Furthermore, NW Marine Drive and Chancellor Boulevard are fronted by private residential property. The likelihood of stakeholder conflict contributes to a 'High' level of risk. A full list of risks and their respective mitigation approach is found in the project charter.

7.4 EROSION SEDIMENT CONTROL PLAN

To mitigate environmental impacts during construction and ensure compliance with relevant regulations, an Erosion and Sediment Control (ESC) Plan has been developed for the Chancellor

Boulevard and East Mall intersection. The ESC Plan integrates structural and procedural best management practices (BMPs) to reduce soil disturbance, manage runoff, and prevent sediment-laden flows from reaching nearby waterways. The use of silt fences, sediment traps, storm drain inlet protection, and a stabilized construction entrance will serve as the first line of defence in containing on-site sediment. Additional structural controls such as check dams, diversion ditches, and berms will be placed strategically across the site to manage the direction and velocity of runoff, particularly in areas with steep slopes. Stockpiled materials will be covered and enclosed with barriers, while catch basins will be outfitted with sumps and sediment traps to protect the storm system during rainfall events.

To support these physical measures, procedural BMPs will be implemented throughout construction to guide how and when land-disturbing activities occur. Land clearing and grading will be phased and limited to only active work zones, reducing the exposure of bare soil to rainfall and wind. Disturbed soils will be stabilized as soon as possible using hydroseeding, erosion control blankets, mulch, or sod, depending on site conditions. Construction will be scheduled to avoid periods of intense rainfall, and all ESC measures will be monitored and maintained regularly to ensure continued performance. Inspections will be conducted after major rainfall events to assess the integrity of installed controls, with repairs made as needed. These practices are consistent with requirements from the City of Vancouver and UBC Campus and Community Planning.

Following completion of construction, long-term erosion and sediment control measures will be implemented across the project site. Permanent BMPs will include vegetated landscaping, riprap-lined ditches to control concentrated flow paths, and bioswales to filter stormwater and promote infiltration. Catch basins will also feature oil/grit separators to treat runoff before discharge. The rainwater management system and such measures align with UBC's Integrated Stormwater Management Plan and ensure that the redesigned intersection supports long-term environmental and ecological sustainability.

8.0 CLASS A COST ESTIMATE

The total design cost for the project, including 12% contingency, is $6,416,040 (see Table 13). See Appendix J for a detailed breakdown of the cost estimate. Intersection design costs account for full excavation of the intersection, installation of new traffic signals, and repaving following design standards. The cost estimate of labour aligns with the 2023 ASEC BC Consulting Engineers Fee Guideline.

Table 13: Initial Construction Class A Cost Estimate

Task	Total ($)
Construction Works - Intersection	$2,844,370
Construction Works – Gateway Sign	$23,960
Construction Works – Retention Tank	$710,300
Project Administration	$19,040
Labour and Equipment	$2,130,940
Total (12% Contingency)	**$6,416,040**

9.0 SERVICE LIFE MAINTENANCE PLAN

The service life maintenance plan includes activities related to the surface, drainage, traffic signals, vegetation, snow, gateway sign, rainwater swale and raingardens. Intersection maintenance standards are outlined in the BC MoTI design guidelines. The total cost of maintenance is estimated at $1.3 million throughout the 20-year design life. Table 14 outlines the various costs associated with these activities. See Appendix K for a detailed table with all service life maintenance activities, frequency the task requires, and costs.

Table 14: Service Life Maintenance Activities and Costs

Task	Total Cost Over 20-Year Design Life
Surface Maintenance Activities	$480,500
Drainage Maintenance Activities	$17,200
Traffic Signal Maintenance Activities	$170,000
Vegetation Maintenance Activities	$192,000
Winter Maintenance Activities	$26,000
Gateway Sign Maintenance Activities	$25,200
Rainwater Swale and Raingarden Maintenance Activities	$284,500
Total (12% Contingency)	**$1,339,000**

Ongoing care and maintenance of the intersection must consider several environmental and operational factors throughout the design life. One key concern is the potential for contamination of downstream water bodies, as debris and pollutants from the roadway can degrade aquatic ecosystems. Road salt used during the winter to prevent slippery conditions can also contribute to runoff contamination, promoting issues like algae growth if not properly managed. Regular sweeping and cleanup of road surfaces is important, especially after snow events or heavy use, to minimize pollutant build-up and ensure safe driving conditions. When cleaning up aggregate, it is best done when surfaces are moist to prevent dust from being swept into the air and negatively impacting local air quality.

Drainage maintenance will also be an essential part of the long-term upkeep. This includes regular clearing of catch basins, addressing blockages in storm pipes, and completing storm sewer upgrades when necessary to ensure efficient water flow. Sediment should be removed from the pre-treatment sediment basin once 25–50% of its volume is filled, to maintain system performance.

In terms of physical infrastructure, curb maintenance on the northwest corner will be especially important. This is where a service vehicle regularly accesses the outhouse near the forested area, often by driving over the curb (see Figure 13). Vegetative maintenance should also be prioritized, with special attention to the tall hedges on the northeast corner of the intersection, which obstruct sightlines and pose safety concerns for drivers and cyclists.

Figure 13: Google Maps Streetview of Northwest Corner

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APPENDIX A

VOLUME PROJECTIONS

Turning Movement Counts Collected - Raw Data

			in ↓	15	15	out ↑			
			14	0	1	12			
			↵	↓	↳	▌▌▌			
out ←	12	⮥	Chancellor Blvd & East Mall				⮤	3	← in
202	84	→		2024-11-07			←	178	186
113	17	↴	AM:	07:00	to	08:00	↲	5	95
in →	2	▌▌▌					▌▌▌	7	→ out
			↰	↑	↱	▌▌▌			
			10	0	10	5			
			out ↓	22	20	in ↑			

			in ↓	41	40	out ↑			721
			32	1	8	9			
			↵	↓	↳	▌▌▌			
out ←	31	⮥	Chancellor Blvd & East Mall				⮤	7	← in
184	401	→		2024-11-06			←	134	151
445	13	↴	PM:	16:00	to	17:00	↲	10	443
in →	7	▌▌▌					▌▌▌	8	→ out
			↰	↑	↱	▌▌▌			
			18	2	34	6			30
			out ↓	24	54	in ↑			

Peak Hour Projected Volumes - 2045

			in ↓	20	20	**out ↑**			
			18	0	1	14			
			↵	↓	↳	III			
out ←	16	↥		**Chancellor Blvd & East Mall**			↰	4	**← in**
266	110	→		2024-11-07			←	234	245
149	22	↴	**AM:**	07:00	to	08:00	↲	7	125
in →	2	III					III	8	**→ out**
			↰	↑	↱	III			
			13	0	13	6			
			out ↓	29	26	**in ↑**			

			in ↓	54	53	**out ↑**			
			42	1	11	11			
			↵	↓	↳	III			
out ←	41	↥		**Chancellor Blvd & East Mall**			↰	9	**← in**
242	527	→		2024-11-06			←	176	199
585	17	↴	**PM:**	16:00	to	17:00	↲	13	583
in →	8	III					III	9	**→ out**
			↰	↑	↱	III			
			24	3	45	7			
			out ↓	32	71	**in ↑**			

APPENDIX B

SYNCHRO ANALYSIS

AM Peak Hour Analysis

SimTraffic Performance Report
Baseline

2025-04-07

3: Int Performance by approach

Approach	NB	SB	NE	SW	All
Total Delay (hr)	0.1	0.1	0.4	1.0	1.6
Delay / Veh (s)	9.7	7.4	5.0	7.7	7.0
Stop Delay (hr)	0.1	0.1	0.2	0.7	1.2
St Del/Veh (s)	9.5	7.7	3.4	5.3	5.1
Total Stops	47	36	62	185	330
Stop/Veh	0.85	0.84	0.23	0.38	0.39
Vehicles Entered	55	43	264	490	852
Vehicles Exited	55	43	264	488	850
Hourly Exit Rate	55	43	264	488	850

Total Network Performance

Total Delay (hr)	1.9
Delay / Veh (s)	8.3
Stop Delay (hr)	1.2
St Del/Veh (s)	5.3
Total Stops	330
Stop/Veh	0.39
Vehicles Entered	852
Vehicles Exited	847
Hourly Exit Rate	847

Queuing and Blocking Report
Baseline

2025-04-07

Intersection: 3: Int

Movement	NB	SB	SB	NE	NE	SW
Directions Served	L	L	TR	L	TR	LTR
Maximum Queue (m)	7.3	0.4	9.4	6.6	44.7	92.6
Average Queue (m)	0.5	0.1	0.6	0.7	9.6	31.0
95th Queue (m)	3.2	0.3	3.5	3.3	26.5	64.9
Link Distance (m)			39.8		132.2	88.0
Upstream Blk Time (%)						0
Queuing Penalty (veh)						0
Storage Bay Dist (m)	15.0	15.0		15.0		
Storage Blk Time (%)			0		2	
Queuing Penalty (veh)			0		0	

Nework Summary

Network wide Queuing Penalty: 0

Actuated Signals, Observed Splits
Baseline 2025-04-07

Intersection: 3: Int

Phase	2	4	6	7	8
Movement(s) Served	NBTL	NET	SBTL	NEL	SWTL
Maximum Green (s)	35.0	37.0	35.0	4.0	29.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0
Recall	None	Max	None	None	Max
Avg. Green (s)	11.1	60.8	11.1	4.0	50.2
g/C Ratio	0.14	0.76	0.14	0.01	0.73
Cycles Skipped (%)	18	19	18	80	6
Cycles @ Minimum (%)	7	0	7	20	0
Cycles Maxed Out (%)	0	81	0	20	94
Cycles with Peds (%)	11	11	7	0	20

Controller Summary
Average Cycle Length (s): 64.9
Number of Complete Cycles : 54

PM Peak Hour Analysis

SimTraffic Performance Report
Baseline 2025-03-06

3: Int Performance by approach

Approach	NB	SB	NE	SW	All
Total Delay (hr)	0.3	0.2	1.6	1.2	3.3
Delay / Veh (s)	11.9	11.2	9.2	13.3	10.7
Stop Delay (hr)	0.3	0.2	1.0	1.0	2.5
St Del/Veh (s)	12.1	11.2	5.7	10.9	8.0
Total Stops	69	44	244	156	513
Stop/Veh	0.71	0.76	0.38	0.50	0.46
Vehicles Entered	96	57	642	316	1111
Vehicles Exited	97	58	643	315	1113
Hourly Exit Rate	97	58	643	315	1113

Total Network Performance

Total Delay (hr)	3.8
Delay / Veh (s)	12.3
Stop Delay (hr)	2.5
St Del/Veh (s)	8.2
Total Stops	513
Stop/Veh	0.46
Vehicles Entered	1111
Vehicles Exited	1115
Hourly Exit Rate	1115

Queuing and Blocking Report
Baseline 2025-03-06

Intersection: 3: Int

Movement	NB	NB	SB	SB	NE	NE	SW
Directions Served	L	TR	L	TR	L	TR	LTR
Maximum Queue (m)	12.6	8.1	1.2	8.6	22.6	80.9	79.3
Average Queue (m)	0.5	0.6	0.1	0.3	1.1	38.3	24.9
95th Queue (m)	4.2	3.2	0.6	2.9	7.8	72.1	52.3
Link Distance (m)		63.5		39.8		132.2	88.0
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	15.0		15.0		15.0		
Storage Blk Time (%)	0					15	
Queuing Penalty (veh)	0					2	

Nework Summary

Network wide Queuing Penalty: 2

Actuated Signals, Observed Splits
Baseline 2025-03-06

Intersection: 3: Int

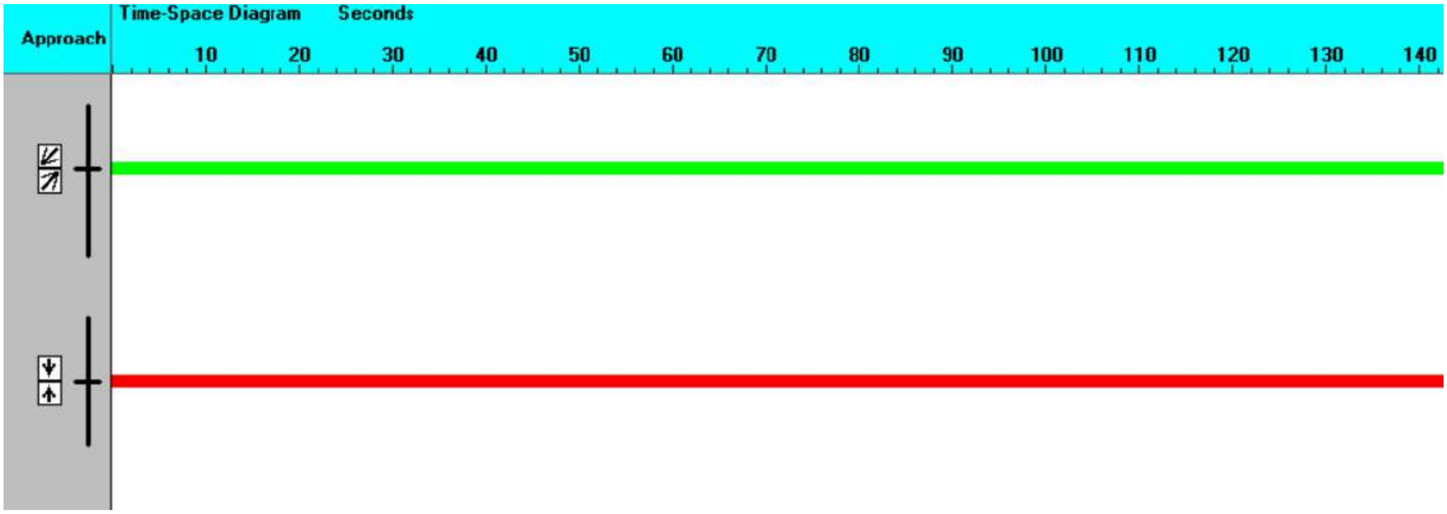
Phase	2	4	6	7	8
Movement(s) Served	NBTL	NET	SBTL	NEL	SWTL
Maximum Green (s)	37.0	35.0	37.0	4.0	27.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0
Recall	None	Max	None	None	Max
Avg. Green (s)	15.9	43.4	15.9	4.0	36.2
g/C Ratio	0.24	0.64	0.24	0.01	0.61
Cycles Skipped (%)	11	12	11	78	0
Cycles @ Minimum (%)	2	0	2	22	0
Cycles Maxed Out (%)	0	88	0	22	100
Cycles with Peds (%)	25	13	15	0	20

Controller Summary

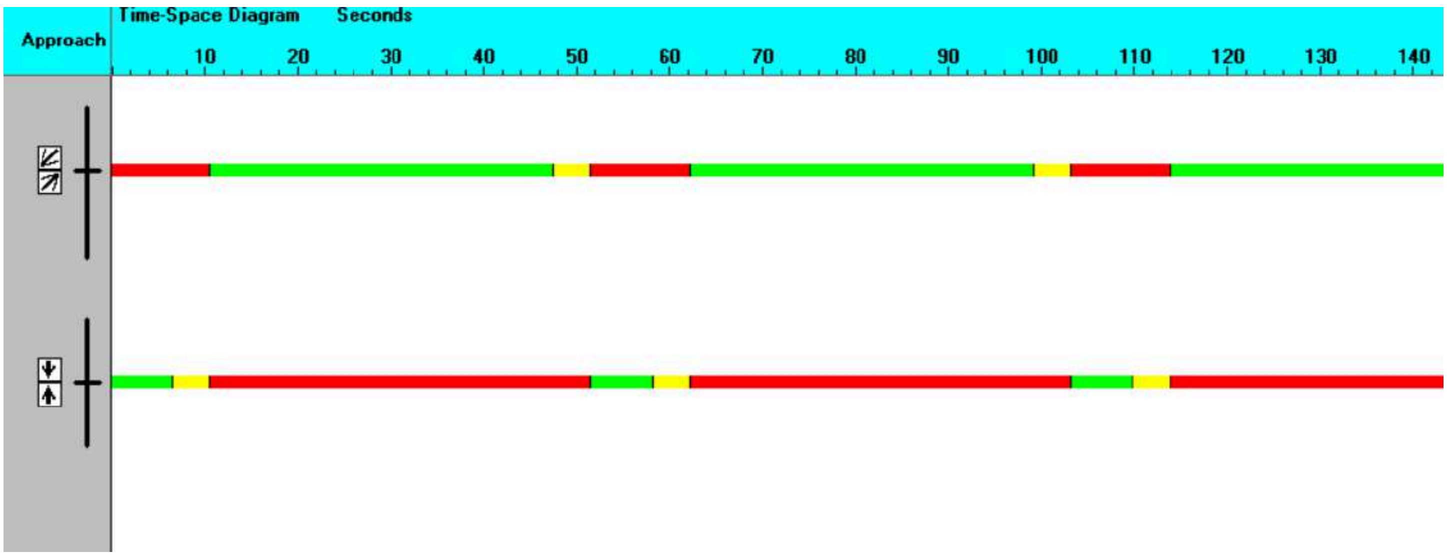
Average Cycle Length (s): 59.6
Number of Complete Cycles : 60

Signal Phasing Diagrams

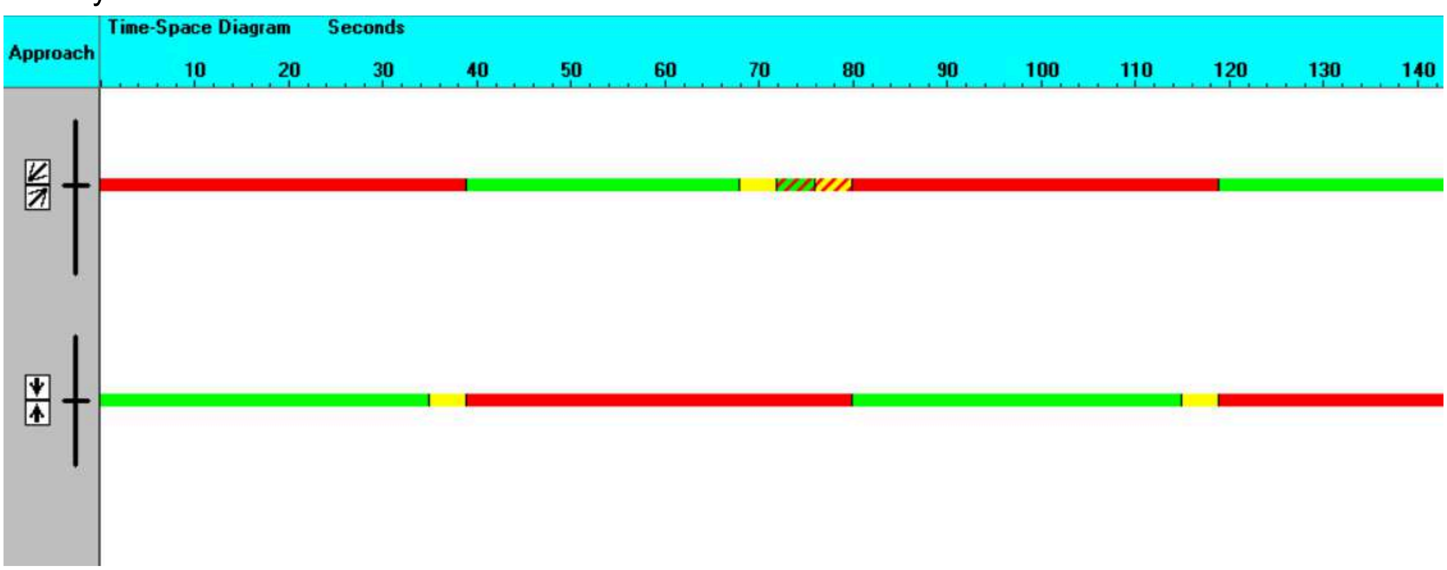
Min Cycle



Ave Cycle



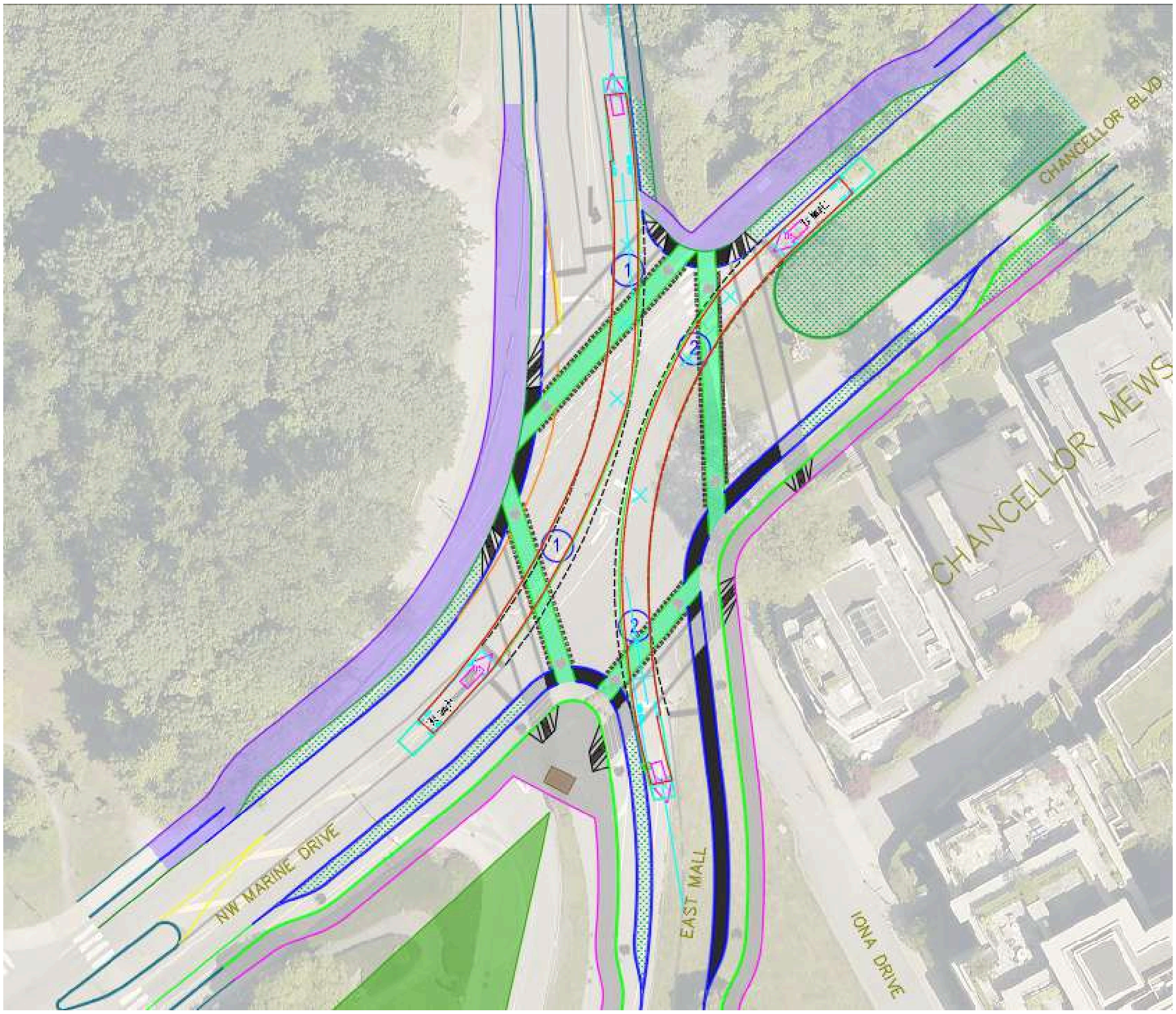
Max Cycle



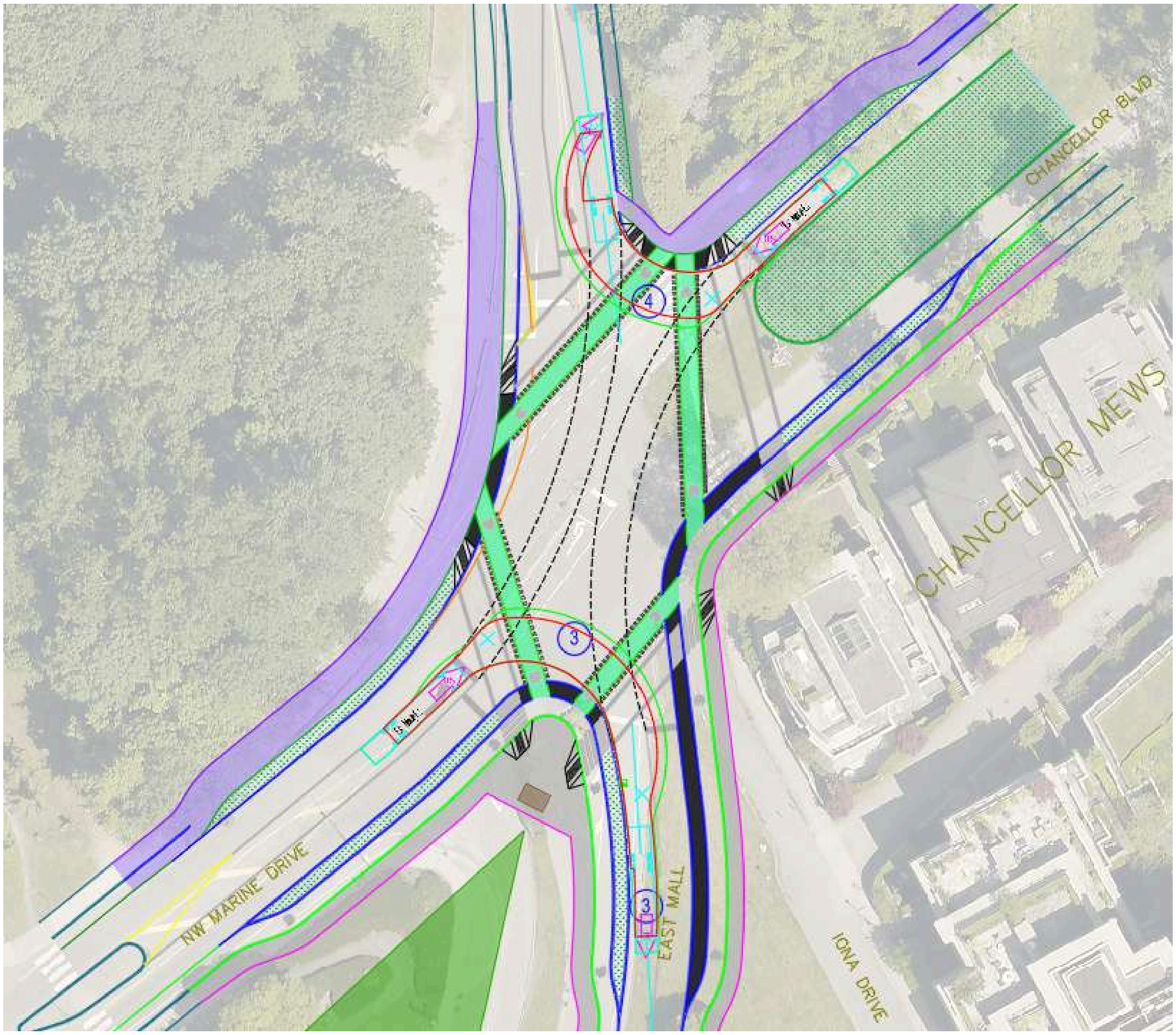
APPENDIX C

AUTOTURN/VEHICLE TRACKING

WB & EB Left Turn Movements (Emergency Vehicle)



WB & EB Right Turn Movement (Emergency Vehicle)



APPENDIX D

3D RENDERINGS


UBC
lumion


UBC
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UBC
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UBC
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Chancellor Blvd.


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APPENDIX E

RAINWATER VOLUME TANK CALCULATIONS

Chancellor Boulevard and East Mall Intersection **7-Apr-25**

Pre Development Flow - Proposed Areas

Onsite Areas and Runoff Coefficient

	Road*	Sidewalk**	Green Space***
A (Areas m^2)	4785	499	2728
Site Coverage (%)	60%	6%	34%
R (Runoff Coeffcient)	0.88	0.80	0.23
Site Coverage * R	0.53	0.05	0.08

Site Area A (m^2) = 8012 Composite R = 0.65

Post Development Flow - Proposed Areas

Onsite Areas and Runoff Coefficient

	Road*	Sidewalk**	Green Space***
A (Areas m^2)	3947	1274	2791
Site Coverage (%)	49%	16%	35%
R (Runoff Coeffcient)	0.88	0.80	0.23
Site Coverage * R	0.43	0.13	0.08

Site Area A (m^2) = 8012 Composite R = 0.64

*Roads are considered "Concrete Streets" per CoV Table 5-2

**Sidewalks are considered "Drives and Walks" per CoV Table 5-2

***Green Space assumed to be "Average (2-7%) Lawns, Heavy Soil" per CoV Table 5-2

Bioretention Swale Storage Capacity **CIVL446**
Chancellor Boulevard and East Mall Intersection **07-Apr-25**

100 Year Peak Flow Calculations

Q = RAIN
Catchment Area: 1.5 Ha

1) Storage Volume Requirements As Per City of Vancouver for Green Infrastructure

Required Storage, as per COV:	48 mm
Required Duration:	24 hours

Storage Demand:	**720.0 m^3**

Because the storage volume computed via analysis of pre- and post development flows is 282.3 m^3, the governing storage demand is the requirement for the storage of 48mm of rainwater in 24 hours, as per the City of Vancouver Building By-law dated July 23, 2019.

2) Rainwater Volume Absorbed by Native Soil Via Infiltration

By assuming an average infiltration rate of **3 mm/hr** from similar site conditions:

Native Soil Storage Capacity:	**93.5 m^3**

3) Rainwater Volume Absorbed by Storage Medium

By assuming a storage medium porosity of **0.42** from the Hydrogeological and Geotechnical Assessment report of the UBC campus by Piteau Associates, and retrieving the volume of bioretention soil, drain rock, and sand medium from Civl3D:

Storage Medium Volume:	1855.2 m^3

Storage Medium Storage Capacity:	**779.2 m^3**

4) Rainwater Volume Stored Via Ponding

With the volume of water ponding from Civl3D, assuming a maximum ponding depth of **0.3m**,

Ponding Storage Capacity:	**389.6 m^3**

Total Infiltration Swale Storage Capacity:	**1262.3 m^3 > 720.0 m^3**

Note: The bioretention swale alone manages the 100 year storm event. The raingarden provides additional capacity.

Raingarden Storage Capacity **CIVL446**
Chancellor Boulevard and East Mall Intersection **07-Apr-25**

100 Year Peak Flow Calculations

Q = RAIN
Catchment Area: 1.5 Ha

2) Rainwater Volume Absorbed by Native Soil Via Infiltration

By assuming an average infiltration rate of **3 mm/hr** from similar site conditions:

Native Soil Storage Capacity:	**30.4 m^3**

3) Rainwater Volume Absorbed by Storage Medium

By assuming a storage medium porosity of **0.42** from the Hydrogeological and Geotechnical Assessment report of the UBC campus by Piteau Associates, and retrieving the volume of bioretention soil, drain rock, and sand medium from Civl3D:

Growing Medium Depth 0.45 m

Storage Medium Storage Capacity:	**79.9 m^3**

4) Rainwater Volume Stored Via Ponding

With the volume of water ponding from Civl3D, assuming a maximum ponding depth of **0.15m**,

Ponding Storage Capacity:	**63.4 m^3**

Additional Storage Capacity:	**173.7**

Detention Tank Storage Requirement **CIVL446**

Chancellor Boulevard and East Mall Intersection **07-Apr-25**

Q= RAIN

100 Year Peak Flow Calculations Site Area (Ha)= 1.5

	Tc min	Runoff coefficient %	Area Ha	Intensity mm/hr	n	Q cms
Qpre (2014 IDF)	**10**	**0.65**	**1.500**	**93.9**	0.00278	**0.256**
Qpost (2100 IDF)	**5**	**0.64**	**1.500**	**191.3**	0.00278	**0.511**

Storage Volume Required (CoV Rational Method)*

**Volume based on maintaining pre-construction runoff flows*

Storage Volume = $$\boldsymbol{V = Q_p D - Q_0\left(\frac{D+T_c}{2}\right)}$$

D= Duration of storm, in seconds

Q_p = Peak runoff rate for duration D, in cubic meters per second

Q0 = Maximum allowable discharge, in cubic meters per second

T_c = Time of concentration, in seconds

Tank Storage Required =	**282.31 cu.m**

Rainfall Duration D	Peak Runoff Q_p	Maximum Allowable Discharge Q_0	Time of Concentration T_c	Groundwater Inflow Q_{GI}* **Added to Peak Runoff*	Required Storage
min	cms	cms	min	cms	cu.m
5	**0.561**	**0.256**	**5**	**0.0500**	**106.58**
15	**0.324**	**0.256**	**5**	**0.0500**	**182.95**
16	**0.314**	**0.256**	**5**	**0.0500**	**188.24**
17	**0.305**	**0.256**	**5**	**0.0500**	**193.29**
20	**0.283**	**0.256**	**5**	**0.0500**	**207.18**
30	**0.235**	**0.256**	**5**	**0.0500**	**243.82**
40	**0.207**	**0.256**	**5**	**0.0500**	**271.05**
45	**0.197**	**0.256**	**5**	**0.0500**	**282.31**

APPENDIX F

GATEWAY - STRUCTURAL CALCULATIONS

Appendix F - Gateway Structural Calculations

Load Calculations:

Snow Load:

$$ULS = 1.0 * [1.9 * (0.8 * 1 * 1 * 1) + 0.3] = 1.82\ kPa$$

Snow Load on Letters

$$Area = 0.4\ m * 0.2m = 0.8m^2$$

$$1.82\ kPa * 0.8m^2 = 1.456\ kN = 1456\ N$$

Snow Load on Column

$$Area = 0.9\ m * 1.4\ m = 1.26m^2$$

$$1.82\ kPa * 1.26\ m^2 = 2.293\ kN = 2293N$$

Snow Load on Footing

$$Area = 3\ m * 2\ m = 6m^2$$

$$1.82\ kPa * 6\ m^2 = 10.92\ kN = 10920N$$

Self Weight of Concrete Column

$$Volume = 6m * 1.4m * 0.9m = 7.56m^3$$

$$7.56\ m^3 * 23.5\ kN/m^3 = 177.76\ kN$$

Self Weight of Steel Letters

Assuming hollow letters, with 0.05m thickness

$$Volume = 2m * 2m * 0.4m = 1.6m^3$$

$$Hollow\ Volume = (2 - 0.05 * 2) * (2 - 0.05 * 2) * (0.4 - 2 * 0.05) = 1.083m^3$$

$$Steel\ Volume = (1.6\ m^3 - 1.083m^3) * 0.67 = 0.347m^3$$

$$0.347m^3 * 7850\ kg/m^3 * 9.81\ m/s^2 = 26,650\ N$$

$$26,650\,N\ *\ 3\,Letters\ =\ 79950\,N\ =\ 79.95\,kN$$

<u>Steel Connection Calculations</u>

Snow Load on Letter : 1456 N

Self Weight of Letter: 26,650 N

Load Combinations:

1.4 D = 37.31 kN   <- Governs

1.25 D + 1.5 S = 35.49 kN

Weld Calculations:

Assuming fusion face to be 5mm.

Weld Metal Check:

$$Vr\ =\ 0.67\phi_w A_w X_w (1.0\ +\ 0.5sin^{1.5}\theta)M_w$$

$$37310\,N\ =\ 0.67\ *\ 0.67\ *\ 0.707\ *\ Length\ of\ Weld\ \ *\ 1\ *\ 490\,MPa$$

$$L\ =\ 23.99\,mm$$

Base Metal Check:

$$Vr\ =\ 0.67\phi_w A_m F_u$$

$$37310N\ =\ 0.67\ *\ 0.67\ *\ 5\ *\ 450\ *\ Length\ of\ Weld$$

$$L\ =\ 36.94\,mm$$

Using a Factor of Safety of 2.0, use 74 mm Weld Length.

<u>Concrete Column Calculations:</u>

Concrete Dimensions: 6m * 1.4 m * 0.9 m

Ag = 1260000 mm^2

Using 30 MPa concrete = $\alpha\ =\ 0.81,\ \beta\ =\ 0.90$

Snow Load = 3749 N

Dead Load = 79950 N

Load Combinations:

1.4 D = 111.3 kN <- Governs

1.25D + 1.5 S = 105.56 kN

Reinforcement Calculations:

$$P_{ro} = 0.8(\alpha\phi_c f'_c A_c + \phi_c F_y A_s)$$

$$111300 = 0.8 * (0.81 * 0.65 * 30 * A_c + 0.85 * 400 * A_s)$$

$$111300 = 12.636 A_c + 272 A_s$$

$$111300 = 12.636 * 0.99 * Ag + 272 * 0.01 * Ag$$

$$111300 = 12.18\, Ag$$

$$Ag = 9133.8\, mm^2 \quad \text{<- OK}$$

$$As = 0.01 * Ag = 91.34\, mm^2$$

Use 4-10M Bar (Nominal Area =400mm^2)

Clear Cover = 75mm

Tie Spacing = 480 mm

<u>Concrete Footing Calculations:</u>

Footing Dimensions: 3m * 2m * 2m

Footing Depth: 1m

Snow Load = 10920 N + 1456 N + 2293 N = 14,670 N

Dead Load = 111300 N + 177760 N + 282000 N = 571,060 N

Load Combinations:

1.4 D = 799.484 kN <- Governs

1.25 D + 1.5 S = 735.83 kN

Assuming 20M Bars

$$d_{Average} = 1000 - 75 - 1.5(20) = 895mm$$

$$dv = 0.9 * d = 805.5\,mm$$

$$Pf/Af = 799.484\,kN/(3m * 2m) = 133.25\,kPa$$

$$C + Davg = 900 + 895 = 1795\,mm$$

$$C + Davg = 1400 + 895 = 2295\,mm$$

$$Vf = 133.25[(3 * 2) - (1.795 * 2.295)] = 250.92\,kN$$

One Way Shear Check:

$$Vr = \phi\beta\sqrt{f'c}b_w d_v$$

$$Vr = 0.65 * \frac{230}{1000+805.5} * \sqrt{30} * 805.5 * 3000 = 1095.95\,kN$$

Two Way Shear Check:

$$Vr = (1 + 2/\beta_c) * 0.19 * \phi_c\sqrt{f'_c} \leq 0.38\phi_c\sqrt{f'_c}$$

$$Vr = (1 + 2/(1.5)) * 0.19 * 0.65 * \sqrt{30} * 3000 * 805.5 = 3814.09\,kN$$

Flexural Design

$$As = 0.002 * (1000 * 3000) = 6000\,mm^2$$

$$6000/300 = 20 - 20M\ Bars$$

$$\beta_1 c = \frac{\phi_s F_y A_s}{\alpha_1 \phi_c f'_c b} = \frac{0.85*400*6000}{0.81*0.65*30*3000} = 43.05mm < 0.5d$$

$$Mr = 340 * 6000 * (895 - 43.05/2) = 1781.9\,kN * m$$

$$Mf = 133.25\,kPa * 0.8 * 3 * 0.8/2 = 127.92\,kN * m$$

$$Mf < Mr$$

APPENDIX G

GATEWAY - GEOTECHNICAL CALCULATIONS

Appendix G - Bearing Capacity Calculations

Using Sonic Hole TH01-01

$Mass = 52000\ kg \quad weight = 508\ kN$

Dimensions = $\underset{\text{length}}{3\text{m}} \times \underset{\text{width}}{2\text{m}} = 6m^2$

S = Shape factors
i = Inclination factors
d = Depth factors

Using Effective Stress Analysis

$$qult = C \cdot N_c \cdot S_c \cdot i_c \cdot d_c + \cdot\ \sigma_D \cdot N_q \cdot S_q \cdot i_q \cdot d_q + 0.5 \cdot \gamma \cdot \beta \cdot N_\gamma \cdot S_\gamma \cdot i_\gamma \cdot d_\gamma$$

Shape Factor: $S_c = 1 + \frac{B}{L} \cdot \frac{N_q}{N_c}$

$= 1 + \frac{2}{3} \cdot 13.2/23.94$

$= 1.4$

$S_q = 1 + \frac{B}{L} \cdot \tan\emptyset$

$= 1 + {}^2/_3 \cdot \tan(27^\circ)$

$S_\gamma = 1 - 0 \cdot 4\,B/L$

$= 0.73$

Depth Factor: $D_F = 1m,\ B = 2m \therefore D_F/B \le 1$

$\therefore d_c = 1 + 0 \cdot 4 \times D_F/\beta$

$= 1.8$

$d_q = 1 + 2\tan\emptyset\,(1 - \sin\emptyset)^2\,D_F/B$

$= 1 + 2 \cdot \tan(27^\circ) \times (1 - \sin(27))^2 \times \gamma_2$

$= 1.2$

$d_\gamma = 1$

Inclination Factor: $\beta = 0^o, \qquad \emptyset = 27^\circ \quad \therefore \beta \cdot 27^\circ$

Angle of load ----- vertical

$\therefore i_\gamma = \left(1 - \frac{\beta}{\emptyset}\right)^2 = 0$

$i_c = i_q = \left(1 - {}^{\beta^\circ}/_{90^\circ}\right)^2$

$= 1 - 0 = 1$

N_q, N_c, N_γ = Bearing Capacity Factors.

Will place the statue in fill; "compact sand to silly sand" conservatively, take compacted silty sand as main soil.
No data given on strength;
∴ Typical values. From: Carter, M and Bentley, S. (1991). Correlation of Soil Properties. PENTECH PRESS Publishers: London
Loose silty sand: 27° friction angle. Note: Firm silt also has 27° friction angle. No groundwater table.

∴, from Terzaghi & Peck, 1948: friction angle 270°: Meyerhof:

$N_c = 23.94$

$N_q = 13.2$

$N_\gamma = 9.46$

σ'_D = Vertical Effective Stress @ Foundation Base level

$\sigma'_D = \sigma_D - u, \quad u = 0 \quad since\ no\ GWT$ & Compact sand & silty sand has good drainage / permeability

Unit weight

$\sigma_D = \gamma \cdot Z, depth$

Assume $\gamma\ silty\ sand = 18\ kN/m^3$

$\therefore \sigma_D = 18kN/m^3 \times 1m$

$18kN/{}^2_m = 18kPa$

$\gamma' = 18kN/m^3$

Use C cohesion = 22kPa for silty sand

From "Swiss Standard SN 670 010b, Characteristic Coefficient of Soils, Association of Swiss Road and Traffic Engineers"

$\therefore qult = 22 \cdot 23.94 \cdot 1.4 \cdot 1.8 + 18 \times 13.2 \cdot 1.3 \cdot 1.2 + 0 \cdot 5 \cdot 18.2 \cdot 9.46 \cdot 0.73 \cdot 1$

$= 1327 + 370 + 62$

$= 1759\ kPa$

$FOS = 2.0$ is not a very risk-significant structure

$\therefore qall = qult/FOS$

$qall = 879.5 \rightarrow Applied\ load\ = 508kN$

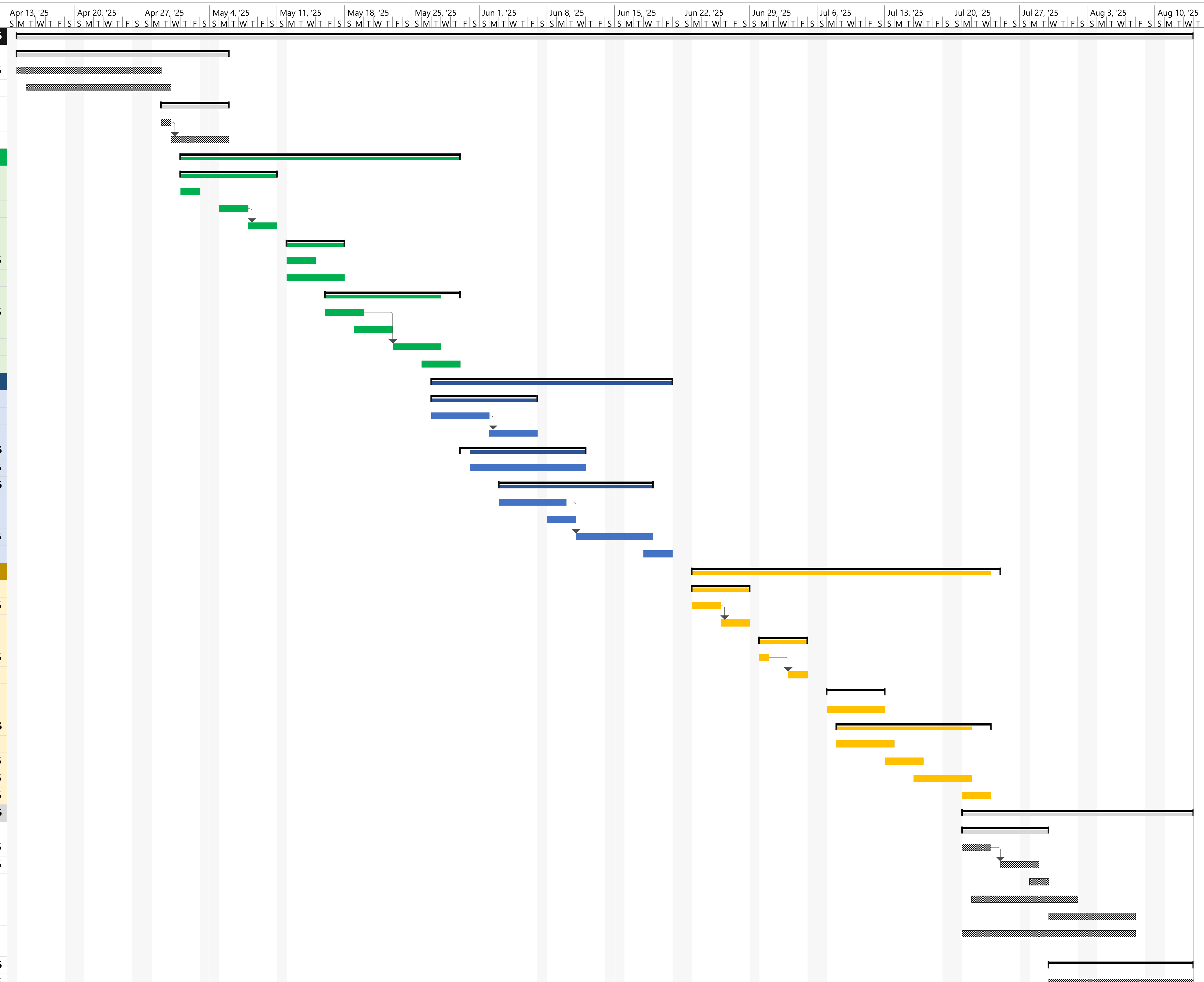
∴, It is acceptable to construct using as $3m \times 2m$ area embedding 1m depth into the fill

Note: During excavation, contractor should ensure site conditions reflect majority compact sand & silly sand

APPENDIX H

CONSTRUCTION SCHEDULE

ID	Task Name	Duration	Start	Finish
1	**Intersection Redesign**	**100 days**	**Mon 4/14/25**	**Wed 8/13/25**
2	**Pre-Construction**	**16 days**	**Mon 4/14/25**	**Mon 5/5/25**
3	Procurement	11 days	Mon 4/14/25	Mon 4/28/25
4	Permitting	11 days	Tue 4/15/25	Tue 4/29/25
5	**Site Mobilization**	**5 days**	**Tue 4/29/25**	**Mon 5/5/25**
6	Site Trailer	1 day	Tue 4/29/25	Tue 4/29/25
7	Machinery	4 days	Wed 4/30/25	Mon 5/5/25
8	**Phase 1 - East Mall**	**26 days**	**Thu 5/1/25**	**Thu 5/29/25**
9	**Remove Existing Works**	**8 days**	**Thu 5/1/25**	**Sat 5/10/25**
10	Clearing and Grubbing	2 days	Thu 5/1/25	Fri 5/2/25
11	Demolition	3 days	Mon 5/5/25	Wed 5/7/25
12	Excavation	3 days	Thu 5/8/25	Sat 5/10/25
13	**Drainage**	**6 days**	**Mon 5/12/25**	**Sat 5/17/25**
14	Tie-In Existing, Catch Basins	3 days	Mon 5/12/25	Wed 5/14/25
15	Stormwater Swale	6 days	Mon 5/12/25	Sat 5/17/25
16	**Roads and Curbs**	**14 days**	**Fri 5/16/25**	**Thu 5/29/25**
17	Aggregate Layers	4 days	Fri 5/16/25	Mon 5/19/25
18	Grading	4 days	Mon 5/19/25	Thu 5/22/25
19	Concrete Pavement	5 days	Fri 5/23/25	Tue 5/27/25
20	Quality Control	4 days	Mon 5/26/25	Thu 5/29/25
21	**Phase 2 - Exterior Lane Work**	**22 days**	**Tue 5/27/25**	**Fri 6/20/25**
22	**Remove Existing Works**	**11 days**	**Tue 5/27/25**	**Fri 6/6/25**
23	Demolition	6 days	Tue 5/27/25	Sun 6/1/25
24	Excavation	5 days	Mon 6/2/25	Fri 6/6/25
25	**Drainage**	**12 days**	**Fri 5/30/25**	**Wed 6/11/25**
26	Tie-In Existing, Catch Basins	11 days	Sat 5/31/25	Wed 6/11/25
27	**Roads and Curbs**	**13 days**	**Tue 6/3/25**	**Wed 6/18/25**
28	Aggregate Layers	6 days	Tue 6/3/25	Mon 6/9/25
29	Grading	3 days	Sun 6/8/25	Tue 6/10/25
30	Concrete Pavement	6 days	Wed 6/11/25	Wed 6/18/25
31	Quality Control	3 days	Wed 6/18/25	Fri 6/20/25
32	**Phase 3 - Interior Lane Work**	**27 days**	**Mon 6/23/25**	**Thu 7/24/25**
33	**Remove Existing Works**	**6 days**	**Mon 6/23/25**	**Sat 6/28/25**
34	Demolition	3 days	Mon 6/23/25	Wed 6/25/25
35	Excavation	3 days	Thu 6/26/25	Sat 6/28/25
36	**Gateway Sign**	**5 days**	**Mon 6/30/25**	**Fri 7/4/25**
37	Concrete Footing, Cast-in-Place	1 day	Mon 6/30/25	Mon 6/30/25
38	Sign Assembly	2 days	Thu 7/3/25	Fri 7/4/25
39	**Drainage**	**6 days**	**Mon 7/7/25**	**Sat 7/12/25**
40	Stormwater Management	6 days	Mon 7/7/25	Sat 7/12/25
41	**Roads and Curbs**	**14 days**	**Tue 7/8/25**	**Wed 7/23/25**
42	Aggregate Layers	6 days	Tue 7/8/25	Sun 7/13/25
43	Grading	4 days	Sun 7/13/25	Wed 7/16/25
44	Concrete Pavement	4 days	Wed 7/16/25	Mon 7/21/25
45	Quality Control	3 days	Mon 7/21/25	Wed 7/23/25
46	**Project Closeout**	**19 days**	**Mon 7/21/25**	**Wed 8/13/25**
47	**Signage and Signalling**	**8 days**	**Mon 7/21/25**	**Tue 7/29/25**
48	Road Markings	3 days	Mon 7/21/25	Wed 7/23/25
49	Signage Placement	3 days	Fri 7/25/25	Mon 7/28/25
50	Traffic Signals	2 days	Mon 7/28/25	Tue 7/29/25
51	Landscaping	10 days	Tue 7/22/25	Fri 8/1/25
52	Final Inspections, Quality	7 days	Wed 7/30/25	Thu 8/7/25
53	Operations and Maintenance Documentation	15 days	Mon 7/21/25	Thu 8/7/25
54	**Site Demobilization**	**11 days**	**Wed 7/30/25**	**Wed 8/13/25**
55	Site Demobilization	11 days	Wed 7/30/25	Wed 8/13/25



Chancellor Boulevard - East Mall Intersection Redesign Construction Schedule

APPENDIX I

PROJECT CHARTER

Title	Chancellor Boulevard - East Mall Intersection Redesign
Client	UBC Campus and Community Planning
Project Manager	Capstone Consulting Limited

Description

Capstone Consulting is redesigning the NW Marine Drive, East Mall, and Chancellor Boulevard intersection at UBC to align with the UBC Transportation Plan. The project aims to enhance safety, promote sustainability, and improve mobility for all users by incorporating traffic calming measures, bike lanes, and green infrastructure. A rainwater retention system will address stormwater management and prevent cliff erosion. Additionally, an eight-meter tall gateway sign, blending with campus architecture, will establish the intersection as a prominent campus entry point.

Business Case (Objective)	**Scope (Deliverable)**
Prioritize Active Travel Modes	➔ Removal of existing works. ➔ Tie-in existing utilities to stormwater solution. ➔ Fill aggregate layers, ensuring proper grading and compaction. Pavement as per design drawings. ➔ Signage, signalling, road markings as per design drawings.
Promote User Intuitivity and Safety	➔ Signage, signalling, road markings as per design drawings.
Establish Intersection as Prominent Campus Entry	➔ Cast concrete footing in place. ➔ Assemble gateway structure as per design drawings.
Prepare Site for Major Storm Event, Prevent Erosion	➔ Tie-in existing utilities to stormwater solution. ➔ Upgrade existing green space to include bioswales, absorbent landscaping.

Key Milestone	Days Required	Scheduled Date	Actual Date
Phase 1 Complete	42	May 28, 2025	TBD
Phase 2 Complete	20	June 20, 2025	TBD
Phase 3 Complete	20	July 16, 2025	TBD
Project Complete	18	August 16, 2025	TBD

Original Contract Value	CA$5,728,607.14	
Incidental	**Stipulation**	**Value**
Contingency	12.00%	CA$687,432.86
Change Orders	Cost + 15.00% Overhead	TBD

Risk Assessment Matrix

	Insignificant 1	Minor 2	Significant 3	Major 4	Severe 5
1 Rare	1	2	3	4	5
2 Unlikely	2	4	6	8	10
3 Possible	3	6	9	12	15
4 Likely	4	8	12	16	20
5 Near Certain	5	10	15	20	25

Level	Low	Moderate	High	Critical
Score	1 - 5	6 - 11	12 - 18	19 - 25

Risk Summary

Risk	Score	Level
Regulatory Compliance Measures	20	Critical
Stakeholder Concerns and Consultation	15	High
Traffic Disruptions and Congestion	12	High
Utilities and Infrastructure Conflicts	8	Moderate
Budget Overruns and Construction Issues	6	Moderate

Risk Mitigation Strategies

Risk	Approach
Regulatory Compliance Measures	• Engage consultants early in the design and planning stages. • Conduct a regulatory review to identify all applicable **CoV and BC MOTI requirements.**

	• Develop a compliance checklist and schedule regular audits throughout the project. • Maintain communication with CoV and secure necessary approvals in advance.
Stakeholder Concerns and Consultation	• Initiate early and continuous stakeholder engagement through public meetings, surveys, and online feedback tools. • Uphold UBC's Indigenous Strategic Plan (ISP)- see our **Indigenous Consultation Plan** • Document all concerns and integrate feasible suggestions into the design and planning phases. • Provide regular updates to stakeholders about project milestones and decisions.
Traffic Disruptions and Congestion	• Develop a detailed traffic management plan, including detours and clear signage for all road users. • Schedule construction activities during off-peak hours or academic breaks to reduce impact. • Coordinate with **UBC CCP, emergency response, and Translink** for smooth flow. • Use digital platforms or signage to alert the public of closures and alternative routes in advance.
Utilities and Infrastructure Conflicts	• General contractor to conduct utility locates and subsurface scans before any excavation. • Coordinate closely with utility companies to understand existing service lines and future plans. • Allocate schedule float time in case of unexpected findings during construction. • Engage our **Erosion Sediment Control Plan (ESC)** to protect existing infrastructure.
Budget Overruns and Construction Issues	• Use detailed cost estimation models and include **contingency buffers (already at 12%)**. • Monitor progress through regular financial and construction audits. • Implement a change order approval system with oversight to manage scope creep. • Pre-qualify contractors and suppliers to ensure performance and reliability.

APPENDIX J

COST ESTIMATE

CONSTRUCTION WORKS - INTERSECTION	UNIT PRICE	UNIT	QUANTITY	COST
Concrete Walks, Curbs, & Gutters				
Extruded Concrete Curb - MMCD C6	$ 120.00	L.M.	500	$ 60,000.00
Concrete Sidewalk & Connector Walks (100mm Thickness per BBY-C101 & BBY-C124 to C128)	$ 140.00	S.M.	1200	$ 168,000.00
Concrete Wheelchair Letdown (Extra over)	$ 200.00	EACH	8	$ 1,600.00
Precast Concrete				
Roadside Barriers	$ 1,500.00	EACH	3	$ 4,500.00
Roadway Lighting				
Existing Pole Relocation with New Base and New LED Light	$ 3,000.00	EACH	4	$ 12,000.00
53mm RPVC Conduit c/w 3 #6 RW90 Cu. + 1 #8 RW90 Cu.	$ 350.00	L.M.	20	$ 7,000.00
Clearing and Grubbing				
Clearing and Grubbing - All Locations	$ 100,000.00	L.S.	1	$ 100,000.00
Tree Removal (<=0.3m DBH Tree Trunk)	$ 1,000.00	EACH	1	$ 1,000.00
Tree Removal (>0.3m DBH Tree Trunk)	$ 2,500.00	EACH	1	$ 2,500.00
Shrub & Tree Preservation				
Tree Protection Fencing (BBY-L103)	$ 60.00	L.M.	80	$ 4,800.00
Reshaping Granular Roadbed				
Reshaping	$ 4.00	S.M.	5805	$ 23,220.00
Roadway Excavation, Embankment, & Compaction				
Removal and Disposal Offsite of Existing Concrete Flatwork	$ 35.00	S.M.	5805	$ 203,175.00
Removal and Disposal Offsite of Existing Concrete Curbs	$ 35.00	L.M.	500	$ 17,500.00
Removal and Disposal Offsite of Existing Asphalt Flatwork	$ 35.00	S.M.	5805	$ 203,175.00
Common Excavation – Offsite Disposal	$ 85.00	C.M.	1300	$ 110,500.00
Over Excavation and Backfill	$ 150.00	C.M.	1300	$ 195,000.00
Imported Embankment Fill	$ 55.00	TONNE	1300	$ 71,500.00
Cold Milling				
Full Depth Milling (Maximum 75mm Deep)	$ 20.00	S.M.	5805	$ 116,100.00
Full Depth Milling (Maximum 175mm Deep)	$ 25.00	S.M.	5805	$ 145,125.00
Granular Subbase				
75mm Minus Crushed Granular Subbase	$ 60.00	TONNE	960	$ 57,600.00
Granular Base				
19mm Minus Crushed Granular Base	$ 90.00	TONNE	240	$ 21,600.00
Asphalt Tack Coat				
Asphalt Tack Coat	$ 1.00	S.M.	5805	$ 5,805.00
Hot-Mix Asphalt Concrete Paving				
Asphaltic Pavement (Chancellor Blvd) MMCD UC#1 - 50mm Thickness	$ 220.00	TONNE	730	$ 160,600.00
Asphaltic Pavement (Chancellor Blvd) MMCD LC#1 - 75mm Thickness	$ 220.00	TONNE	1080	$ 237,600.00
Asphaltic Pavement (Local Roads) MMCD UC#2 - 40mm Thickness	$ 220.00	TONNE	580	$ 127,600.00
Asphaltic Pavement (Local Roads) MMCD LC#1 - 45mm Thickness	$ 220.00	TONNE	650	$ 143,000.00
Asphalt Drainage Curb (50mm high, 175mm wide)	$ 40.00	L.M.	500	$ 20,000.00
Painted Pavement Markings				
Supply & Install Thermoplastic Pavement Markings	$ 21,000.00	L.S.	1	$ 21,000.00
Supply & Install Thermoplastic Bike Lane Markings	$ 175.00	EACH	12	$ 2,100.00
Install Traffic Signs c/w Base	$ 500.00	EACH	5	$ 2,500.00
Pedestrian Crosswalks	$ 1,000.00	EACH	4	$ 4,000.00
Top Soil & Finish Grading				
Imported Topsoil (150mm thickness)	$ 100.00	C.M.	18	$ 1,800.00
Sodding				
Sodding	$ 15.00	S.M.	120	$ 1,800.00
Planting of Trees, Shrubs, and Ground Covers				
Proposed Tree c/w Root Barrier	$ 1,000.00	EACH	2	$ 2,000.00
Storm Sewers				
Catch Basin Lead - 150mm SDR28 PVC	$ 500.00	L.M.	50	$ 25,000.00
Manhole and Catch Basins				
Type V Top Inlet Catch Basin (BBY-S110)	$ 1,700.00	EACH	1	$ 1,700.00
Type VA Side Inlet Catch Basin (BBY-S105 and BBY-S110)	$ 2,000.00	EACH	12	$ 24,000.00
Major Adjustment of Existing Manholes c/w New Self Levelling Frame	$ 2,500.00	EACH	8	$ 20,000.00
Removal & Disposal of Existing Catch Basins/ Lawn Basins and Capping Existing Lead	$ 400.00	EACH	12	$ 4,800.00
Traffic Signals				
Traffic Detector Loops	$ 2,500.00	EACH	4	$ 10,000.00
Installation of Traffic Lights	$ 500,000.00	L.S.	1	$ 500,000.00
Junction Box	$ 3,168.00	EACH	1	$ 3,168.00
CONSTRUCTION WORKS - GATEWAY SIGN				
Footing				
20M Bar	$ 25.00	L.S.	1	$ 25.00
10M Bar	$ 10.00	L.S.	1	$ 10.00
30MPa Concrete Column	$ 300.00	CU.M.	7.56	$ 2,268.00
Aluminum Letters	$ 500.00	S.M.	35.00	$ 17,500.00
Wood Slab	$ 2,000.00	L.S.	1	$ 2,000.00
30MPa Concrete Footing	$ 300.00	CU.M.	7.2	$ 2,160.00
CONSTRUCTION WORKS - RAINWATER RETENTION SYSTEM				
Waste Material (Excavate & Dispose Off-Site)	$ 151.20	CU.M.	3714.5	$ 561,632.40
Single Pipe (150mm - 3 -4 m depth)	$ 902.88	L.M.	20	$ 18,057.60
Impermeable Fabric	$ 26.40	L.M.	350	$ 9,240.00
Dimple Board - 3.5mx20m	$ 1,215.28	EACH	15	$ 18,229.20
Sodding & Topsoil - 150mm	$ 43.20	S.M.	1023.9	$ 44,232.48
Single CB - Side Inlet	$ 14,725.92	EACH	4	$ 58,903.68
PROJECT ADMINISTRATION				
Redline Drawings				
Red Line Drawings - Storm	$ 1,000.00	L.S.	2	$ 2,000.00
Red Line Drawings - Water	$ 1,000.00	L.S.	2	$ 2,000.00
Red Line Drawings - Sanitary	$ 1,000.00	L.S.	2	$ 2,000.00
Red Line Drawings - Roads	$ 1,000.00	L.S.	2	$ 2,000.00

Red Line Drawings - Communications Conduit	$	1,000.00	L.S.	2	$	2,000.00
Permits						
Development and Building Permits	$	800.00	L.S.	1	$	800.00
Streets and Landscape Permit	$	820.00	L.S.	1	$	820.00
Electrical Work Permits	$	820.00	L.S.	1	$	820.00
Traffic Management Plan	$	800.00	L.S.	1	$	800.00
Highway Use Permit	$	800.00	L.S.	1	$	800.00
Project Planning						
Community Consultation Plan	$	5,000.00	L.S.	1	$	5,000.00
LABOUR AND EQUIPMENT						
Project Director	$	1,200.00	L.D.	9	$	10,800.00
Project Manager	$	1,100.00	L.D.	90	$	99,000.00
Design Engineer	$	1,200.00	L.D.	90	$	108,000.00
Project Coordinator	$	1,100.00	L.D.	235	$	258,500.00
Superintendant	$	1,200.00	L.D.	235	$	282,000.00
Foreman (x6)	$	700.00	L.D.	1410	$	987,000.00
Design Engineer	$	800.00	L.D.	30	$	24,000.00
Installation of Electrical	$	2,000.00	L.D.	5	$	10,000.00
Tow Trucks	$	600.00	R.D.	235	$	141,000.00
Tow Truck Driver	$	500.00	L.D.	235	$	117,500.00
Excavator	$	560.00	R.D.	9	$	5,040.00
Concrete Truck	$	600.00	R.D.	36	$	21,600.00
Concrete Truck Operator	$	900.00	L.D.	36	$	32,400.00
Crane	$	1,800.00	R.D.	2	$	3,600.00
Crane Operator	$	1,000.00	L.D.	1	$	1,000.00
Street Light Installation	$	1,600.00	L.D.	5	$	8,000.00
Utility Relocation	$	2,000.00	L.D.	10	$	20,000.00
Welder	$	1,500.00	L.D.	1	$	1,500.00
				Total	$	5,728,606.36
				Contingency		12%
				FINAL TOTAL	$	6,416,039.12

APPENDIX K

SERVICE LIFE MAINTENANCE PLAN

Surface Maintenance Activities		
Task Description	**Frequency of the Task**	**Cost**
Patching/sealing paved surfaces with chemical compounds/treatment	Every 3-5 years	$ 31,500.00
Sweeping and disposal of surface debris	Monthly – Quarterly	$ 42,000.00
Grading and shoulder repair	Annually	$ 72,000.00
Curb maintenance (curb painting, repaving, etc.)	Every 2-5 years	$ 280,000.00
Painting maintenance (crosswalks, bike lanes, road markings)	Every 1-2 years	$ 48,000.00
Tactile strip maintenance	Every 5 years	$ 6,000.00
Replacement/reinstallation of surface reflectors and delineators	Every 3-5 years	$ 1,000.00
Drainage Maintenance Activities		
Task Description	**Frequency of the Task**	**Cost**
Removal of obstructions and debris from catch basins	Spring/Fall	$ 7,200.00
Repair and reinstallation of storm sewer components	Every 10-30 years	$ 10,000.00
Traffic Signal Maintenance Activities		
Task Description	**Frequency of the Task**	**Cost**
Inspection of signal controllers	Annually	$ 75,000.00
Inspection of signal lights and bulb replacements	Annually	$ 40,000.00
Maintenance of signal poles	Every 5 years	$ 25,000.00
Sign cleaning and replacement	Every 2-3 years	$ 30,000.00
Vegetation Maintenance Activities		
Task Description	**Frequency of the Task**	**Cost**
Shoulder/boulevard mowing/bush whacking	Monthly	$ 96,000.00
Sight line clearing	Annually	$ 96,000.00
Winter Maintenance Activities		
Task Description	**Frequency of the Task**	**Cost**
Road sanding/salting, plowing, and snow removal	Annually	$ 12,000.00
Clearing out snow from high foot traffic areas	Annually	$ 4,000.00
Spring cleaning of winter aggregates	Annually	$ 10,000.00
Gateway Sign Maintenance Activities		
Task Description	**Frequency of the Task**	**Cost**
Inspection of overall sign condition	Annually	$ 7,000.00
Cleaning of aluminum lettering	Every 1-2 years	$ 8,000.00
Re-coating of aluminum letters	Every 10-15 years	$ 1,000.00
Wood slab staining/sealing	Every 3-5 years	$ 2,000.00
Replacement of damaged wooden components	Every 10-20 years	$ 2,000.00
Concrete crack repair/sealing	Every 5-10 years	$ 3,200.00
Structural integrity check	Every 5 years	$ 2,000.00
Rainwater Swale and Raingarden Maintenance Activities		
Task Description	**Frequency of the Task**	**Cost**
Pre-treatment sediment treatment basin clearing	Quarterly or after major storm events	$ 80,000.00
Weeding and vegetation management	Monthly or after major storm events	$ 96,000.00
Inspection for sediment buildup, erosion, and channeling	Monthly or after major storm events	$ 36,000.00
Removal of trash and debris	Monthly or after major storm events	$ 36,000.00
Monitoring for water pollutants in swale	Every 2-3 years	$ 12,000.00
Soil and vegetation overhaul	Every 3-5 years	$ 24,500.00
	Total (12% Contingency)	$ 1,339,000.00

CAPSTONE CONSULTING

SITE LOCATION

OFFSITE DRAWING INDEX	
DRAWING NO.	DRAWING TITLE
01	COVER SHEET
02	GENERAL NOTES
03	KEY PLAN 1
04	KEY PLAN 2
05	GRADING PLAN
06	PROFILE VIEW
07	SAMPLE LINE PLAN VIEW
08	A1 SECTION VIEW (1)
09	A1 SECTION VIEW (2)
10	A2 SECTION VIEW (1)
11	A2 SECTION VIEW (2)
12	SIGNAGE AND PAINT PLAN
13	RAINWATER MANAGEMENT DETAILS
14	GATEWAY SIGN DIMENSIONS
15	GATEWAY SIGN DETAILS
16	CONSTRUCTION PHASING
17	TMP PHASE 1 ROAD CLOSURE
18	TMP PHASE 2 INTERSECTION
19	TMP PHASE 2 MIDBLOCK
20	TMP PHASE 3 TYPICAL
21	STANDARD ROADWORKS DETAILS
22	STANDARD UTILITIES & GI DETAILS
23	STANDARD ELECTRICAL DETAILS (1)
24	STANDARD ELECTRICAL DETAILS (2)

CLIENT:

UBC CAMPUS AND COMMUNITY PLANNING

6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:

CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN

UNIVERSITY ENDOWMENT LANDS

A. GENERAL NOTES

1. ALL CONSTRUCTION TO BE COMPLETED IN ACCORDANCE WITH THE LATEST REQUIREMENTS AND SPECIFICATIONS FROM THE CITY OF VANCOUVER ENGINEERING DESIGN MANUAL, STANDARD DETAIL DRAWINGS (SDD), THE CONSTRUCTION SPECIFICATIONS, AND THE APPLICABLE MASTER MUNICIPAL CONSTRUCTION DOCUMENT (MMCD) SPECIFICATIONS UNLESS OTHERWISE NOTED.
2. CONTACT BC 1 CALL TO OBTAIN UTILITY LOCATION INFORMATION 2 WEEKS PRIOR TO CONSTRUCTION.
3. THE CONTRACTOR IS TO NOTIFY THE ENGINEER 48 HRS. PRIOR TO CONSTRUCTION TO VERIFY THAT THEY HAVE THE LATEST DRAWINGS ISSUED FOR CONSTRUCTION.
4. THE CONTRACTOR IS TO MAINTAIN ON-SITE COPIES OF THE MOST CURRENT SET OF DESIGN DRAWINGS AT ALL TIMES, AND MARK UP IN RED ANY FIELD REVISIONS OR APPROVED DEVIATIONS FROM THE DESIGN. THIS REDLINED SET IS TO BE AVAILABLE ONSITE FOR THE CIVIL ENGINEER TO REVIEW AT ALL TIMES.
5. ANY REVISIONS TO THESE DRAWINGS MUST BE APPROVED BY THE ENGINEER, WHO SHALL REVIEW ANY CHANGES WITH THE CITY OF VANCOUVER ENGINEER.
6. ALL LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES HAVE BEEN DETERMINED FROM CITY OF VANCOUVER GEOGRAPHIC INFORMATION SYSTEM (GIS) AND THE ENGINEER CANNOT BE HELD RESPONSIBLE FOR THEIR ACCURACY. THE CONTRACTOR SHALL FIELD VERIFY AND EXPOSE THE LOCATION AND ELEVATION OF ALL EXISTING SERVICES AND TIE-IN POINTS PRIOR TO CONSTRUCTION AND TO IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES, CONFLICTS OR OMISSIONS.
7. DIMENSIONS, GRADES, COORDINATES, AND DETAILS OF THE DESIGN ARE TO BE CONFIRMED IN THE FIELD PRIOR TO CONSTRUCTION. IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES, CONFLICTS OR OMISSIONS.
8. ALL SITEWORK, TRENCHING, EXCAVATION, BACKFILL, ROADWORKS AND CONCRETE WORKS ARE TO BE SUPPLIED AND CONSTRUCTED IN ACCORDANCE WITH CITY OF VANCOUVER STANDARDS. IN CASES WHERE NO CITY OF VANCOUVER STANDARD EXISTS, THEN MMCD STANDARDS ARE TO BE ADHERED TO.
9. THE CONTRACTOR SHALL OBTAIN ALL PERMITS AND LICENSES PRIOR TO CONSTRUCTION AND ENSURE THAT ALL APPROVALS REQUIRED FOR THE PROPOSED WORK HAVE BEEN OBTAINED. THE CONTRACTOR IS TO CHECK WITH FORTIS BC, B.C. HYDRO AND TELUS PRIOR TO COMMENCING WORK TO VERIFY THE LOCATIONS AND INVERTS OF THESE SERVICES.
10. ALL MATERIALS TESTING MUST BE DONE IN ACCORDANCE WITH THE CITY OF VANCOUVER SPECIFICATIONS. TESTING TO BE CARRIED OUT BY A QUALIFIED MATERIALS TESTING FIRM AND PAID FOR BY THE CONTRACTOR. THE ENGINEER AND THE CITY ENGINEER SHALL RECEIVE COPIES Of ALL TEST RESULTS FROM THE CONTRACTOR.
11. TRAFFIC CONTROL (SIGNS, BARRICADES, FLAG PERSONS) IS TO BE MAINTAINED AT ALL TIMES WHILE WORKING ON MUNICIPAL RIGHT-OF-WAYS. A TRAFFIC OBSTRUCTION PERMIT MUST BE OBTAINED FROM THE CITY'S ENGINEERING DEPARTMENT PRIOR TO PARTIAL OR FULL ROAD CLOSURES.
12. TRAFFIC CONTROL TO CONFORM TO THE LATEST EDITION OF THE "TRAFFIC CONTROL MANUAL FOR WORK ON ROADWAYS" AS PUBLISHED BY THE MINISTRY OF TRANSPORTATION AND HIGHWAYS.
13. ANY MATERIAL SUBSTITUTION MUST BE APPROVED BY THE ENGINEER AND THE CITY ENGINEER.
14. THE CONTRACTOR SHALL USE EXTREME CARE WHEN WORKING NEAR EXISTING SERVICES AND INFRASTRUCTURE. ALL SERVICES AND INFRASTRUCTURE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITION AND TO THE SATISFACTION OF THE CITY OF VANCOUVER OR OTHER APPROVING AGENCIES.
15. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR REPAIR OF ANY DAMAGE CAUSED TO EXISTING STREET OR SERVICES BY CONSTRUCTION EQUIPMENT AND/OR TRUCKS HAULING MATERIAL TO AND FROM THE SITE. THIS MAY INCLUDE DAILY CLEANING OR SWEEPING EXISTING ROADS OF DIRT AND DEBRIS CAUSED BY THE CONSTRUCTION ACTIVITY.
16. OPEN TRENCH OPERATIONS IN EXISTING PAVEMENT SHALL BE VERTICAL. THE CONTRACTOR SHALL CONFIRM TRENCH COVERING REQUIREMENTS DURING CONSTRUCTION WITH THE CITY, PRIOR TO CONSTRUCTION. THE CONTRACTOR WILL BE HELD RESPONSIBLE TO PREVENT ANY HAZARD FOR PEDESTRIANS AND VEHICLES. ALL PAVEMENT, BOULEVARDS, ETC. ARE TO BE RESTORED TO ORIGINAL CONDITIONS WHERE NO IMPROVEMENT IS PROPOSED UNDER THIS CONTRACT.
17. ALL SURVEY MONUMENTS, POSTS, OR IRON PINS MUST BE PROTECTED AND ANY DAMAGE SHALL BE REPAIRED PRIOR TO THE COMPLETION OF CONSTRUCTION AT THE CONTRACTOR'S EXPENSE.
18. ALL EXISTING IMPROVEMENTS ARE TO BE RESTORED TO THE SATISFACTION OF THE CITY OF VANCOUVER.
19. FIGURED DIMENSIONS SHALL GOVERN OVER SCALED DIMENSION.
20. FOR ANY QUESTIONS, PROPOSED CHANGES, OR CONSTRUCTION ISSUES, CONTACT
21. FOR REMOVAL OF STREET FURNITURE, CONTACT STREET FURNITURE COORDINATOR AT street.furniture@vancouver.ca A MINIMUM OF 4 WEEKS PRIOR TO CONSTRUCTION.

B. ROADWORK NOTES

1. OFFSITE ROADWORKS TO BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF VANCOUVER DESIGN GUIDELINES, CONSTRUCTION SPECIFICATIONS, AND STANDARD DETAIL DRAWINGS.
2. ALL MANHOLE COVERS, VALVE COVERS, CATCHBASIN RIMS, AND LIDS OF ANY OTHER STRUCTURE OR UTILITY ARE TO BE ADJUSTED TO SUIT FINAL GRADES.
3. ALL LOOSE AND ORGANIC MATERIALS ARE TO BE EXCAVATED AND REMOVED FROM ROADWAY AS APPROVED BY THE ENGINEER PRIOR TO PLACING OF ANY ROAD GRAVELS.
4. ALL SUBGRADES TO BE COMPACTED TO 95% MODIFIED PROCTOR DENSITY, AS WELL AS ALL GRANULAR SUBBASE AND BASE MATERIALS.
5. CHANGES IN GRADE ARE TO BE FORMED WITH SMOOTH CURVES.
6. TESTING OF ROAD MATERIALS AND COMPACTION TO BE COMPLETED IN ACCORDANCE WITH THE CITY'S CONSTRUCTION SPECIFICATIONS.
7. CONTACT MINIMUM 2 WEEKS IN ADVANCE OF ANY SIDEWALK OR MEDIAN CONCRETE WORK TO OBTAIN SIGN-POLE SLEEVES/BASES AND CONFIRM LOCATIONS.
8. FOR ALL CURB RAMPS, CONTACT TO HAVE CREWS GHOST IN CROSSWALK LOCATIONS.
9. SCORING PATTERNS FOR CURB RAMPS SHALL CONFORM TO CITY STANDARD DETAIL DRAWINGS C8.1, C8.2, C8.3, AND C8.4 AND INDICATE DIRECTION OF TRAVEL IN TO CROSSWALK.
10. INSTALL ALL SIGNAGE, PARKING METER, AND BUS ID SLEEVES AS PER CITY STANDARD DETAIL DRAWINGS C19.1, C19.2, AND C19.3. CONTACT TO OBTAIN SIGN PLAN AND LOCATIONS.
11. TIE-INS TO EXISTING PAVEMENT SHALL BE MADE BY CUTTING BACK THE EXISTING PAVEMENT TO SOUND MATERIAL AS NECESSARY TO PRODUCE A NEAT VERTICAL FACE WITH A STRAIGHT EDGE. PRIOR TO PLACING HOT-MIX ASPHALTIC CONCRETE, EXPOSED PAVEMENT FACES SHALL BE PAINTED WITH LIQUID ASPHALT AND HEATED TO 65 DEGREES CELSIUS. THE FINISHED PAVEMENT SURFACE SHALL BLEND IN SMOOTHLY WITH EXISTING PAVEMENT. ALL PAVEMENTS, BOULEVARDS, ETC. ARE TO BE RESTORED TO ORIGINAL CONDITIONS WHERE NO IMPROVEMENT IS PROPOSED UNDER THIS CONTRACT.
12. LOCATIONS OF DRIVEWAYS, WHEELCHAIR RAMPS, ETC. SHALL BE CONFIRMED IN THE FIELD PRIOR TO CONSTRUCTION OF ANY PROPOSED CONCRETE CURB AND GUTTER AND SIDEWALK.
13. PLACEMENT OF ASPHALTIC CONCRETE AND PORTLAND CEMENT CONCRETE SHALL BE UNDERTAKEN ONLY WHEN WEATHER CONDITIONS ARE IN CONFORMANCE WITH THE CITY OF VANCOUVER SPECIFICATIONS.
14. THE ROAD BASE SHALL EXTEND A MINIMUM OF 0.3m BEYOND THE BACK OF CURB AND GUTTER, WHICHEVER IS GREATER.
15. TESTING WILL BE REQUIRED TO CONFIRM THE SUITABILITY OF THE ROAD STRUCTURE PRIOR TO PAVING IN ACCORDANCE WITH CITY OF VANCOUVER CONSTRUCTION SPECIFICATIONS (2019) AND THE LATEST VERSION OF MMCD.
16. CONTRACTOR TO VERIFY FORM WORK FOR SIDEWALK WITH THE INSPECTOR FOR THE CITY OF VANCOUVER. FORM WORK TO BE APPROVED BY CoV PRIOR TO POURING SIDEWALK.
17. CONTRACTOR TO FIELD VERIFY THAT PROPOSED GUTTER PAN TIE-IN MEETS WITH EXISTING ROADWAY CROSSFALL.
18. DAMAGES TO ANY EXISTING CoV INFRASTRUCTURE ADJACENT TO THE SITE DURING CONSTRUCTION IS TO BE REPLACED TO CURRENT CoV STANDARDS. REPLACEMENT TO BE DETERMINED AT THE SOLE DISCRETION OF THE GENERAL MANAGER OF ENGINEERING SERVICES.

C. STREET TREES:

16. ALL TREE INSTALLATIONS TO BE COMPLETED IN ACCORDANCE WITH THE CITY OF VANCOUVER ENGINEERING DESIGN MANUAL, STANDARD DETAIL DRAWINGS (SDD) AND THE CONSTRUCTION SPECIFICATIONS, UNLESS OTHERWISE NOTED.
17. PRIOR TO CONSTRUCTION, PROTECT ALL EXISTING TREES WITHIN THE CONSTRUCTION AREA WITH TREE PROTECTION FENCING AS OUTLINED IN THE CoV STANDARD DETAIL DRAWINGS.
18. PRIOR TO CONSTRUCTION, IDENTIFY ANY POTENTIAL TREE IMPACTS AND CONTACT CITY OF VANCOUVER PARKS FOR FURTHER DIRECTION.
19. ALL ELECTRICAL CONDUIT TO BE LOCATED AT BACK OF CURB TO ALLOW FOR TREE PLANTING IN BOULEVARD UNLESS OTHERWISE INSTRUCTED.

D. SANITARY SEWER AND STORM SEWER NOTES

1. TWO WEEKS PRIOR TO THE COMMENCEMENT OF ANY GROUND DISTURBANCE WORKS ON THE SITE, THE CONTRACTOR SHALL PRE-LOCATE (EM/GPR OR APPROVED EQUIVALENT), HYDRO-VAC (WHERE REQUIRED), AND MARK THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES ACROSS THE EXTENT OF THE SITE. THE PRE-LOCATION WORKS SHALL BE PERFORMED BY A THIRD PARTY SERVICE LOCATOR. ANY DISCREPANCIES WITH THE INFORMATION SHOWN THAT MAY ALTER THE DESIGN SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
2. HAND DIG WHEN EXCAVATING WITHIN 0.5m OF EXISTING UTILITIES.
3. A MINIMUM OF 1.0m COVER IS REQUIRED OVER STORM AND SANITARY PIPING. THE ENGINEER IS TO BE NOTIFIED OF ANY CHANGES PRIOR TO INSTALLATION.
4. FOR STREET RESTORATION SEE LATEST CoV STANDARD DRAWING G5.1.
5. WHERE SEWER MAIN IS ABANDONED, USE CONTROLLED DENSITY FILL (CDF) AS REQUIRED BY CONTRACT SPECIFICATIONS.
6. ALL STORM AND SANITARY SEWER MAIN DEFLECTIONS ARE TO CONFORM TO HALF OF THE MANUFACTURER'S SPECIFICATIONS.
7. STORM AND SANITARY SEWERS ARE TO BE PVC SDR 28 FOR PIPES LESS THAN 200mm DIAMETER AND PVC SDR 35 FOR 200mm DIAMETER PIPE OR GREATER UNLESS OTHERWISE NOTED.
8. ALL MH BENCHING FOR STORM AND SANITARY SEWERS TO BE FULL HEIGHT BENCHING.
9. FOR CLOSED RAMP (C/R) AND OPEN RAMP (O/R) MANHOLE DROP CONNECTIONS, REFER TO LATEST CoV STANDARD DRAWING DWG S3.1. CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR MANHOLES FOR APPROVAL PRIOR TO CONSTRUCTION.
10. ALL WYES ARE TO BE MANUFACTURED.
11. THE CONTRACTOR MUST PRESSURE TEST AND FLUSH ALL NEW SEWER LINES PRIOR TO TIE-IN PROCEDURES. TESTS ARE TO BE PERFORMED AS PER CITY OF VANCOUVER CONSTRUCTION SPECIFICATIONS. THE CONTRACTOR IS TO PROVIDE THE ENGINEER AND THE CITY ENGINEER WITH THE TEST RESULTS.
12. THE CONTRACTOR IS TO REVIEW THE GEOTECHNICAL REPORT AND DETERMINE IF DEWATERING MEASURES ARE NECESSARY DURING TRENCHING OPERATIONS. THE CONTRACTOR IS TO PROVIDE A COST FOR NECESSARY DEWATERING MEASURES IN THE CONTRACT BID.
13. SANITARY SEWERS ARE TO BE CONSTRUCTED WITH SEALED JOINTS UNLESS NOTED OTHERWISE.
14. SUPPORT OF EXISTING WATER MAINS IS REQUIRED AT ALL CROSSINGS. CONTRACTOR TO SUBMIT DETAIL OF SUPPORT DESIGN TO CITY OF VANCOUVER FOR APPROVAL AT LEAST 2 WEEKS PRIOR TO COMMENCEMENT OF CONSTRUCTION. WATER MAIN SUPPORT DESIGN TO BE SIGNED AND SEALED BY STRUCTURAL ENGINEER.
15. ALL WATER CROSSINGS TO BE WITNESSED BY WW REPRESENTATIVE. CONTRACTOR TO CONTACT CoV WATER REPRESENTATIVE TO BE ON SITE DURING WATER CROSSINGS, AT LEAST 1 WEEK PRIOR TO COMMENCEMENT OF CONSTRUCTION.

E. SEWER SERVICE CONNECTION NOTES

1. RECONNECT ALL SERVICE CONNECTIONS TO NEW PROPOSED MAINS: SANITARY CONNECTIONS TO SANITARY MAIN, STORM CONNECTIONS TO STORM MAINS. COMBINED CONNECTIONS TO STORM MAIN. PER CoV DESIGN STANDARDS.
2. LEAVE 100 COM WYES FOR ALL LOTS. MATCH EXISTING CONNECTION DIAMETER IF LARGER.
3. EXISTING LOT SEWER SERVICE CONNECTIONS ASSUMED TO BE 100ø COMBINED. MATCH EXISTING DIAMETER IF LARGER.
4. TIE EXISTING CB(S) TO PROPOSED STORM SEWER.
5. ALL LOTS AND UTILITY MH(S) HAVE EXISTING SERVICE CONNECTIONS EVEN IF NO CONNECTIONS INFORMATION OR LOCATIONS ARE INDICATED ON THE DRAWING.
6. REFER TO CoV STD DETAIL DWG S7.1 AND S7.2 FOR SERVICE CONNECTION TIE-IN REQUIREMENTS.
7. ALL EXISTING ACTIVE SERVICE CONNECTIONS ARE TO BE MAINTAINED IN FUNCTION DURING CONSTRUCTION, UNLESS DIRECTED BY THE CITY OF VANCOUVER OTHERWISE.
8. "RELAY" OR "RE-CONNECT" EX. SERVICE CONNECTIONS, CB LEADS AND UTILITY DRAINS AS APPROPRIATE PER CURRENT VERSION OF THE CITY OF VANCOUVER STANDARD DETAIL DRAWINGS. "RELAY"= DIG BACK (OUTSIDE MAINLINE TRENCH) TO INTERCEPT EXISTING SERVICE AND LAY EXTENSION BETWEEN EX. AND PROP. SEWER ALIGNMENTS. "RECONNECT"= CUT SERVICE AND TRANSFER TO TO NEW SEWER (WITHIN MAINLINE TRENCH).

F. ENVIRONMENTAL:

1. ALL WORKS TO BE IN COMPLIANCE WITH CITY OF VANCOUVER, BC MINISTRY OF ENVIRONMENT AND FEDERAL FISHERIES REQUIREMENTS.
2. IMMEDIATELY NOTIFY THE ENGINEER OF ANY SUSPECTED ARCHAEOLOGICAL MATERIALS UNCOVERED DURING EXCAVATION.
3. PROVIDE DITCHING, SILT FENCING, AND CATCHBASIN SEDIMENT TRAPS. CONTAINMENT FACILITIES ARE REQUIRED TO PREVENT DISCHARGE OF SEDIMENT FROM WORK AREA.
4. ALL TEMPORARY FILL SLOPES AND STOCK PILES TO BE PROTECTED FROM WEATHER EROSION.
5. ALL EXPOSED SLOPES TO BE PROTECTED FROM WEATHER EROSION AND SEEDED AS SOON AS PRACTICABLE.

REV. NO.	DESCRIPTION	DR	CH	DATE
01	NOTES	TF	AZ	APR 4 2025

CAPSTONE CONSULTING

CLIENT: UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSI"Y BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: GENERAL NOTES

SCALE : 1:750

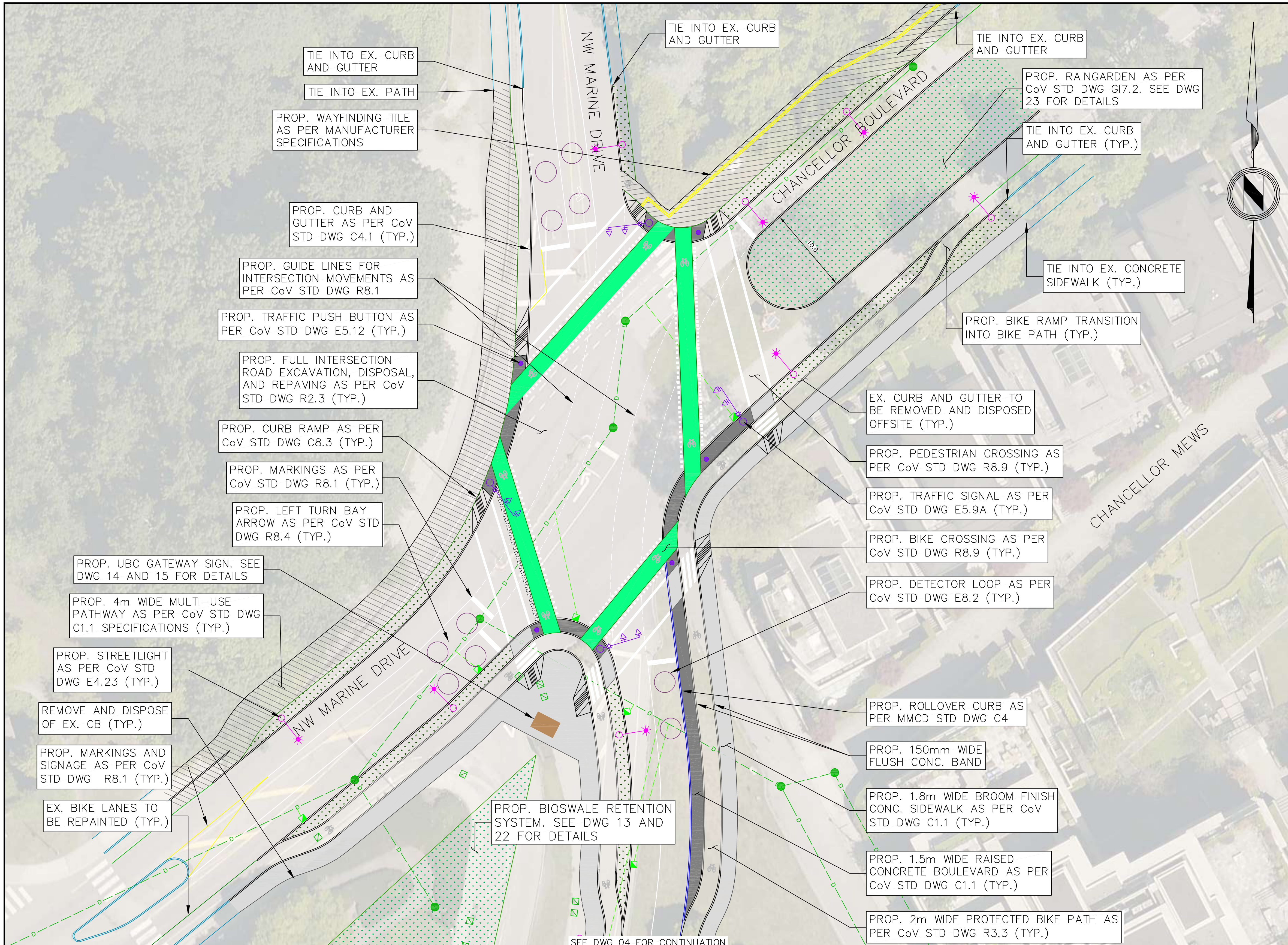
DRAWING NO. 02

DESIGN: ALL CHECK: AZ
DRAWN: TF

DRAWING DATE: APRIL 2025

SHEET NO. 02 OF 24 REV. 01

Apr 07 2025 – 2:18pm C:\Users\Ting\Documents\Fourth Year\CIVL 446\Design Corridor_TF_Rev5.dwg/Notes Ting



LEGEND

PROPOSED CURB & GUTTER	
PROPOSED ROLLOVER CURB & GUTTER	
PROPOSED FLUSH CONCRETE STRIP	
PROPOSED CONCRETE SIDEWALK	
PROPOSED MULTI-USE PATHWAY	
PROPOSED CONCRETE BOULEVARD	
PROPOSED GRASS BOULEVARD	
PROPOSED GREEN INFRASTRUCTURE	
PROPOSED BIKE CROSSING	
PROPOSED WAYFINDING STRIP	
PROPOSED BIKE LANE SYMBOL	
PROPOSED BIKE LANE PAINT	
PROP. YELLOW PAVEMENT MARKINGS	
EXIS. STORM SEWER	
PROP. CB LEAD	
EXIS. STORM MH	
PROP./ EXIS. CB	
EXIS. CURB AND GUTTER	
EXIS. SIDEWALK	
PROP. TRAFFIC LIGHT	
PROP. TRAFFIC PUSH BUTTON	
PROP STREETLIGHT	
PROP. U/G DETECTOR LOOPS	

NOTES:

1. SEE DWG 21 – 24 FOR ALL STANDARD DETAILS.
2. SEE DWG 05 – 11 FOR GRADING DESIGN AND ROAD CROSS SECTIONS.
3. THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK.

REV. NO.	DESCRIPTION	DR	DATE
01	PROJECT KEY PLAN	SI	DEC 6 2024
02	DETAILED DESIGN KEY PLAN	AZ	APR 7 2025

CAPSTONE CONSULTING

CLIENT: **UBC CAMPUS AND COMMUNITY PLANNING**
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
UNIVERSITY ENDOWMENT LANDS

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TITLE: **KEY PLAN 1**

DESIGN: AZ CHECK: CM

SCALE : 1:500

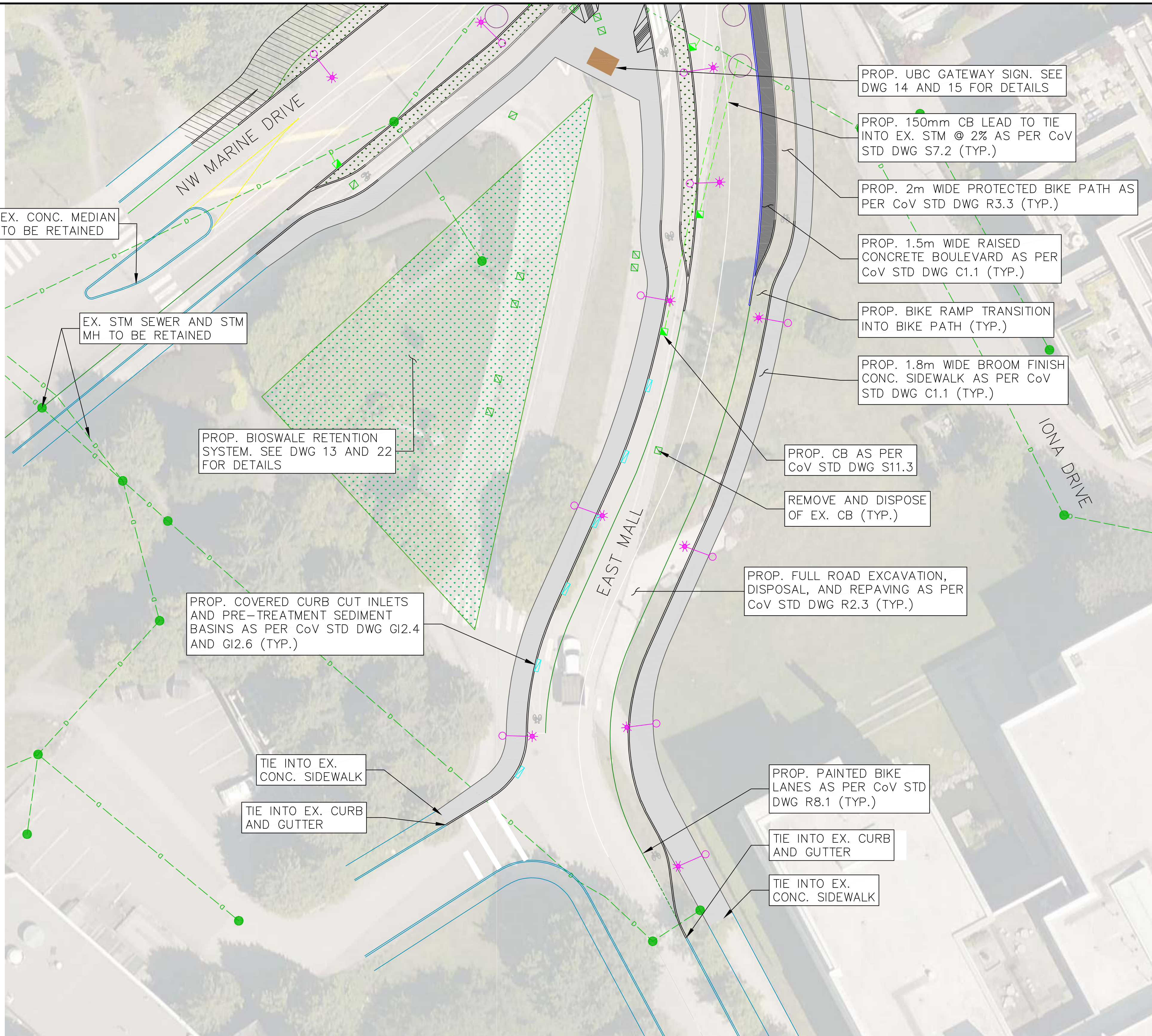
DRAWING DATE: **APRIL 2025**

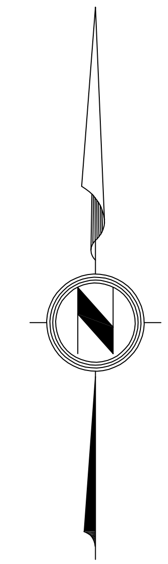
DRAWING NO. **03**

SHEET NO. **03 OF 24**

REV. **02**

SEE DWG 03 FOR CONTINUATION





LEGEND

PROPOSED CURB & GUTTER
PROPOSED ROLLOVER CURB & GUTTER
PROPOSED FLUSH CONCRETE STRIP
PROPOSED CONCRETE SIDEWALK
PROPOSED MULTI-USE PATHWAY
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PROPOSED GRASS BOULEVARD
PROPOSED GREEN INFRASTRUCTURE
PROPOSED BIKE CROSSING
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PROPOSED BIKE LANE SYMBOL
PROPOSED BIKE LANE PAINT
PROP. YELLOW PAVEMENT MARKINGS
EXIS. STORM SEWER
PROP. CB LEAD
EXIS. STORM MH
PROP./ EXIS. CB
EXIS. CURB AND GUTTER
EXIS. SIDEWALK
PROP. TRAFFIC LIGHT
PROP. TRAFFIC PUSH BUTTON
PROP STREETLIGHT
PROP. U/G DETECTOR LOOPS

NOTES:

1. SEE DWG 21 – 24 FOR ALL STANDARD DETAILS.
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REV. NO.	DESCRIPTION	DR	DATE
01	DETAILED DESIGN KEY PLAN	AZ	APR 7 2025

CAPSTONE CONSULTING

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6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
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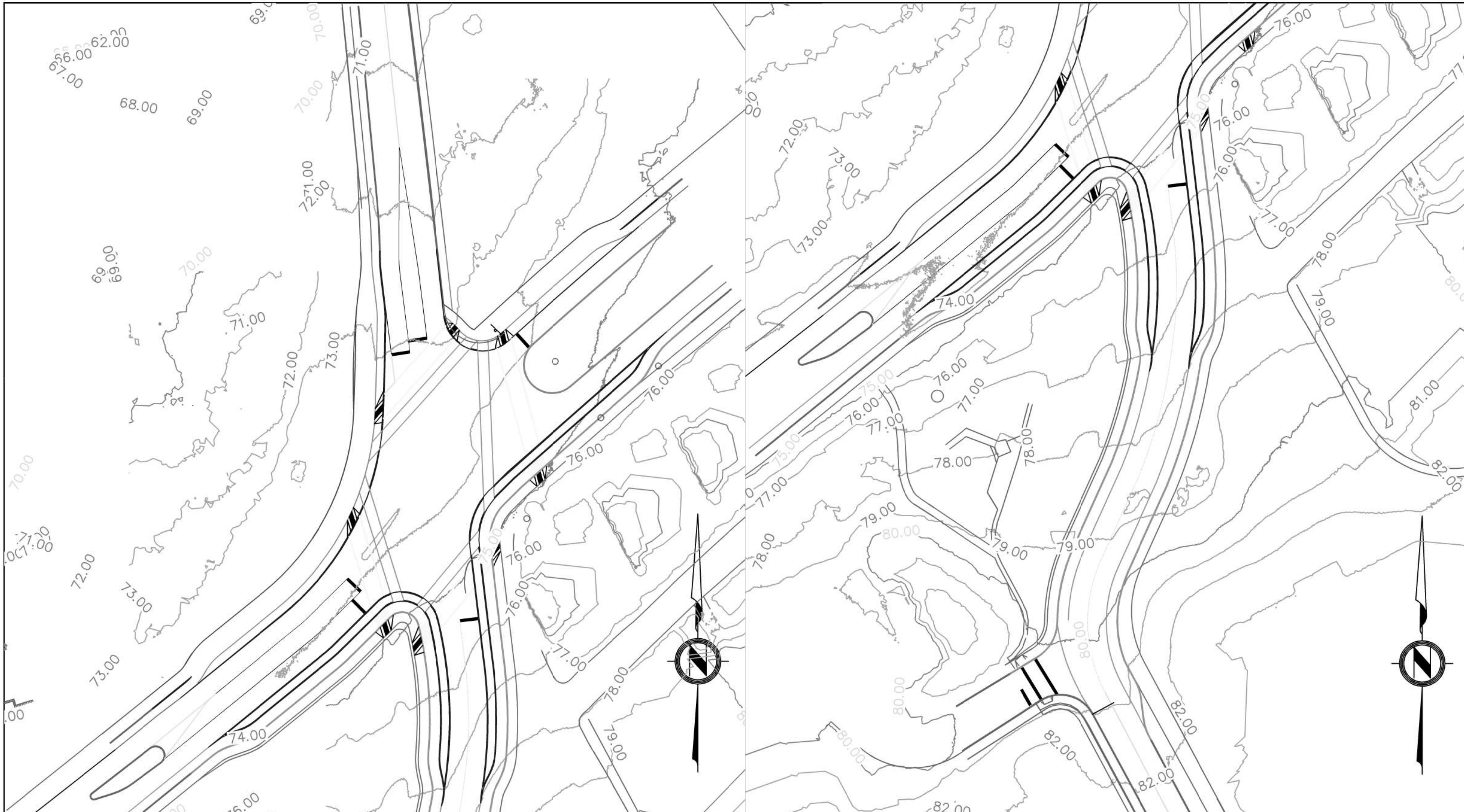
TITLE: **KEY PLAN 2**
SCALE : 1:500
DRAWING NO. 04
DESIGN: AZ CHECK: CM
DRAWING DATE: **APRIL 2025**
SHEET NO. **04 OF 24**
REV. **01**



REV. NO.	DESCRIPTION	DR	CH	DATE
01	GRADING PLAN	TF	AZ	APR 4 2025

CAPSTONE CONSULTING

CLIENT: UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

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TITLE: GRADING

SCALE : 1:1000

DRAWING NO. 05

DESIGN: ALL CHECK: AZ
DRAWN: TF

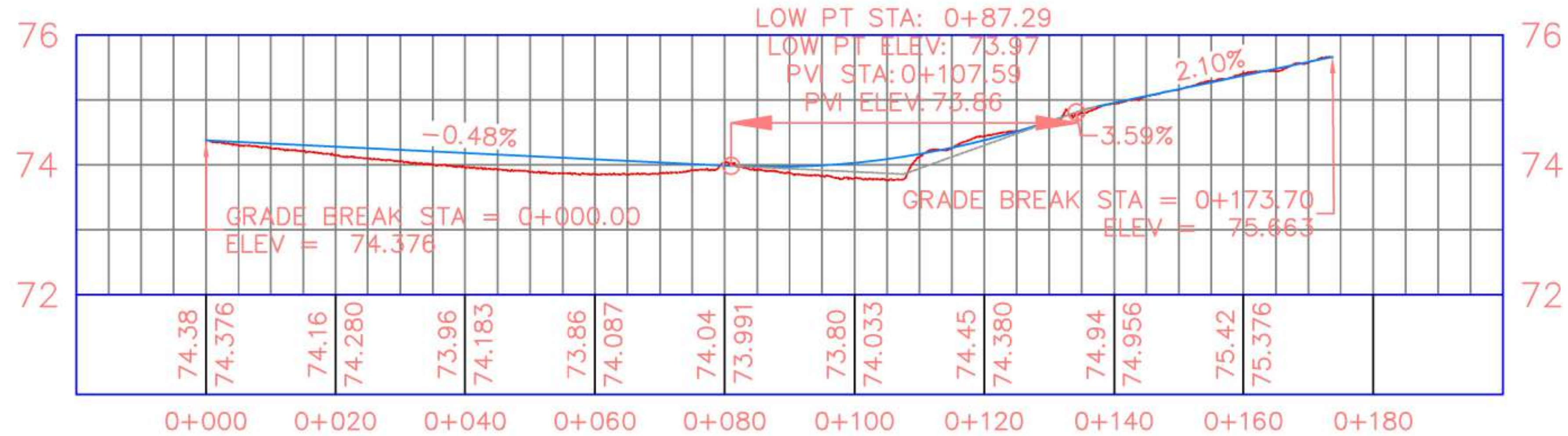
DRAWING DATE: APRIL 2025

SHEET NO. 05 OF 24

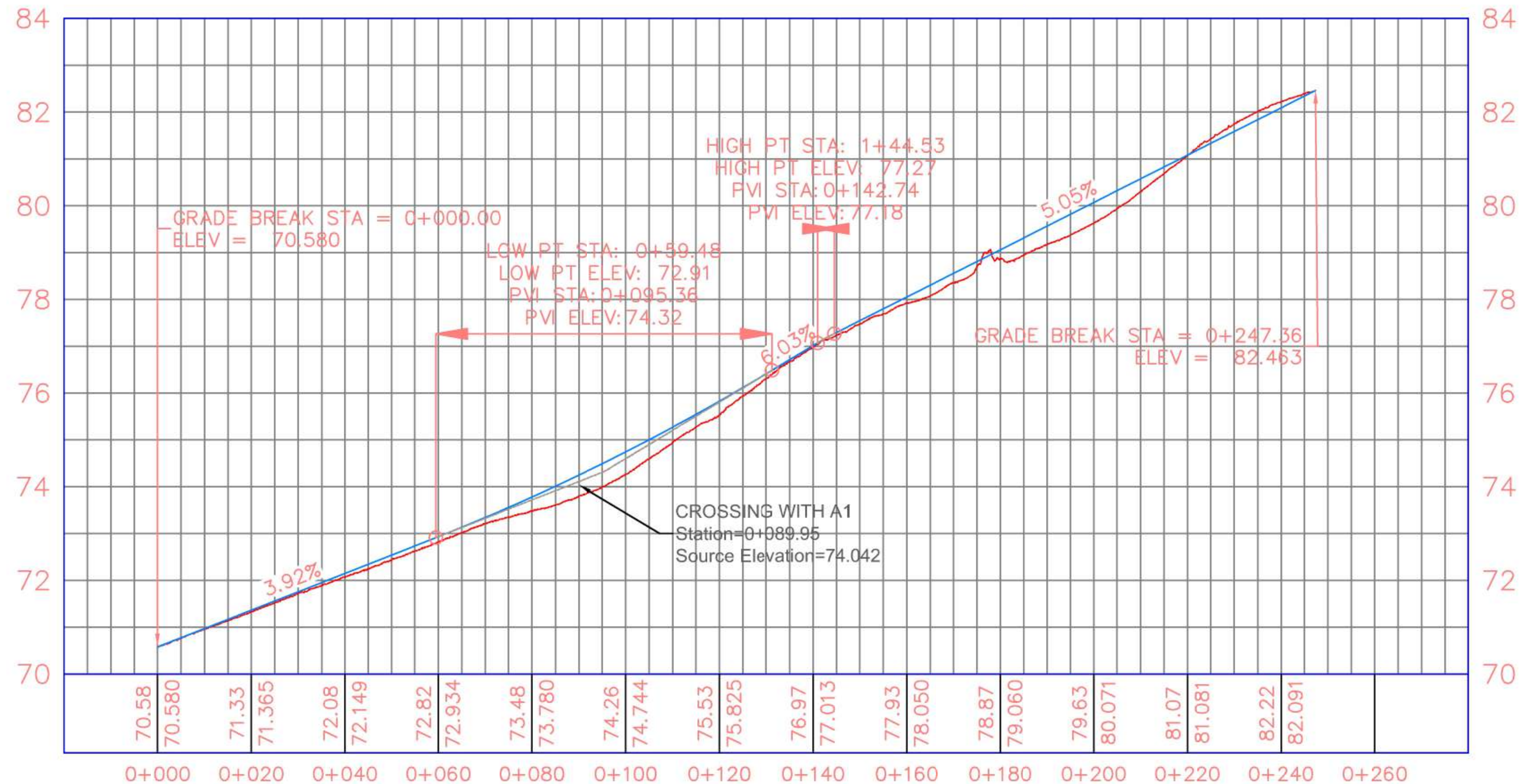
REV. 01

Apr 07 2025 – 12:39pm C:\Users\Ting\Documents\Fourth Year\CIVL 446\Design Corridor_TF_Rev5.dwg/Grading Ting

A1 PROFILE
HORIZONTAL SCALE: 1000
VERTICAL EXAGGERATION (H/V): 10



A2 PROFILE
HORIZONTAL SCALE: 1000
VERTICAL EXAGGERATION
(H/V): 10



REV. NO.	DESCRIPTION	DR	CH	DATE
01	PROFILE VIEW	TF	AZ	APR 4 2025

CAPSTONE CONSULTING

CLIENT:
UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:
CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
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TITLE:
PROFILE VIEW

SCALE : 1:1000

DRAWING NO. 06

DESIGN: ALL CHECK: AZ
DRAWN: TF

DRAWING DATE: APRIL 2025

SHEET NO. 06 OF 24 REV. 01

Apr 07 2025 - 12:42pm C:\Users\Ting\Documents\Fourth Year\CIVL 446\Design Corridor_TF_Rev5.dwg/Profile Ting

REV. NO.	DESCRIPTION	DR	CH	DATE
01	SAMPLE LINE PLAN VIEW	TF	AZ	APR 4 2025

CAPSTONE CONSULTING

CLIENT:
UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:
CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

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TITLE:
SAMPLE LINE - PLAN VIEW

SCALE : 1:1000

DRAWING NO. 07

DESIGN: ALL CHECK: AZ
DRAWN: SI

DRAWING DATE: APRIL 2025

SHEET NO. 07 OF 24

REV. 01

Apr 07 2025 - 12:44pm C:\Users\Ting\Documents\Fourth Year\CIVL 446\Design Corridor_TF_Rev5.dwg/Sample Line View Ting

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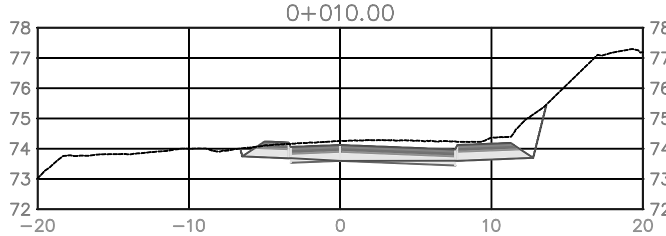

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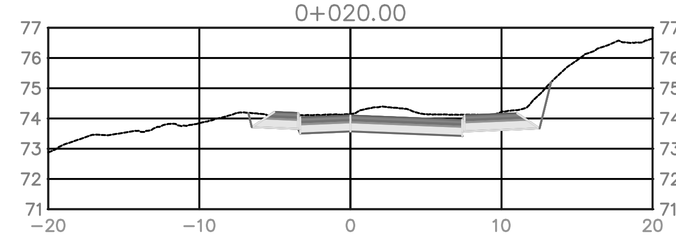

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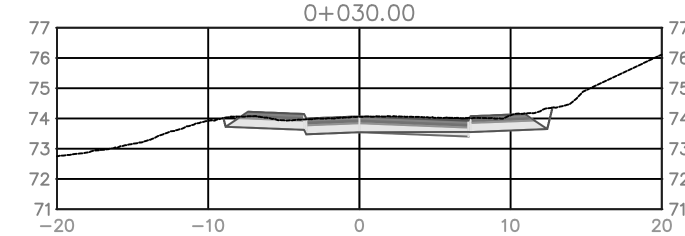

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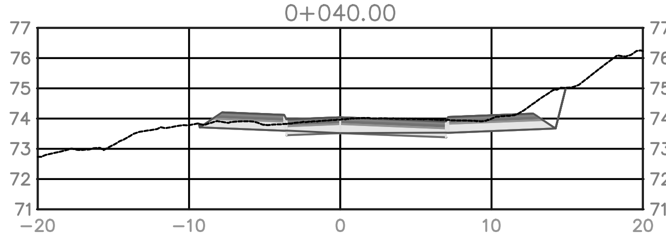

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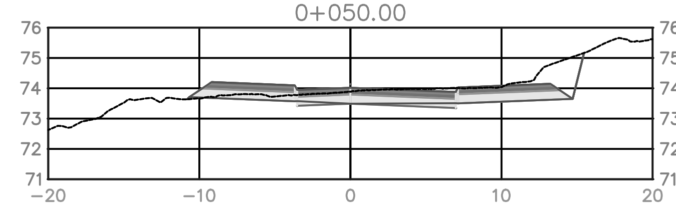

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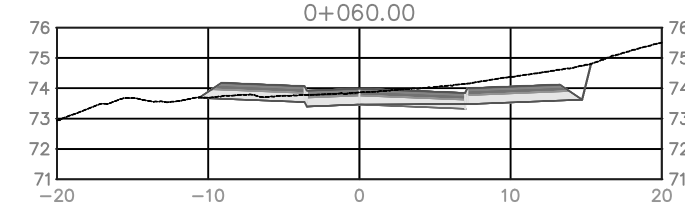

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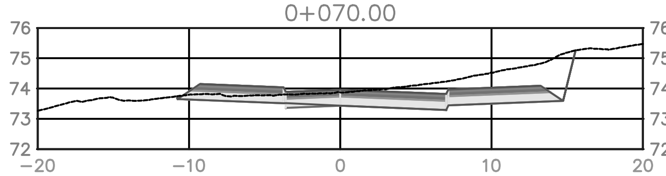

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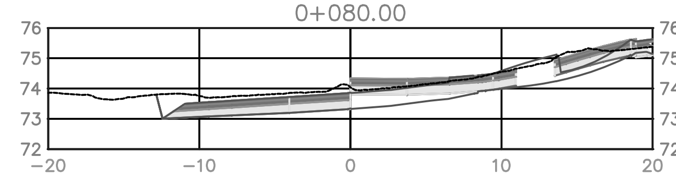

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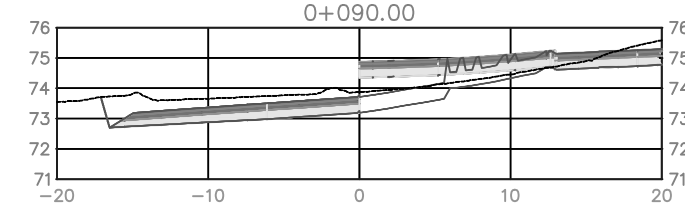

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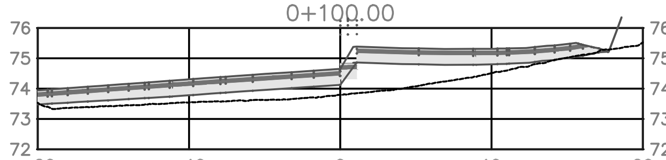

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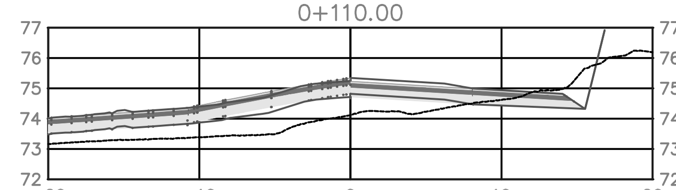

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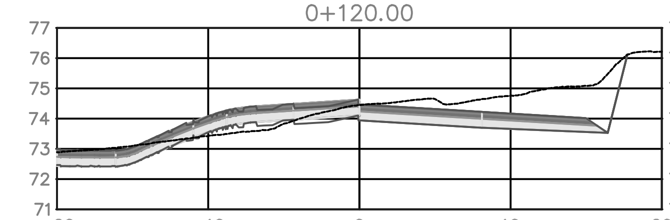

REV. NO.	DESCRIPTION	DR	CH	DATE
01	A1 SECTION VIEW	TF	AZ	APR 4 2025

CAPSTONE CONSULTING

CLIENT: **UBC CAMPUS AND COMMUNITY PLANNING**
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
UNIVERSITY ENDOWMENT LANDS

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TITLE: **A1 SECTION VIEW**

SCALE : 1:750

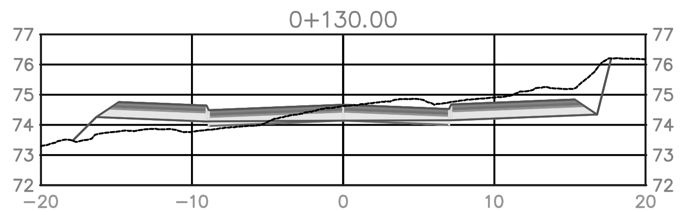
DRAWING NO. 08

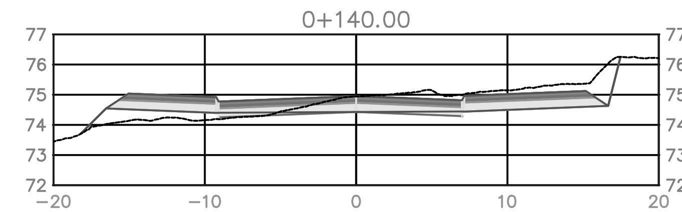
DESIGN: ALL CHECK: AZ
DRAWN: TF

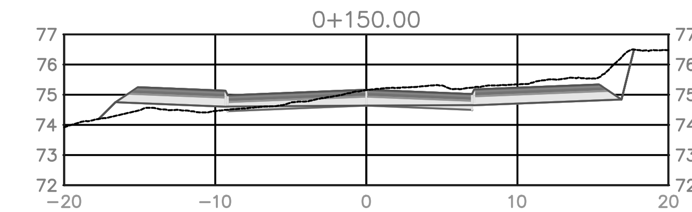
DRAWING DATE: APRIL 2025

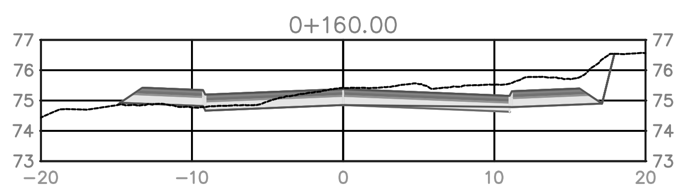
SHEET NO. 08 OF 24

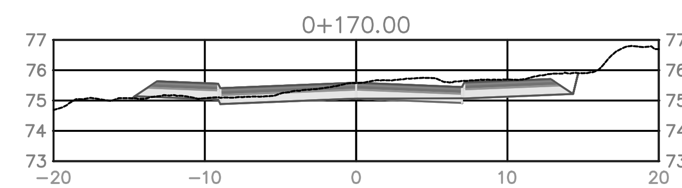
REV. 01











REV. NO.	DESCRIPTION	DR	CH	DATE
01	A1 SECTION VIEW (2)	TF	AZ	APR 4 2025

CAPSTONE CONSULTING

CLIENT: **UBC CAMPUS AND COMMUNITY PLANNING**
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
UNIVERSITY ENDOWMENT LANDS

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TITLE: **A1 SECTION VIEW (2)**

DESIGN: ALL CHECK: AZ
DRAWN: TF

SCALE : 1:750

DRAWING DATE: APRIL 2025

DRAWING NO. 09

SHEET NO. 09 OF 24

REV. 01

Apr 07 2025 – 12:48pm C:\Users\Ting\Documents\Fourth Year\CIVL 446\Design Corridor_TF_Rev5.dwg/A1 Section (2) Ting

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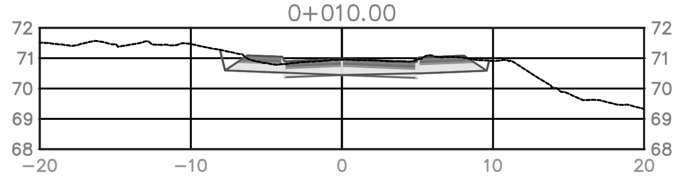

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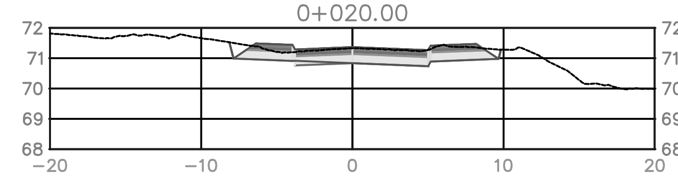

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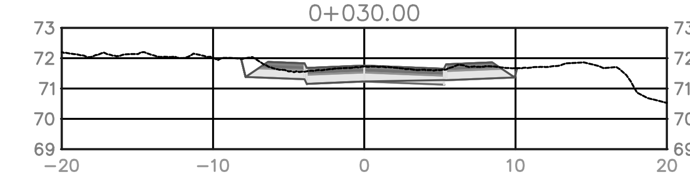

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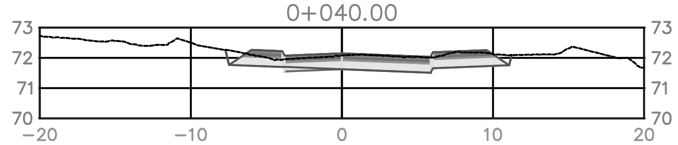

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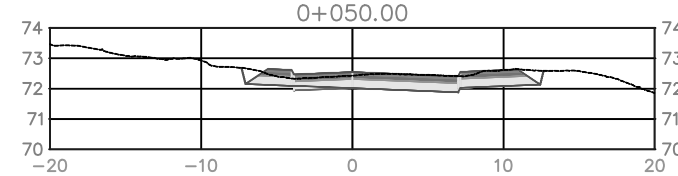

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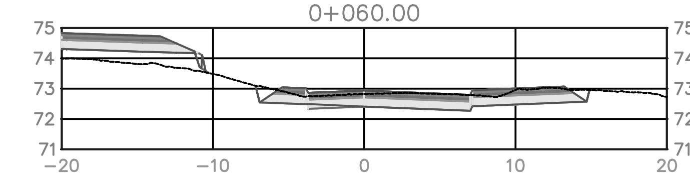

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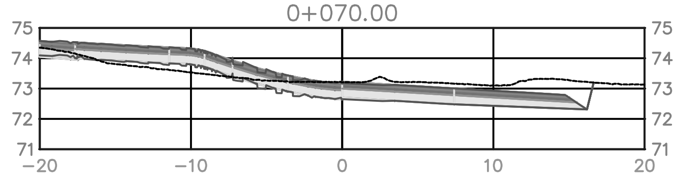

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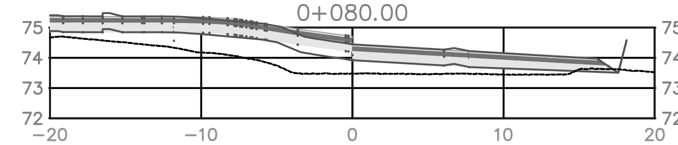

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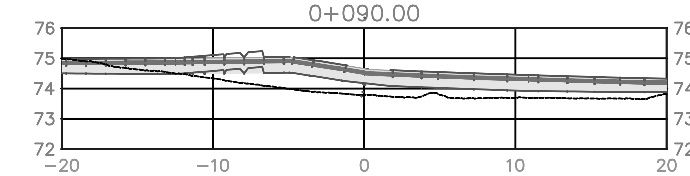

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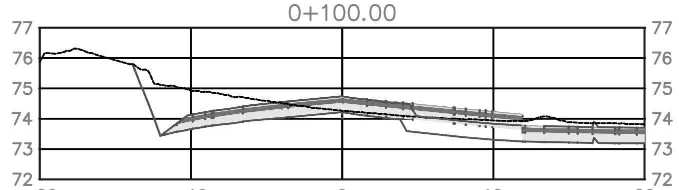

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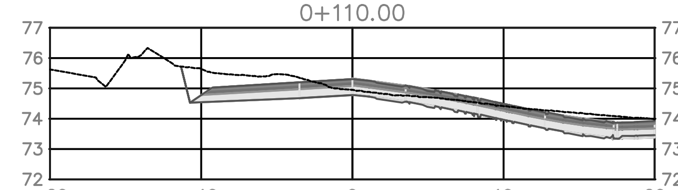

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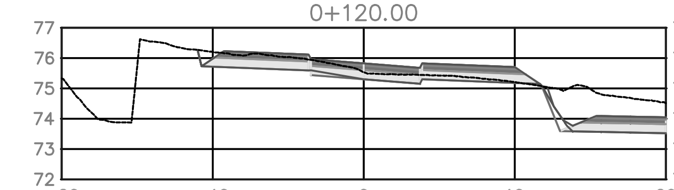

REV. NO.	DESCRIPTION	DR	CH	DATE
01	A2 SECTION VIEW	TF	AZ	APR 4 2025

CAPSTONE CONSULTING

CLIENT:
UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:
CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

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TITLE: **A2 SECTION VIEW**

DESIGN: ALL CHECK: AZ
DRAWN: TF

SCALE : 1:750

DRAWING DATE: APRIL 2025

DRAWING NO. 10

SHEET NO. 10 OF 24

REV. 01

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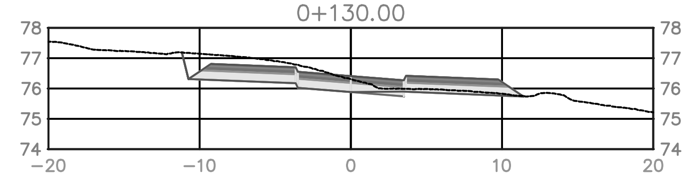

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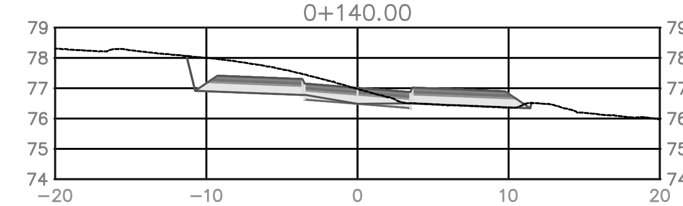

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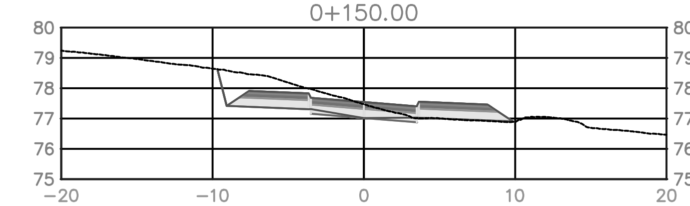

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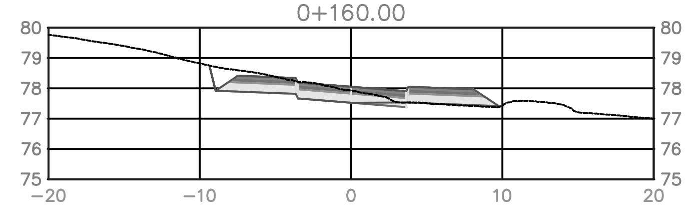

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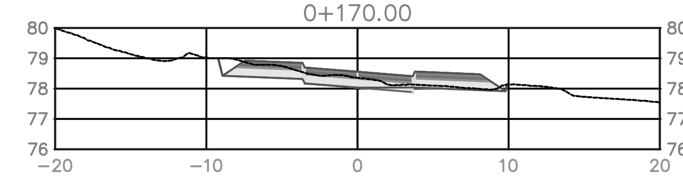

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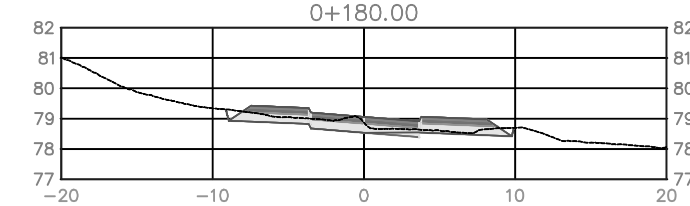

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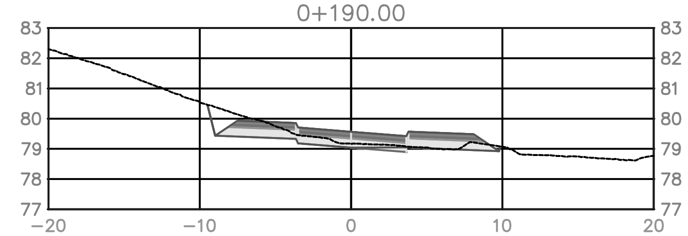

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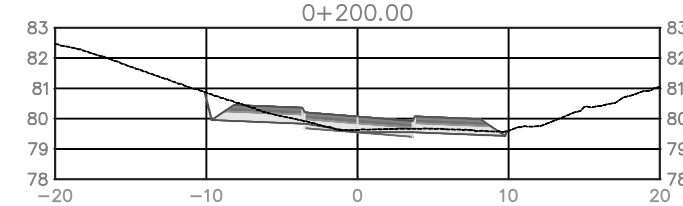

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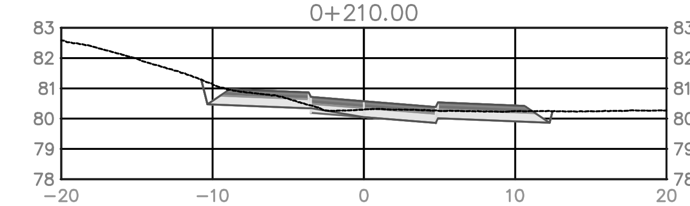

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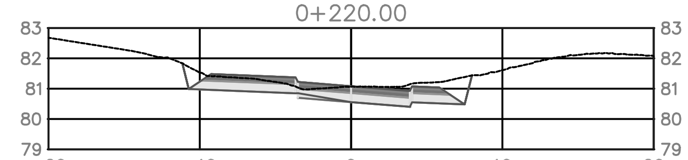

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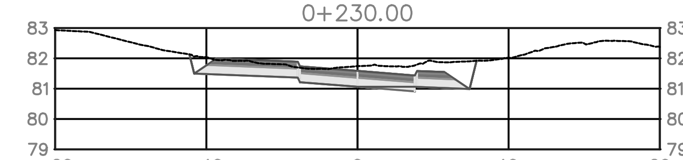

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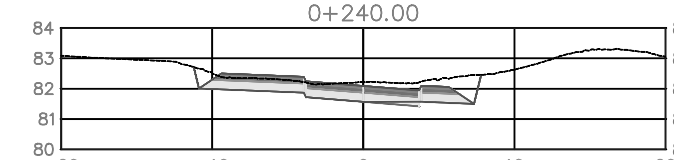

REV. NO.	DESCRIPTION	DR	CH	DATE
01	A2 SECTION VIEW	TF	AZ	APR 4 2025

CAPSTONE CONSULTING

CLIENT:
UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:
CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

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TITLE:
A2 SECTION VIEW (2)

SCALE : 1:1000

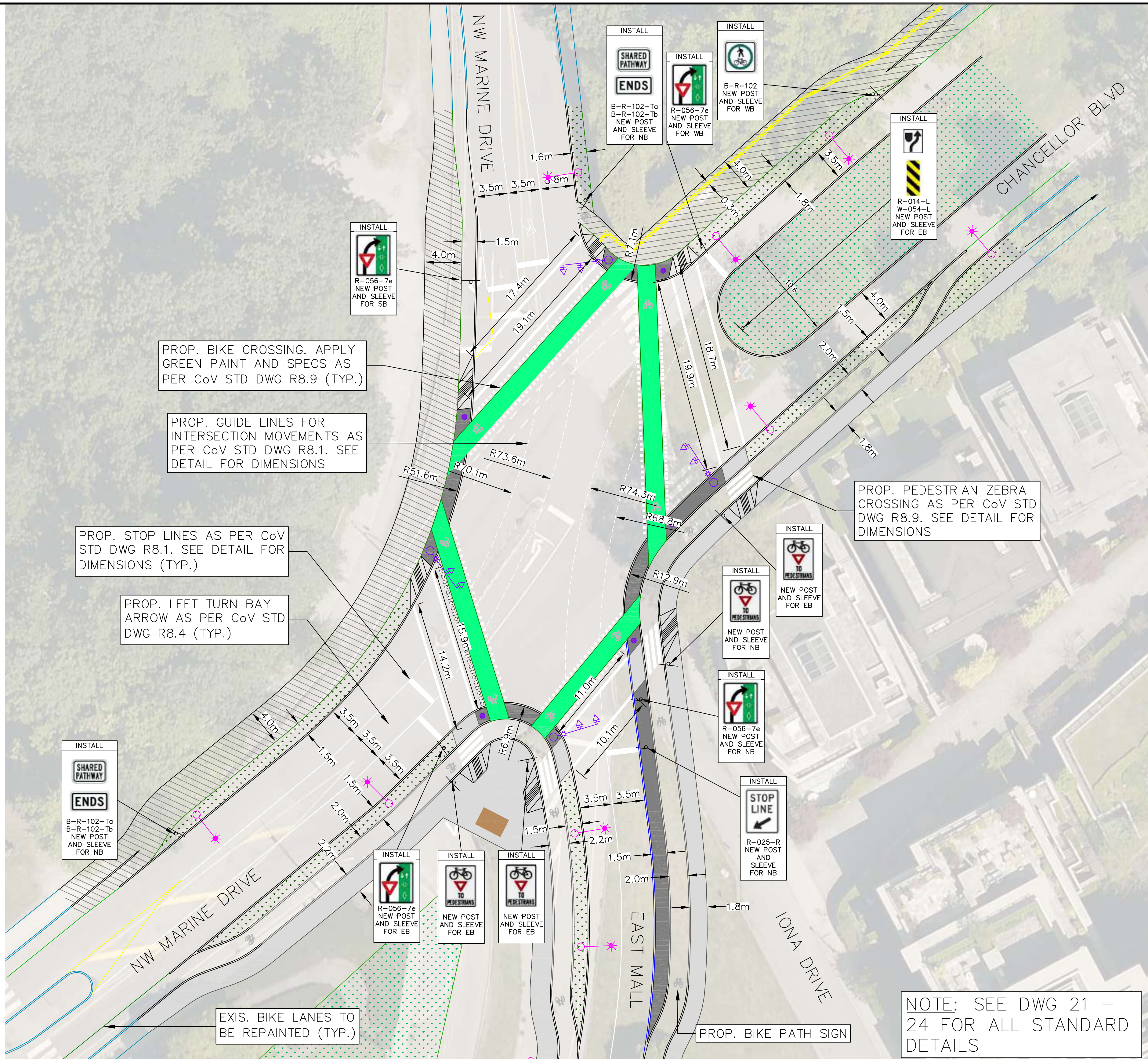
DRAWING NO. 11

DESIGN: ALL CHECK: AZ
DRAWN: TF

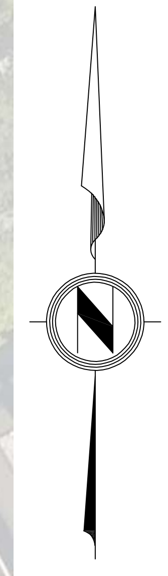
DRAWING DATE: APRIL 2025

SHEET NO. 11 OF 24

REV. 01



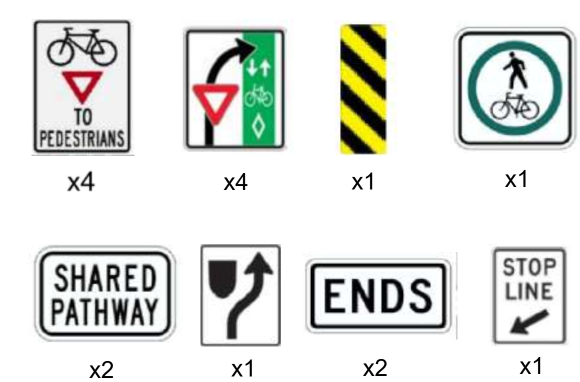
NOTE: SEE DWG 21 – 24 FOR ALL STANDARD DETAILS



LEGEND

- PROPOSED CURB & GUTTER
- PROPOSED ROLLOVER CURB & GUTTER
- PROPOSED FLUSH CONCRETE STRIP
- PROPOSED CONCRETE SIDEWALK
- PROPOSED MULTI–USE PATHWAY
- PROPOSED CONCRETE BOULEVARD
- PROPOSED GRASS BOULEVARD
- PROPOSED GREEN INFRASTRUCTURE
- PROPOSED BIKE CROSSING
- PROPOSED WAYFINDING STRIP
- PROPOSED BIKE LANE SYMBOL
- PROPOSED BIKE LANE PAINT
- PROP. YELLOW PAVEMENT MARKINGS
- EXIS. CURB AND GUTTER
- EXIS. SIDEWALK
- PROP. TRAFFIC LIGHT
- PROP. TRAFFIC PUSH BUTTON
- PROP STREETLIGHT

SIGN INVENTORY



REV. NO.	DESCRIPTION	DR	DATE
01	SIGNAGE AND PAVEMENT PLAN	SI	APR 7 2025

CAPSTONE CONSULTING

CLIENT: **UBC CAMPUS AND COMMUNITY PLANNING**
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
UNIVERSITY ENDOWMENT LANDS

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TITLE: **SIGNAGE AND PAVEMENT PLAN**

SCALE : 1:500

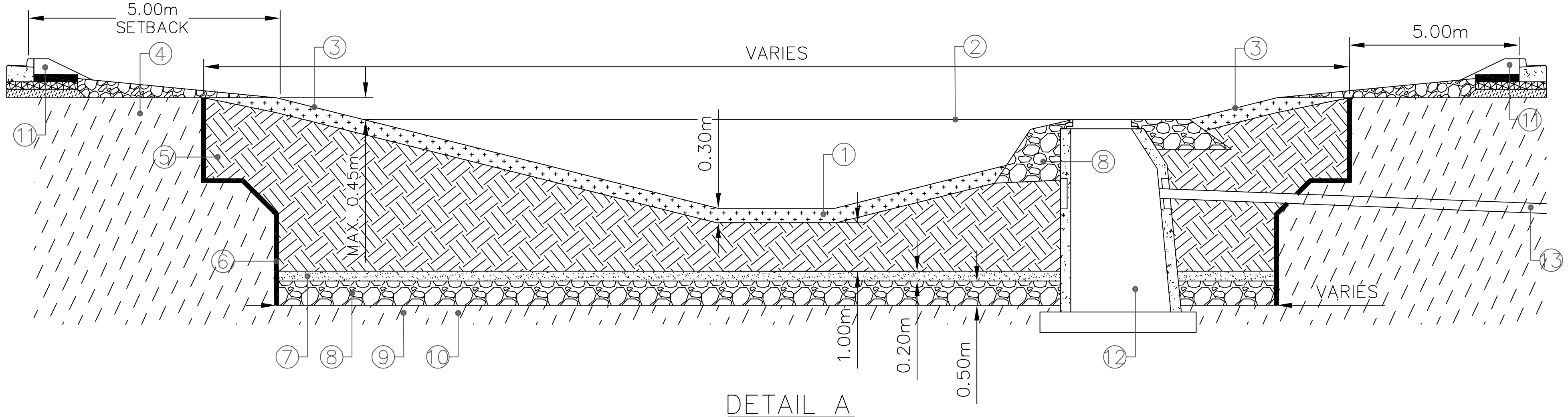
DRAWING NO. 12

DESIGN: SI | CHECK: AZ

DRAWING DATE: APRIL 2025

SHEET NO. 12 OF 24

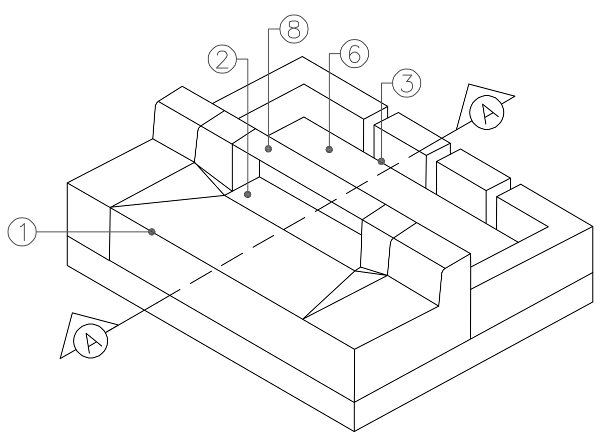
REV. 01



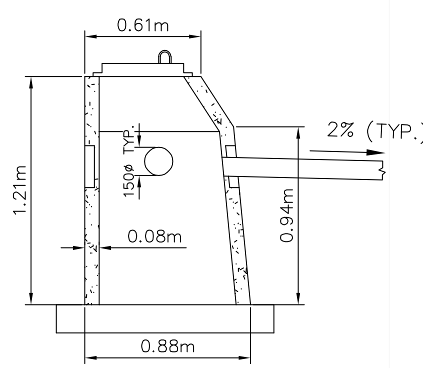
DETAIL A
INFILTRATION SWALE
SCALE: 1:125

DETAIL A LEGEND

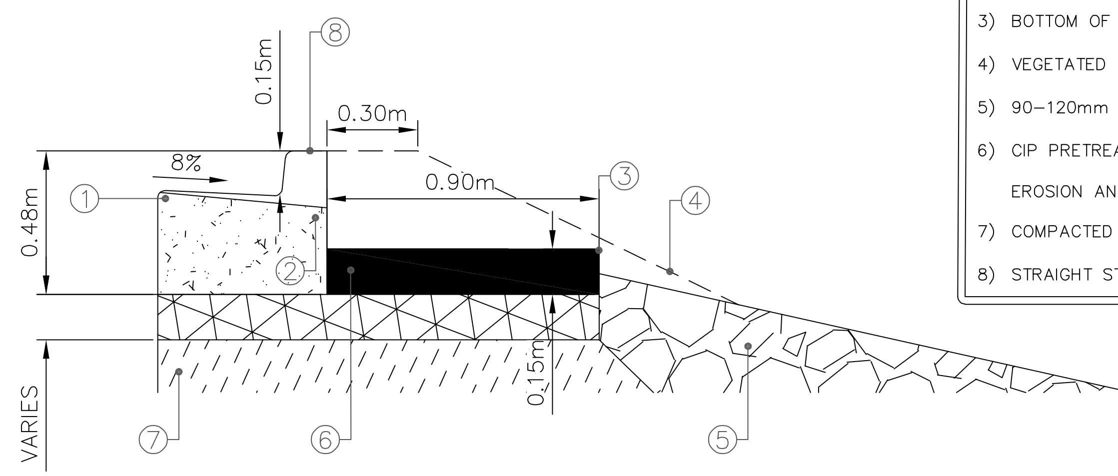
1) SHREDDED WOOD MULCH
2) MAX. PONDING LEVEL
3) TAPER SOIL TO ENSURE A MAX. 200mm DROP FROM SIDEWALK CURB
4) GRANULAR BASE COMPACTED TO 95% MPMDD
5) BIORETENTION SOIL FOR STORAGE
6) NON-PERMEABLE FABRIC FOR RETENTION ELEMENT. FABRIC PER CITY STANDARDS
7) SAND. 20mm CLEAR CRUSH AGGREGATE
8) DRAIN ROCK RESERVOIR COMPRISED OF ROUND RIVER ROCK STONE. 90-120mm
9) INFILTRATION INTO NATIVE SOIL
10) TRENCH SCARIFICATION IN NATIVE SOIL
11) PROP. OPEN COVERED CURB INLET AND PRETREATMENT SEDIMENT BASIN. SEE DETAIL A.
12) PROP. OVERFLOW SUBDRAIN LAWNBASIN. SEE DETAIL C
13) PROP. 200ø CB LEAD TO TIE INTO EXIS. STM @ 2%



DETAIL B
AXONOMETRIC VIEW OF COVERED CURB
INLET AND PETREATMENT SEDIMENT BASIN
SCALE: 1:25



DETAIL C
PRECAST CONCRETE LAWNBASIN
SCALE: 1:25



SECTION A-A
COVERED CURB CUT INLET AND
PRETREATMENT SEDIMENT BASIN
SCALE: 1:25

DETAIL B AND SECTION A-A LEGEND

1) NEW ROAD CURB WITH BASE THICKENED BY 15mm
2) CURB INLET WITH MODIFIED GUTTER PAN
3) BOTTOM OF WEIR NOTCH
4) VEGETATED SLOPE BEYOND INLET AREA DEPENDENT ON SITE CONDITIONS
5) 90-120mm ROUND RIVER ROCK STONE
6) CIP PRETREATMENT SEDIMENT BASIN TO PREVENT BIORETENTION MEDIA EROSION AND REDUCE SEDIMENT ENTERING INTO GI. SEE DETAIL B
7) COMPACTED GRANULAR BASE. REFER TO CoV STD DWG FOR DETAILS
8) STRAIGHT STEEL INLET COVER

REV. NO.	DESCRIPTION	DR	CH	DATE
01	GREEN INFRASTRUCTURE CROSS SECTIONS	AZ	TF	DEC 6 2024
02	GREEN INFRASTRUCTURE CROSS SECTIONS	AZ	TF	APR 7 2025

CAPSTONE CONSULTING

CLIENT:
UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:
CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

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TITLE: **RAINWATER MANAGEMENT DETAILS**

DESIGN: AZ CHECK: TF

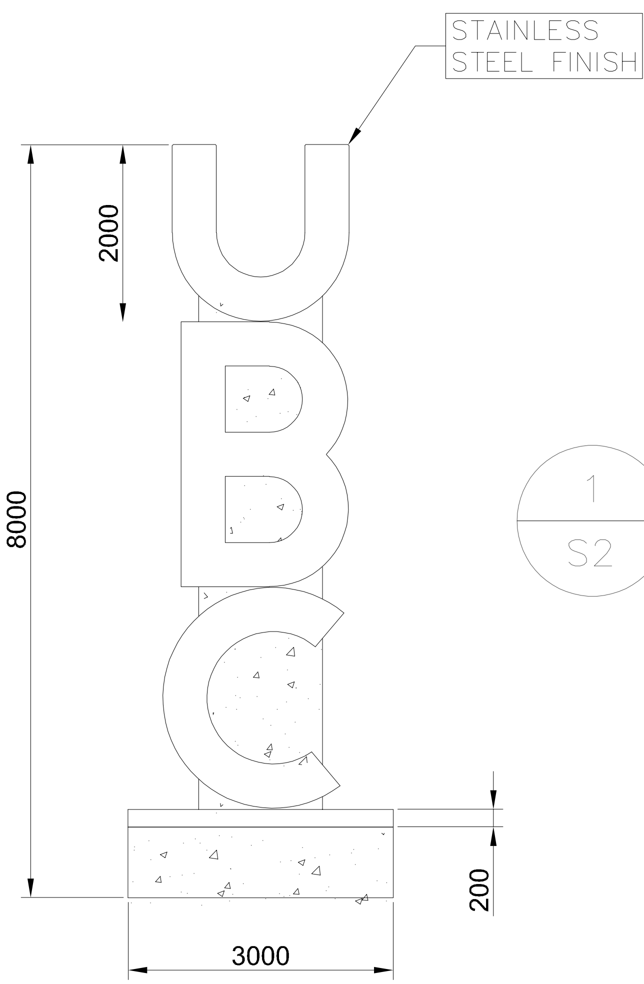
SCALE : VARIES

DRAWING DATE: **APRIL 2025**

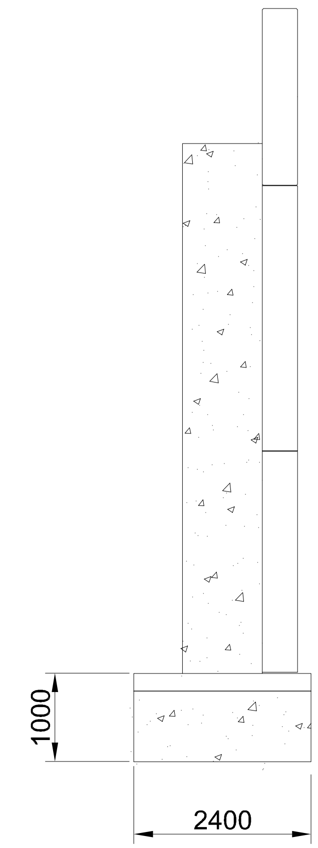
DRAWING NO. **13**

SHEET NO. **13 OF 24**

REV. **02**

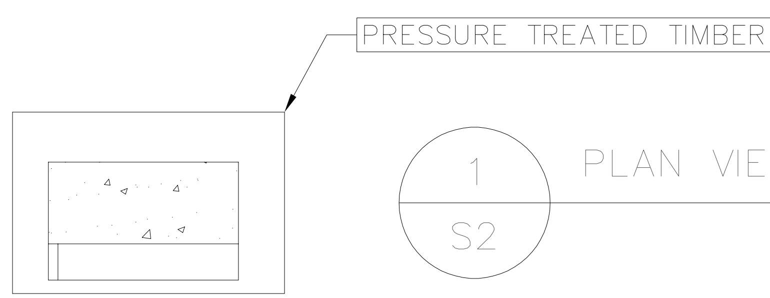


1 / S2 ELEVATION VIEW SOUTH

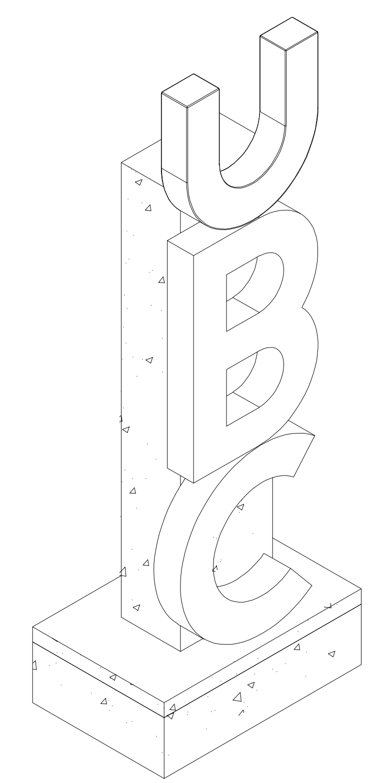


1 / S2 ELEVATION VIEW WEST

NOTES:
1. ALL CONCRETE SHOWN WITH 28-DAY COMPRESSIVE STRENGTH OF 30MPa
2. ALL STEEL REINFORCEMENT BARS HAVE A YIELD STRENGTH OF 400MPa
3. ALL DIMENSIONS SHOWN IN MILLIMETERS
4. PROVIDE MINIMUM 30MM CLEAR COVER
5. FOR GENERAL NOTES REFER TO NOTES PAGE



1 / S2 PLAN VIEW



REV. NO.	DESCRIPTION	DR	CH	DATE
01	GATEWAY SIGN DIMENSIONS	MB	PT	APR 7 2025

CAPSTONE CONSULTING

CLIENT: **UBC CAMPUS AND COMMUNITY PLANNING**
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
UNIVERSITY ENDOWMENT LANDS

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TITLE: **GATEWAY SIGN DIMENSIONS**

SCALE :

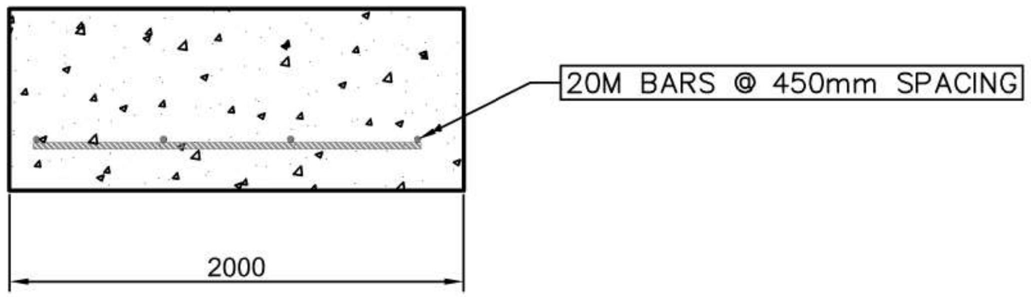
DRAWING NO. 14

DESIGN: PT CHECK: MB

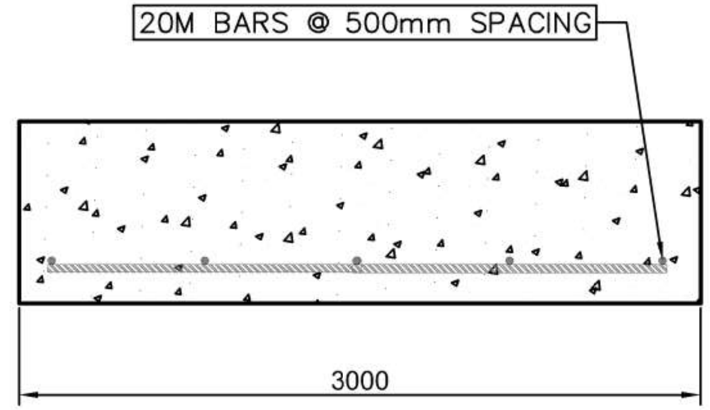
DRAWING DATE: **APRIL 2025**

SHEET NO. **14 OF 24**

REV. **01**

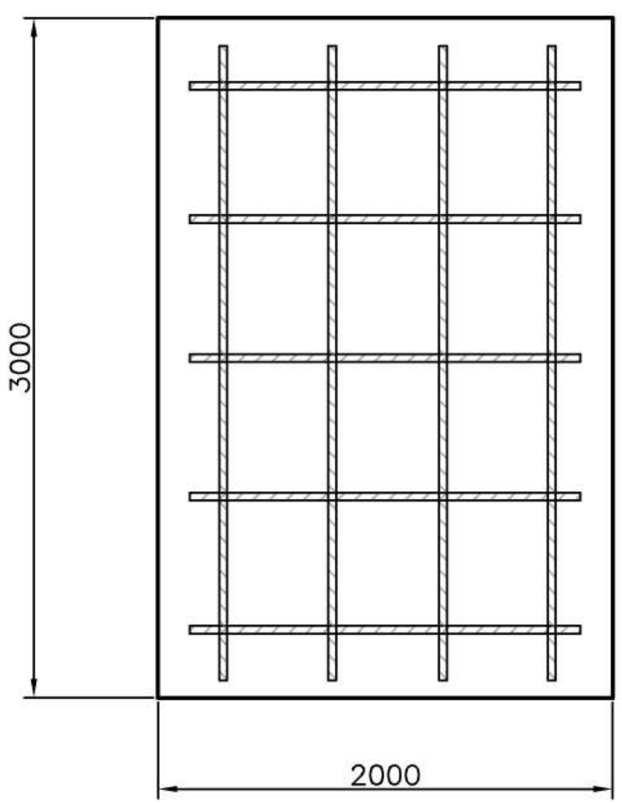


1 / S2 GATEWAY SIGN FOUNDATION CROSS SECTION

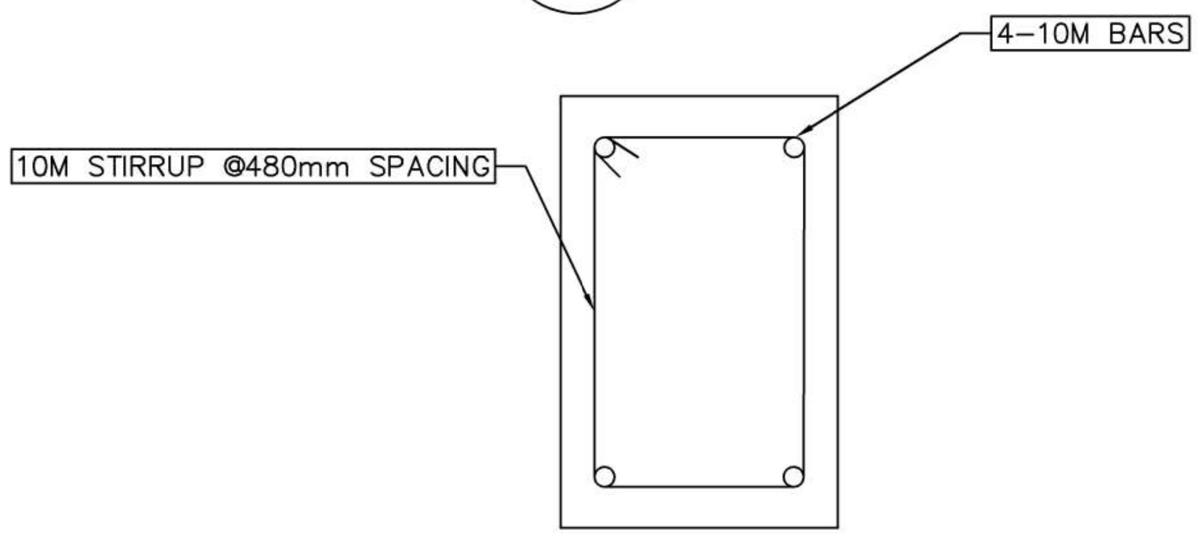


2 / S2 GATEWAY SIGN FOUNDATION CROSS SECTION

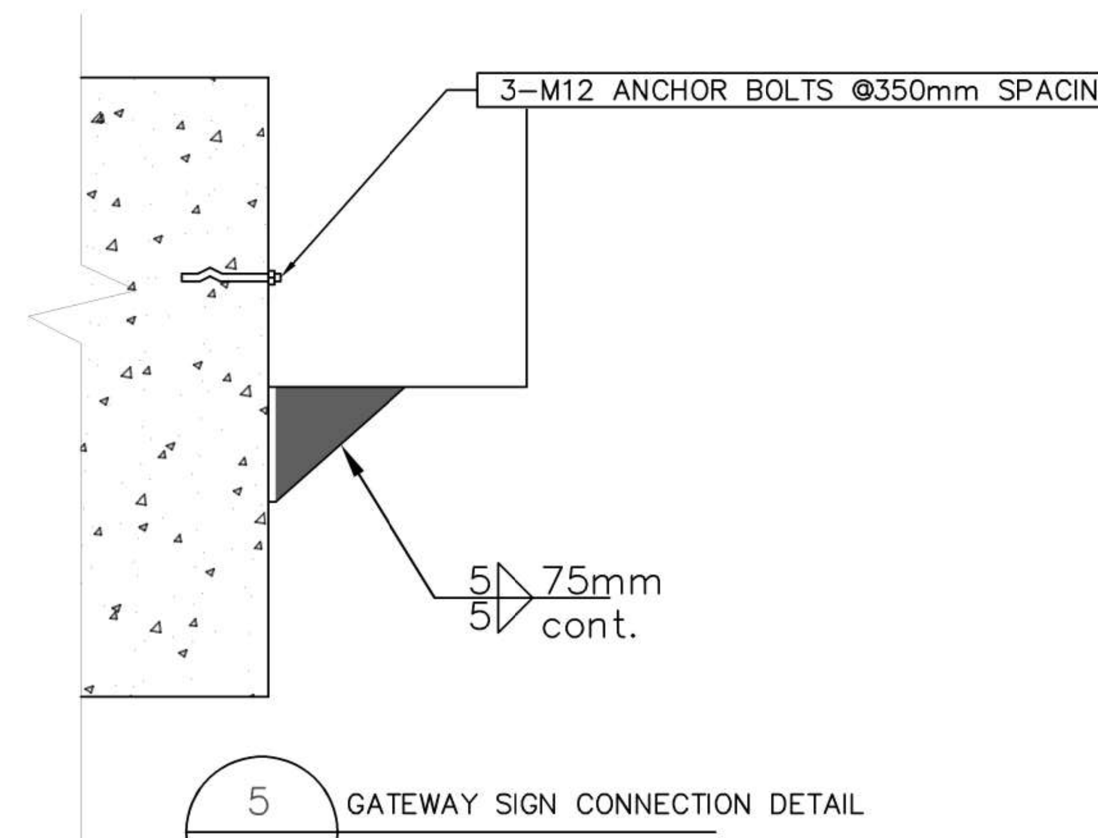
NOTES:
1. ALL CONCRETE SHOWN WITH 28-DAY COMPRESSIVE STRENGTH OF 30MPa
2. ALL STEEL REINFORCEMENT BARS HAVE A YIELD STRENGTH OF 400MPa
3. ALL DIMENSIONS SHOWN IN MILLIMETERS
4. PROVIDE MINIMUM 30MM CLEAR COVER
5. FOR GENERAL NOTES REFER TO NOTES PAGE



3 / S2 GATEWAY SIGN FOUNDATION PLAN VIEW



4 / S2 GATEWAY SIGN COLUMN REINFORCEMENT



5 / S2 GATEWAY SIGN CONNECTION DETAIL

REV. NO.	DESCRIPTION	DR	CH	DATE
01	GATEWAY SIGN DETAILS	MB	AZ	APR 7 2025

CAPSTONE CONSULTING

CLIENT: UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

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TITLE: GATEWAY SIGN DETAILS

DESIGN: MB CHECK: AZ

SCALE : 1:500

DRAWING DATE: APRIL 2025

DRAWING NO. 15

SHEET NO. 15 OF 24

REV. 01

REV. NO.	DESCRIPTION	DR	DATE
01	CONSTRUCTION PHASING	PT	PT MAR27 2025

CAPSTONE CONSULTING

CLIENT:
UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:
CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: **CONSTRUCTION PHASING**

SCALE : 1:750

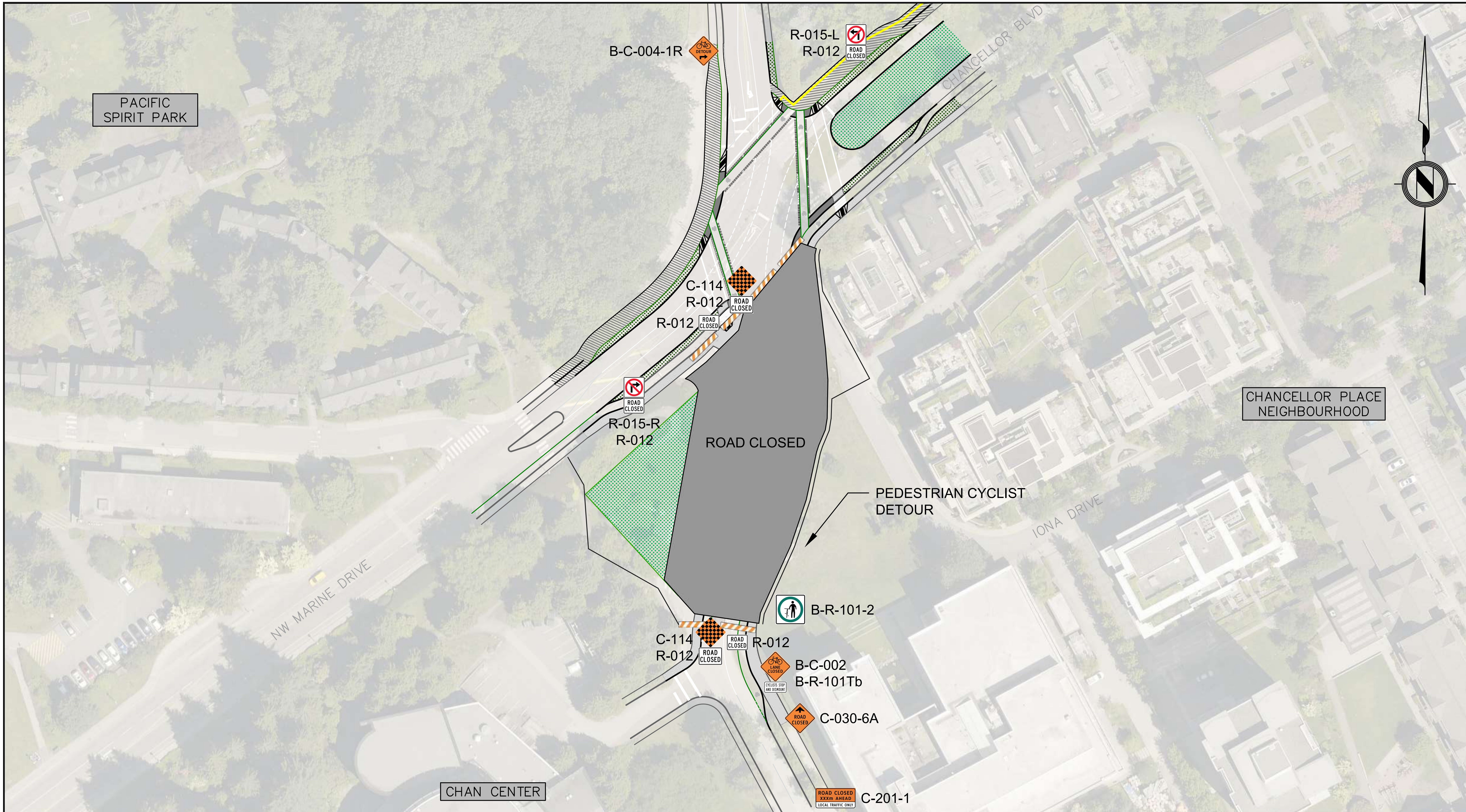
DRAWING NO. 16

DESIGN: PT CHECK: AZ
PT

DRAWING DATE: **APRIL 2025**

SHEET NO. **16 OF 24**

REV. **01**



REV. NO.	DESCRIPTION	DR		DATE
01	TMP PHASE 1 ROAD CLOSURE	PT	PT	APR 6 2025

CAPSTONE CONSULTING

CLIENT: UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

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TITLE: TMP PHASE 1 ROAD CLOSURE

SCALE : 1:750

DRAWING NO. 17

DESIGN: PT CHECK: AZ
PT

DRAWING DATE: APRIL 2025

SHEET NO. 17 OF 24

REV. 01

REV. NO.	DESCRIPTION	DR		DATE
01	TMP PHASE 2 INTERSECTION	PT	PT	APR 6 2025

CAPSTONE CONSULTING

CLIENT: UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

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TITLE: TMP PHASE 2 INTERSECTION

SCALE : 1:750

DRAWING NO. 18

DESIGN: PT CHECK: AZ
PT

DRAWING DATE: APRIL 2025

SHEET NO. 18 OF 24

REV. 01

REV. NO.	DESCRIPTION	DR		DATE
01	TMP PHASE 2 MIDBLOCK	PT	PT	APR 6 2025

CAPSTONE CONSULTING

CLIENT: **UBC CAMPUS AND COMMUNITY PLANNING**
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
UNIVERSITY ENDOWMENT LANDS

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TITLE: **TMP PHASE 2 MIDBLOCK**

SCALE : 1:750

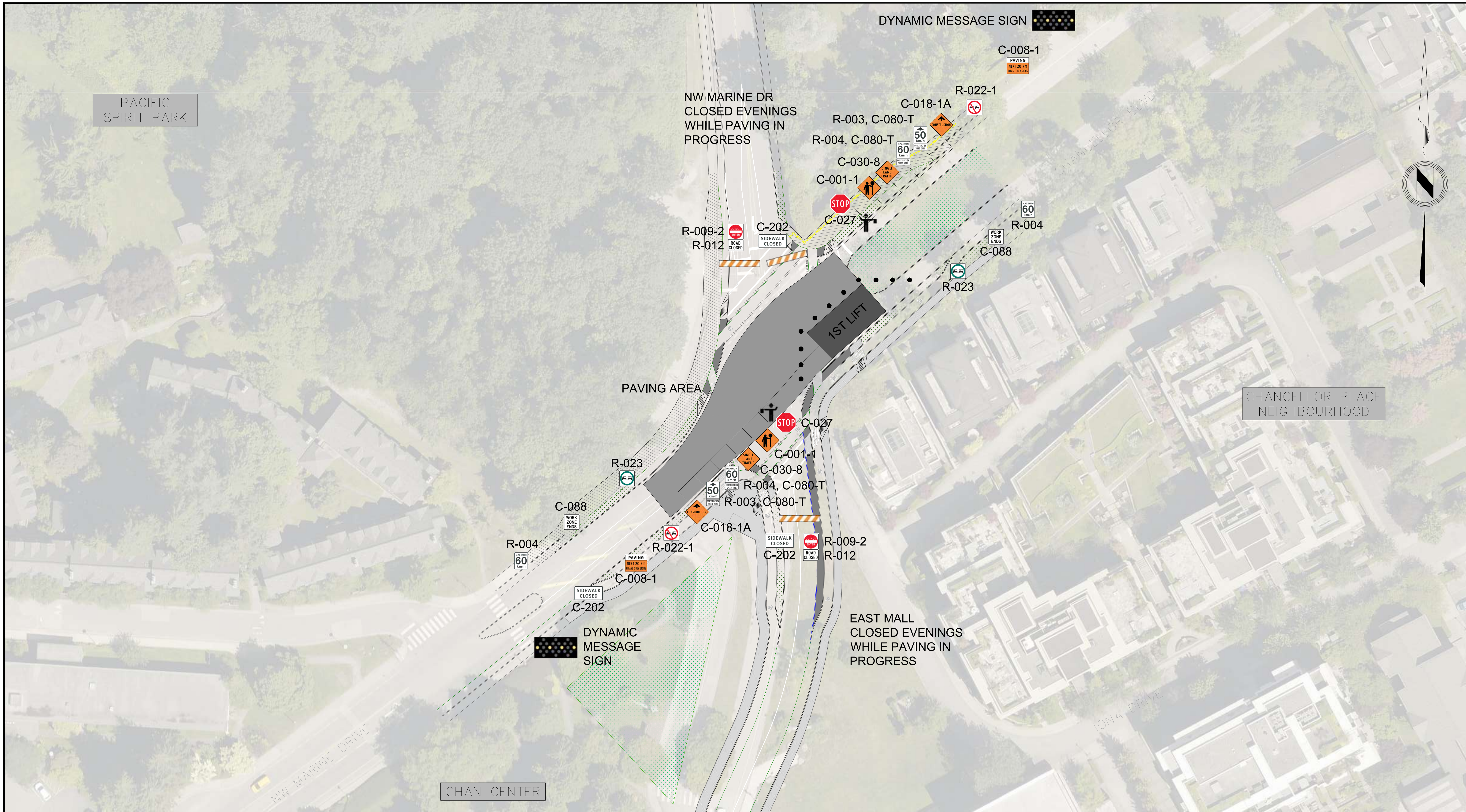
DRAWING NO. 19

DESIGN: PT CHECK: AZ
PT

DRAWING DATE: **APRIL 2025**

SHEET NO. **19 OF 24**

REV. 01



REV. NO.	DESCRIPTION	DR		DATE
01	TMP PHASE 3 TYPICAL	PT	PT	APR 6 2025

CAPSTONE CONSULTING

CLIENT: **UBC CAMPUS AND COMMUNITY PLANNING**
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
UNIVERSITY ENDOWMENT LANDS

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TITLE: **TMP PHASE 3 TYPICAL**

DESIGN: PT CHECK: AZ
PT

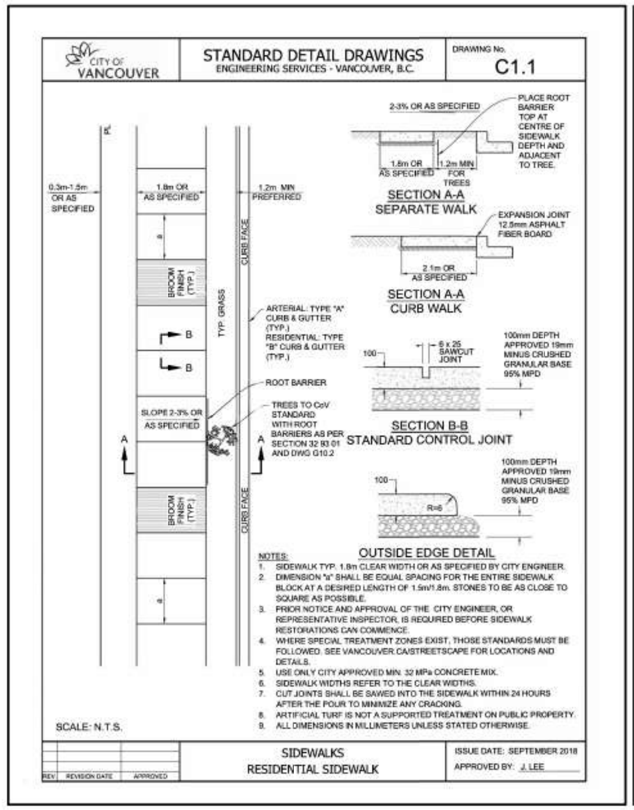
SCALE : 1:750

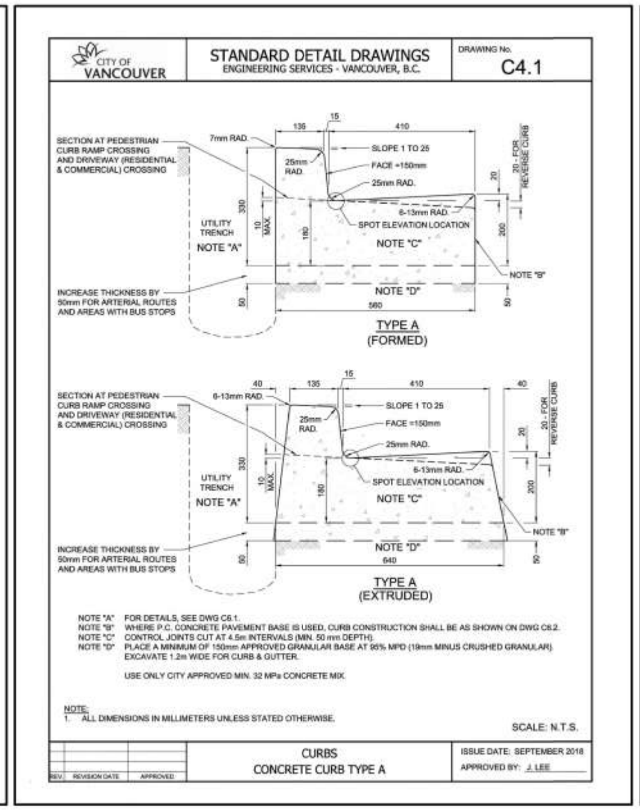
DRAWING DATE: **APRIL 2025**

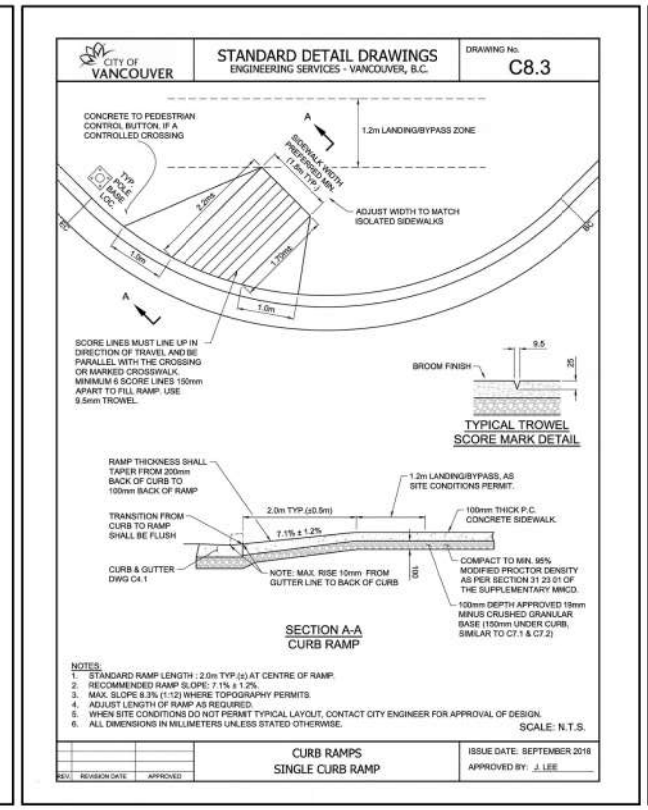
DRAWING NO. **20**

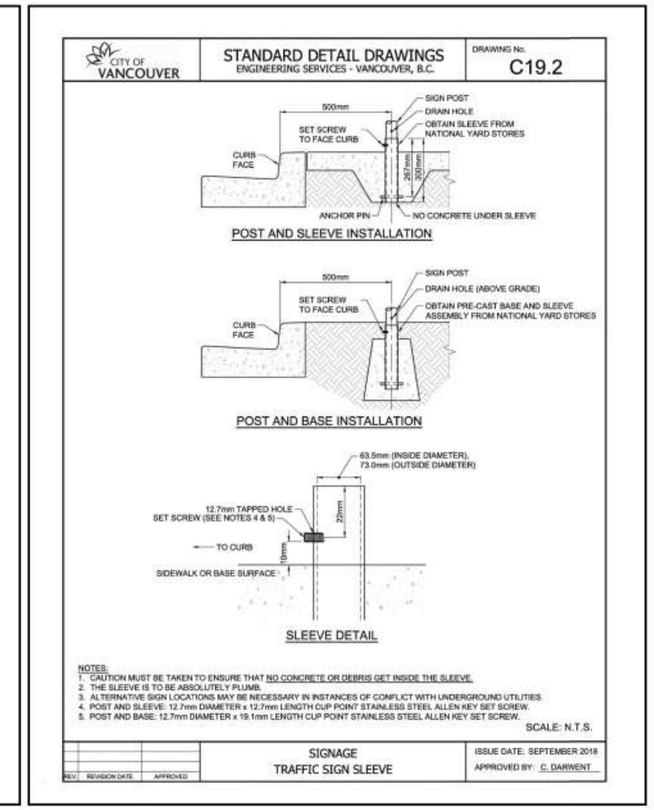
SHEET NO. **20 OF 24**

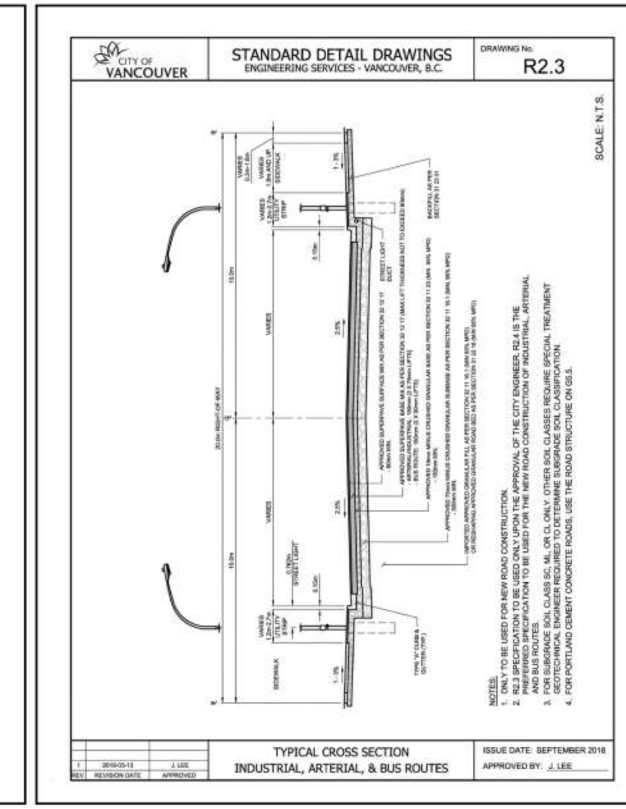
REV. **01**

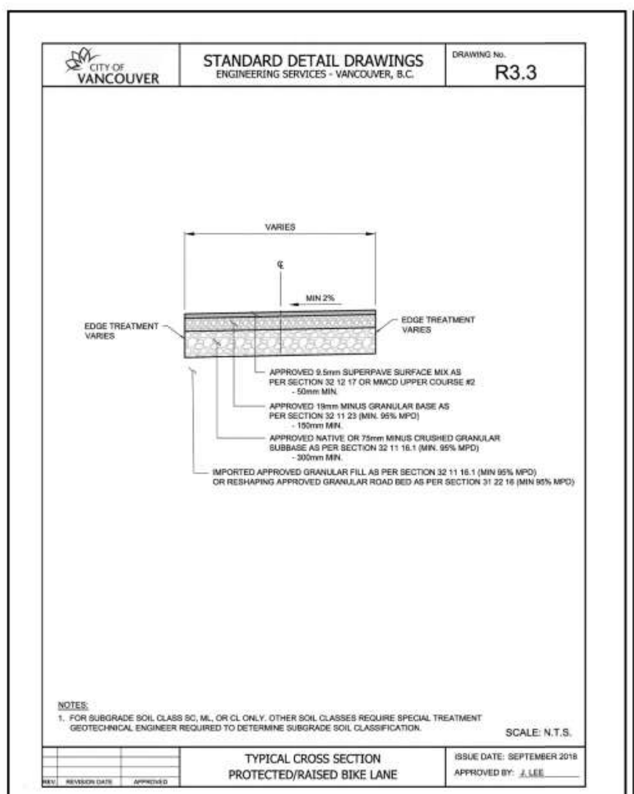


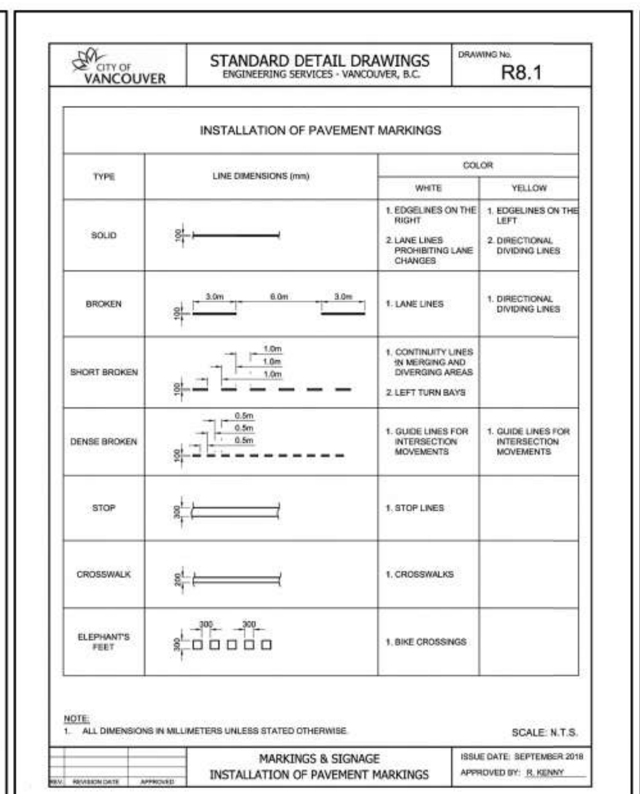


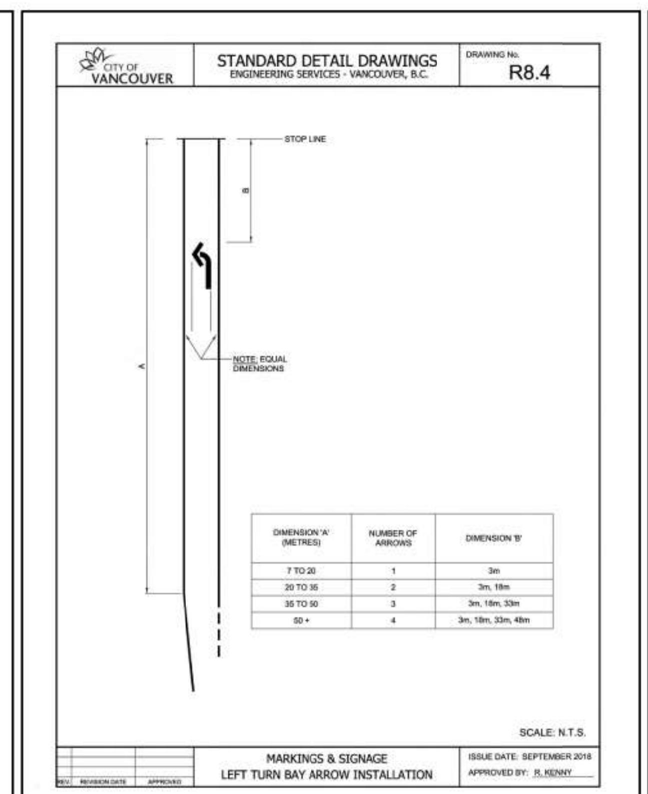


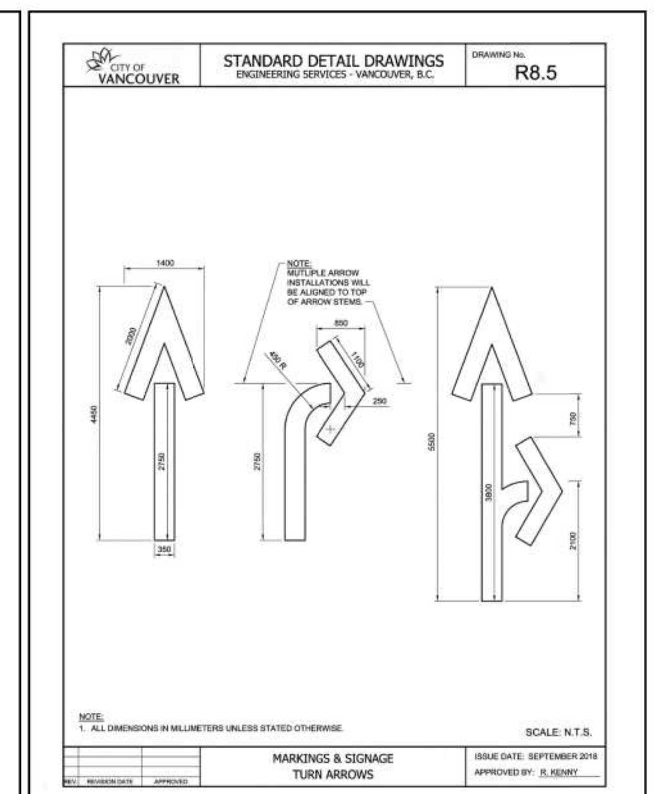


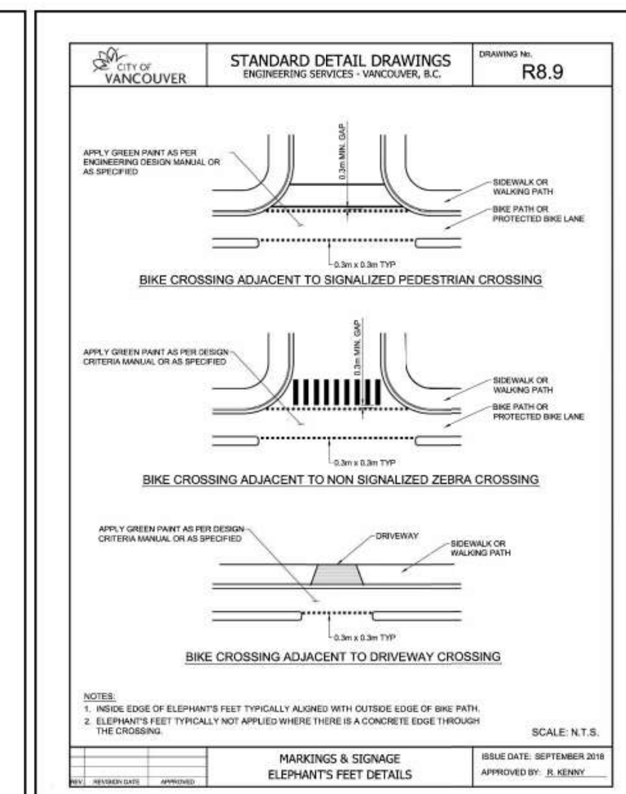












REV. NO.	DESCRIPTION	DR	DATE
01	STANDARD ROADWORKS DETAILS	CM	APR 7 2025

CAPSTONE CONSULTING

CLIENT:
UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:
CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: STANDARD ROADWORKS DETAILS

DESIGN: CM CHECK: AZ

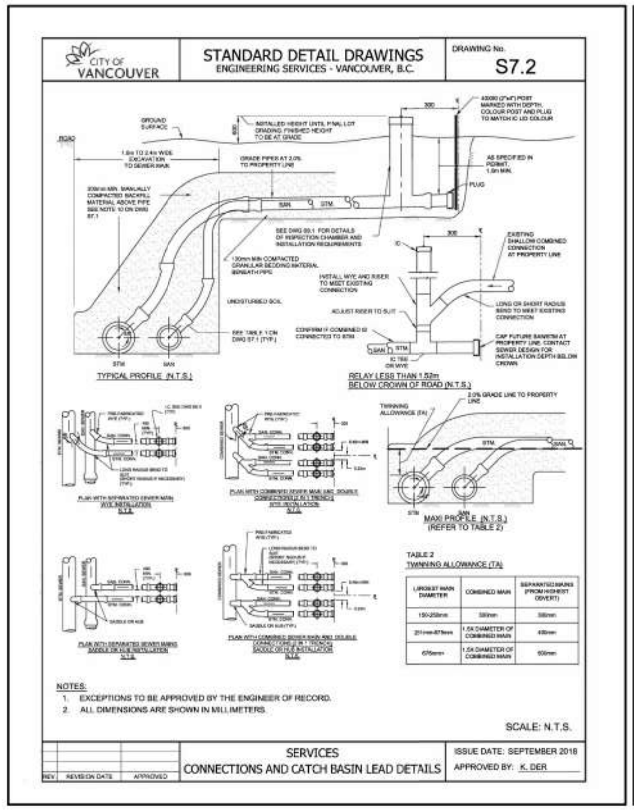
SCALE : 1:960

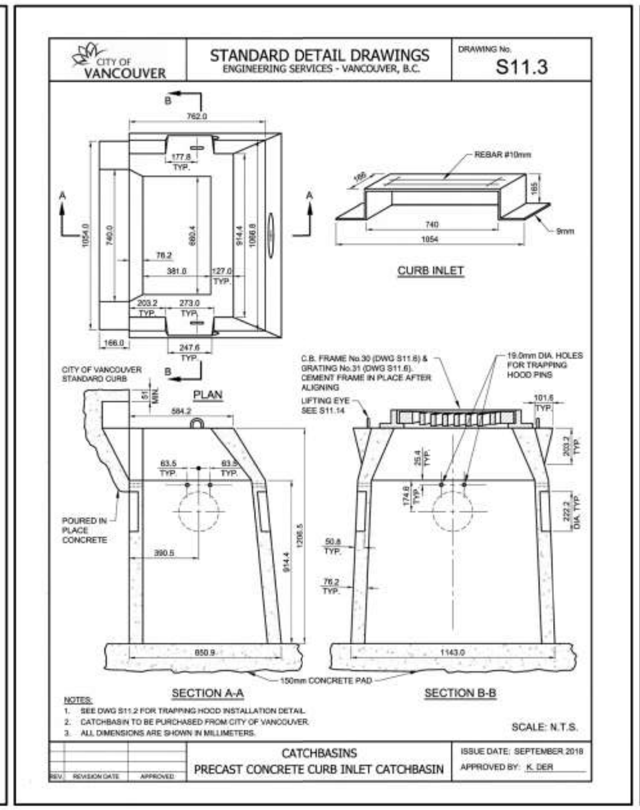
DRAWING DATE: APRIL 2025

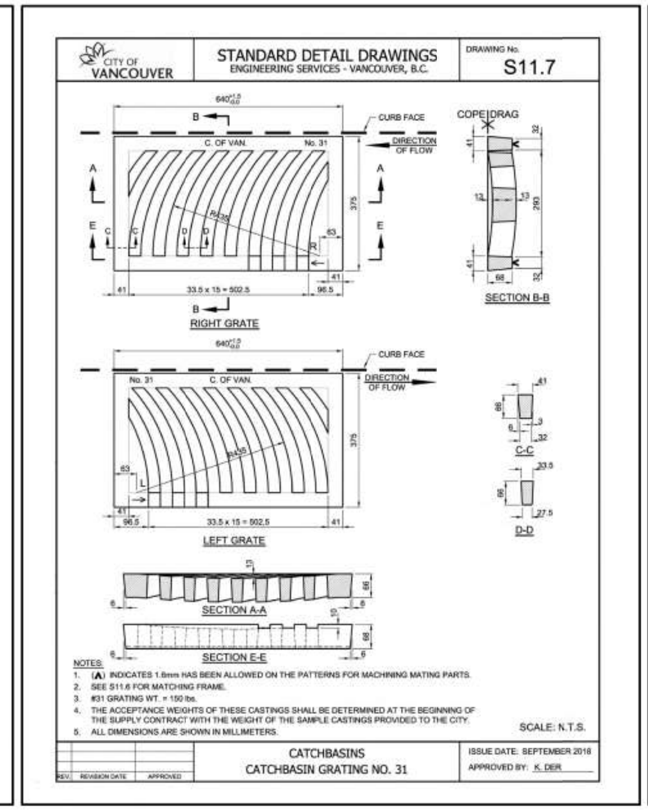
DRAWING NO. 21

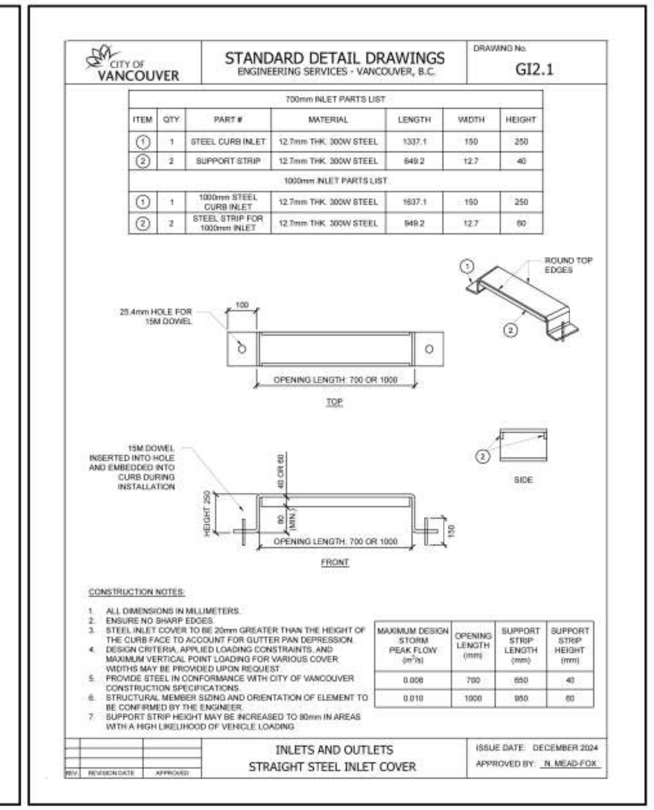
SHEET NO. 21 OF 24

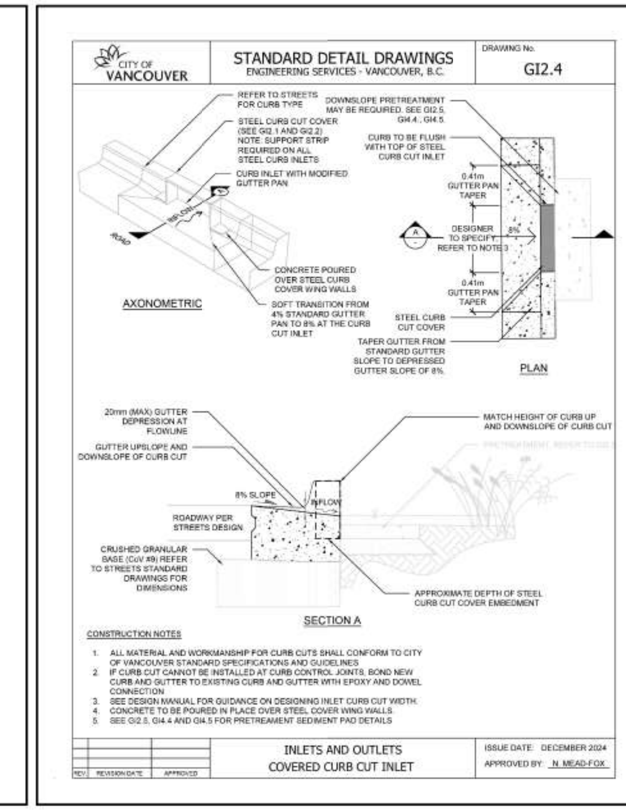
REV. 01

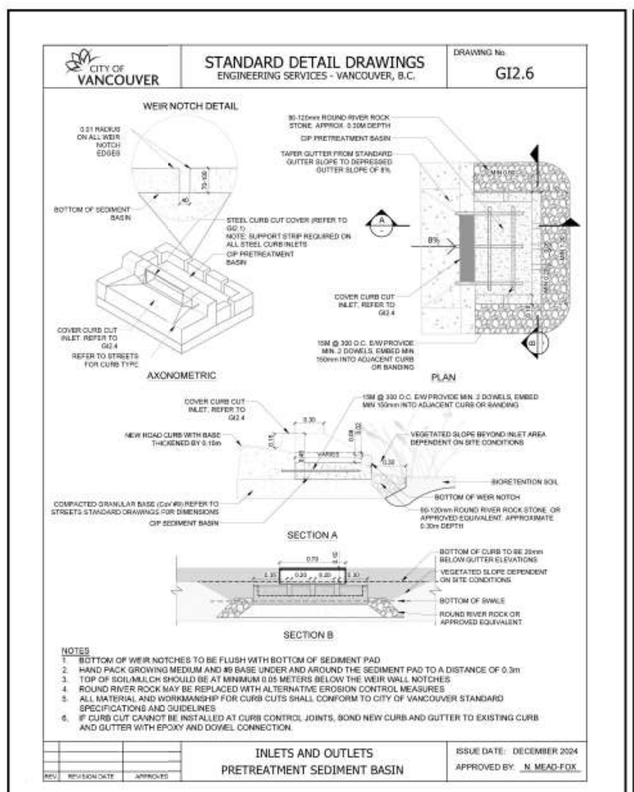


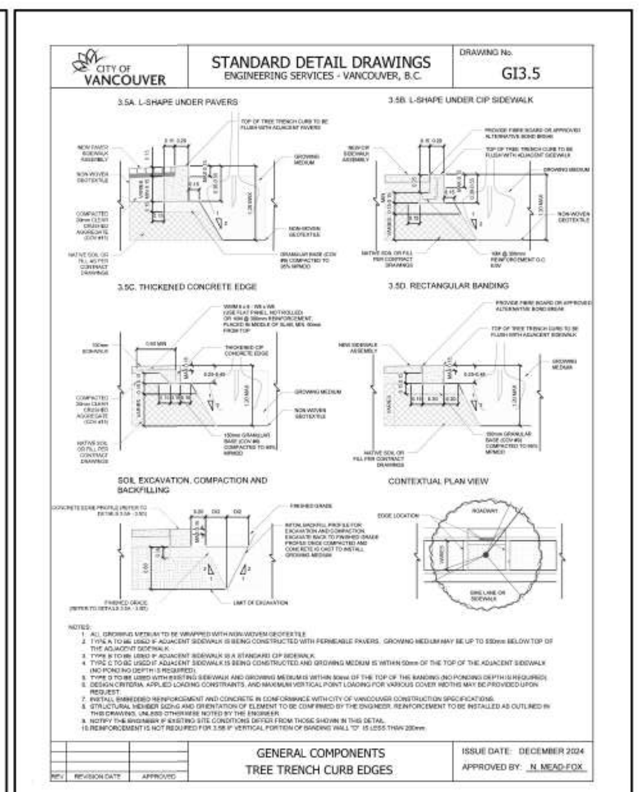


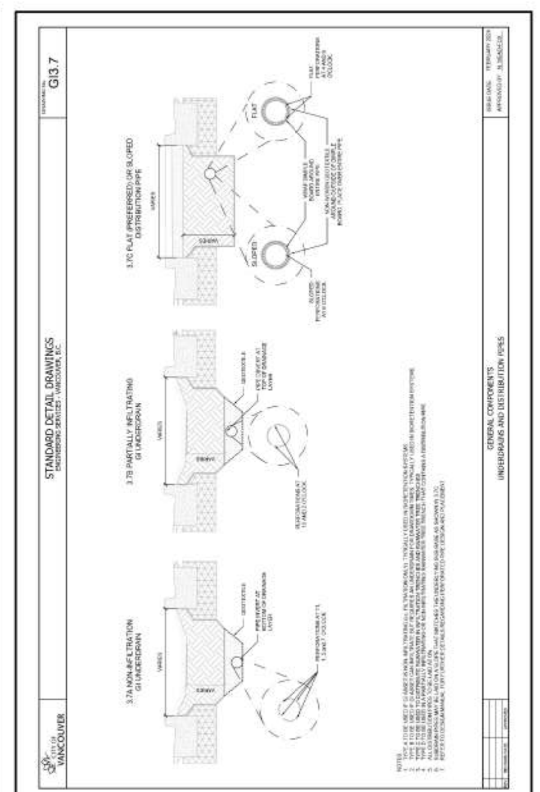


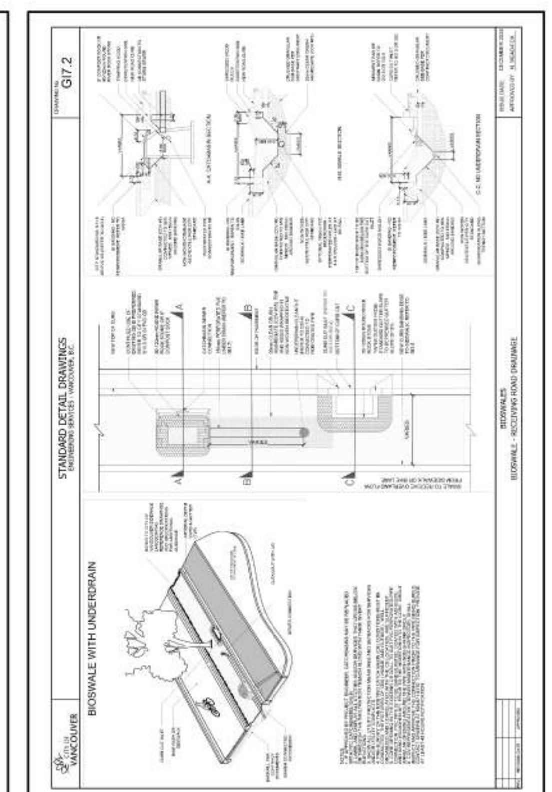












REV. NO.	DESCRIPTION	DR	DATE
01	STANDARD UTILITIES AND GI DETAILS	CM	APR 7 2025

CAPSTONE CONSULTING

CLIENT: **UBC CAMPUS AND COMMUNITY PLANNING**
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: **CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN**
UNIVERSITY ENDOWMENT LANDS

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TITLE: **STANDARD UTILITIES AND GI DETAILS**

DESIGN: CM CHECK: AZ

SCALE : 1:960

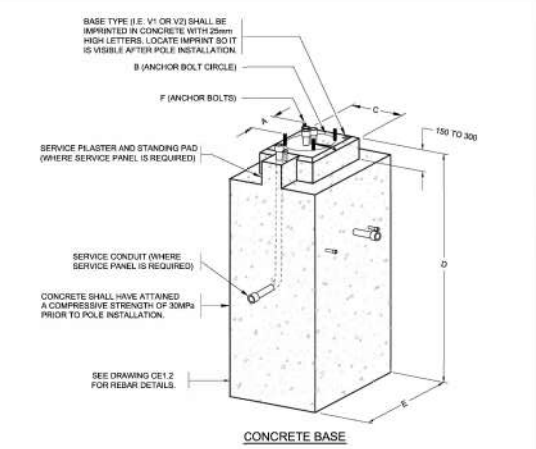
DRAWING DATE: APRIL 2025

DRAWING NO. 22

SHEET NO. 22 OF 24

REV. 01

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. CE1.1



CONCRETE BASE

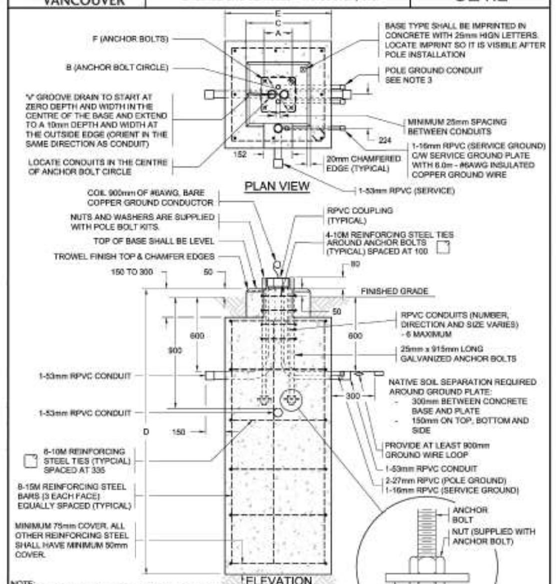
BASE TYPE	POLE TYPE	A	B	C	D	E	F (ANCHOR BOLTS)	VOLUME OF CONCRETE	APPROXIMATE MASS
V1	3.0m TRAFFIC SIGNAL POLES & TYPE 4A SIGNAL POSTS	197	280	350	1300	600	4-25mm x 915mm LONG AISI / SAE 4140 BOLTS	0.43 m³	1080 kg
V2	TYPE 5 SHAFTS & 7.5m POST TOP LUMINAIRE POLES & 7.6m, 9.1m DAVIT LUMINAIRE POLES	197	280	350	1800	600	4-25 mm x 915mm LONG AISI / SAE 4140 BOLTS	0.61 m³	1530 kg

NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. BASES TO BE IMPRINTED WITH DATE AND BASE TYPE ON TOP OF PEDESTAL.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

CONCRETE BASES
V1 & V2 POURED IN PLACE CONCRETE BASES
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. CE1.2

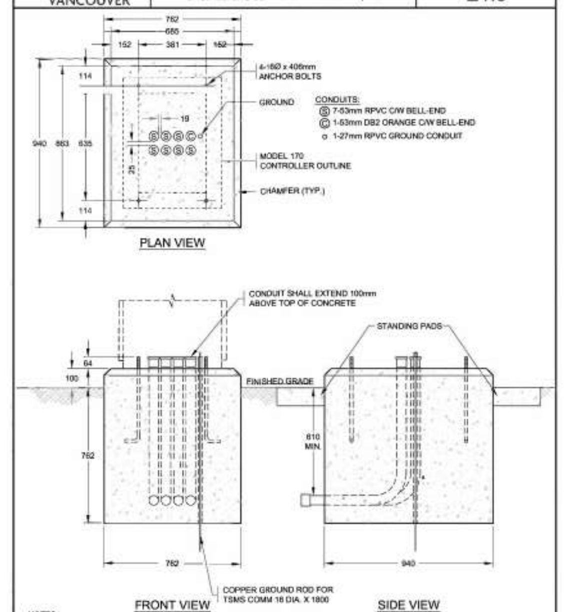


NOTE:
1. SEE DRAWING CE1.1 FOR NOTES AND ADDITIONAL DETAILS.
2. POLE BASE SHALL HAVE STANDING PAD IF SERVICE PANEL IS REQUIRED.
3. POLE GROUND CONDUIT AND PLATE IS REQUIRED ON OLD INFRASTRUCTURE WITH NO BOND WIRE BACK TO THE PANEL AND/OR IF OTHER UTILITIES ARE INSTALLED ON THE POLE.
4. POLE GROUND CONDUIT AND PLATE IS NOT REQUIRED WHEN THERE IS NEW INFRASTRUCURE COMPLETE WITH BOND WIRE BACK TO PANEL.
5. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

CONCRETE BASES
V1 & V2 POURED IN PLACE CONCRETE BASES
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. E1.3

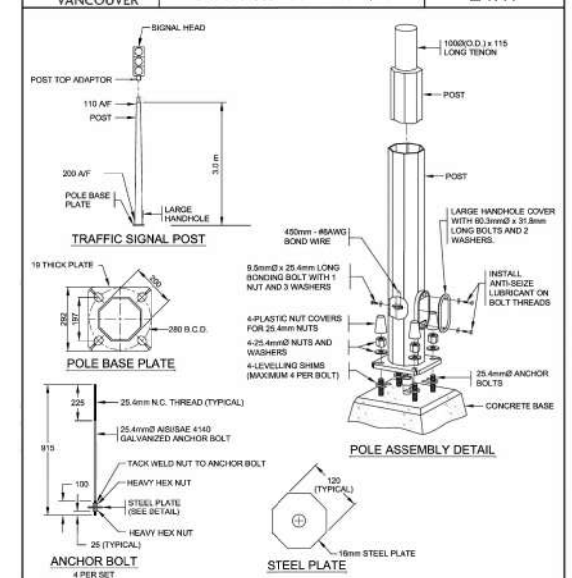


NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. BASES TO BE STAMPED WITH DATE AND BASE TYPE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

CONCRETE BASES
POURED IN PLACE CONCRETE CONTROLLER BASE
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. E4.17



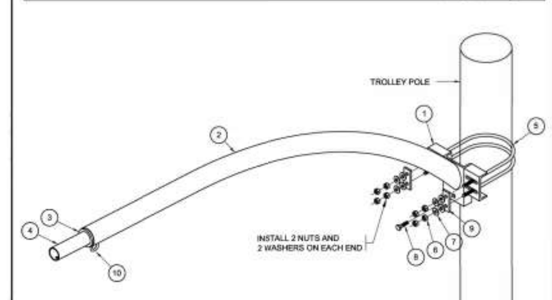
NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. SHAFTS TO BE INSTALLED PLUMB.
3. ALL SHAFTS, ARMS AND EXTENSIONS TO BE SUPPLIED WITH A GALVANIZED FINISH, UNLESS OTHERWISE NOTED.
4. APPLY GREASE TO ANCHOR BOLT THREADS.
5. TOUCH UP ANY SCRATCHES IN GALVANIZED SURFACES WITH COLD GALVANIZING COMPOUND.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

POLES
3.0m TRAFFIC SIGNAL POST
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. E4.23

QTY	ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	UNIT WEIGHT	TOTAL WEIGHT
1	1	S15-22-AVA-A02	Bracket Arm, For Trolley Pole, City of Vancouver	See drawing S15-22-AVA-A02	5.0	5.0
2	1	R20-65-3.00-C003	Arm, 76.2mm Sch 10 Pipe, OD=88.9mm, Thk=3.05mm	ASTM A53 Grade B	16.0	16.0
3	1	P66-00-84X62X10	TENON PLATE, ROUND, OD=84mm, CO=62mm, THK=9.53mm	G40.21 300W	0.2	0.2
4	1	P65-60X230-001	TENON, HSS ROUND, OD=60mm, THK=3.9mm, L=230mm	ASTM A500 GR.C	1.2	1.2
5	2	H12-GS-2.020-10.00x8.86	U Bolt, Wire Dia=12.7mm, For Pole Size= 254.0mm, Thread Length = 177.8mm, Galvanized Steel	SAE GR.5	0.9	1.8
6	8	H40-A194-G0.500	NUT, HEAVY HEX, 12.7mm, GALV	ASTM A563 GRADE DH	0.0	0.0
7	8	H70-F436-G0.500	WASHER, FLAT, STRUCTURAL, 12.7mm, GALV	ASTM F436	0.0	0.0
8	1	H10-A325-0.500X2.00	BOLT HEX, 12.7mm x 50.8mm, GALV	ASTM A325 TYPE1	0.1	0.1
9	2	H70-PW-D001	Rectangular Washer Plate, Length=101.6mm, Width=38.1mm, Thk=7.9mm, Galv	G40.21 300W	0.2	0.4
10	1	R20-15-AVA-01	Curved Rod, Dia=38.1mm, Rod Dia=9.53mm	G40.21 300W	0.1	0.1
					Assembly Weight (kg)=	24.8

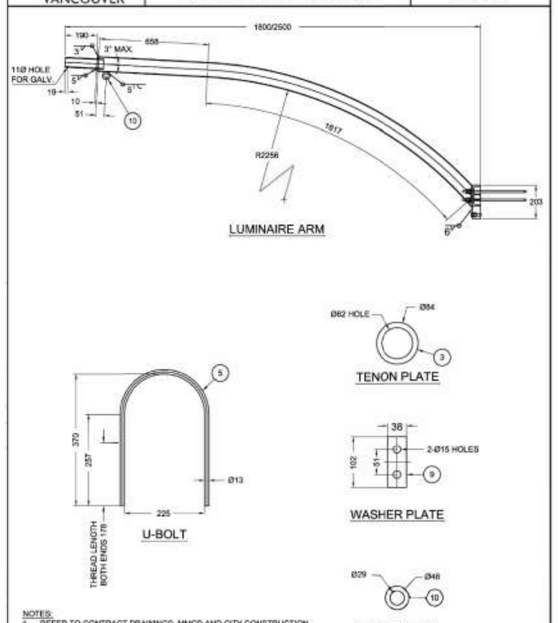


NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

POLES
1.8M / 2.5M TROLLEY POLE LUMINAIRE ARM
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. E4.24

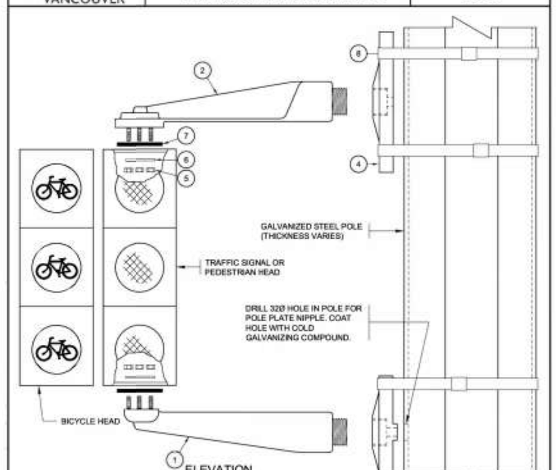


NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

POLES
1.8M / 2.5M TROLLEY POLE LUMINAIRE ARM
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. E5.2



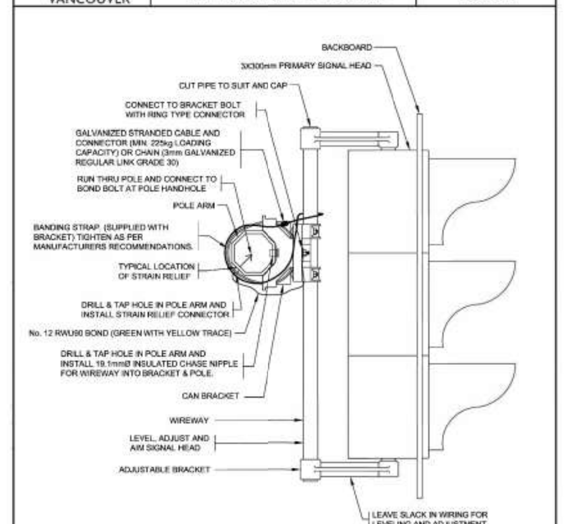
ITEM NO.	QTY	DESCRIPTION
1	1	SINGLE ARM BRACKET (TUBULAR) WITH WIREWAY
2	1	SINGLE ARM BRACKET (T SECTION)
3	1	POLE PLATE WITH NIPPLE
4	1	POLE PLATE WITH NO NIPPLE AND SLOTTED HOLES
5	6	7.9mmØ STAINLESS STEEL NYLOCK NUT
6	2	STAINLESS STEEL RETAINING WASHER
7	2	RUBBER GASKET
8	4	19.1mm STAINLESS STEEL BANDING

NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. AIM SIGNAL HEADS AS DIRECTED BY CONTRACT ADMINISTRATOR.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

HEADS
POLE SHAFT SIGNAL HEAD MOUNTING
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. E5.9A

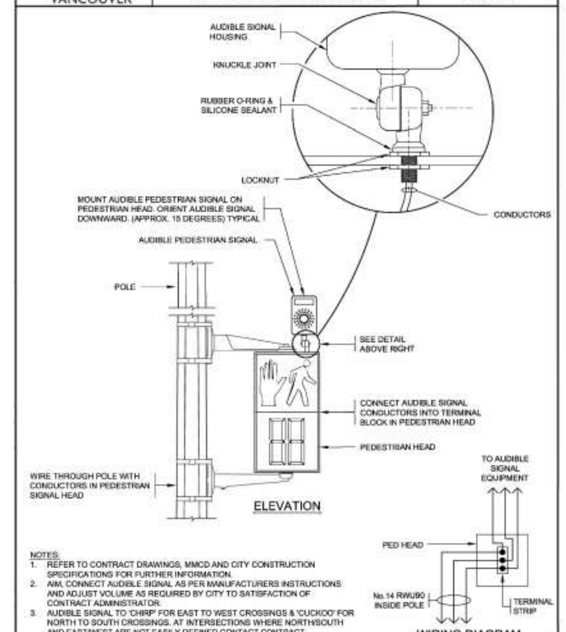


NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. AIM SIGNAL HEADS AS DIRECTED BY CONTRACT ADMINISTRATOR.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
4. ALL METAL PARTS THAT ELECTRICAL CONDUCTORS RUN THROUGH SHALL BE BONDED.

SCALE: N.T.S.

HEADS
OVERHEAD SIGNAL HEAD MOUNTING (ADJUSTABLE BRACKET METHOD)
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. E5.12

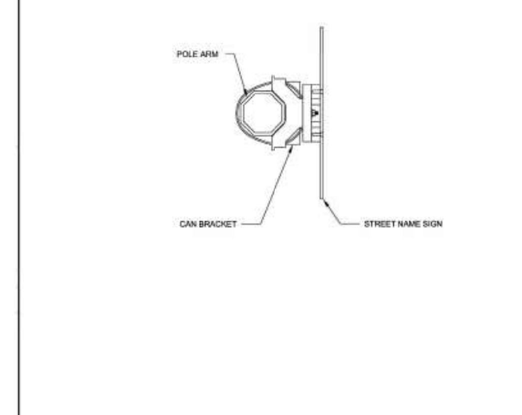


NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. AIM, CONNECT AUDIBLE SIGNAL AS PER MANUFACTURERS INSTRUCTIONS AND ADJUST VOLUME AS REQUIRED BY CITY TO SATISFACTION OF CONTRACT ADMINISTRATOR.
3. AUDIBLE SIGNAL TO 'CHIRP' FOR EAST TO WEST CROSSINGS & 'CUCKOO' FOR NORTH TO SOUTH CROSSINGS. AT INTERSECTIONS WHERE NORTH/SOUTH AND EAST/WEST ARE NOT EASILY DEFINED CONTACT CONTRACT ADMINISTRATOR FOR DIRECTION.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

HEADS
AUDIBLE SIGNALS
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

CITY OF VANCOUVER — STANDARD DETAIL DRAWINGS
ENGINEERING SERVICES - VANCOUVER, B.C.
DRAWING No. E5.16



NOTES:
1. REFER TO CONTRACT DRAWINGS, MMCD AND CITY CONSTRUCTION SPECIFICATIONS FOR FURTHER INFORMATION.
2. AIM STREET SIGNS AS DIRECTED BY CONTRACT ADMINISTRATOR.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

SCALE: N.T.S.

HEADS
OVERHEAD SIGN MOUNTING
ISSUE DATE: SEPTEMBER 2018
APPROVED BY: D. EPA
REV. | REVISION DATE | APPROVED

REV. NO.	DESCRIPTION	DR	DATE
01	STANDARD ELECTRICAL DETAILS (1)	CM	APR 7 2025

CAPSTONE CONSULTING

CLIENT: UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT: CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: STANDARD ELECTRICAL DETAILS (1)

DESIGN: CM CHECK: AZ

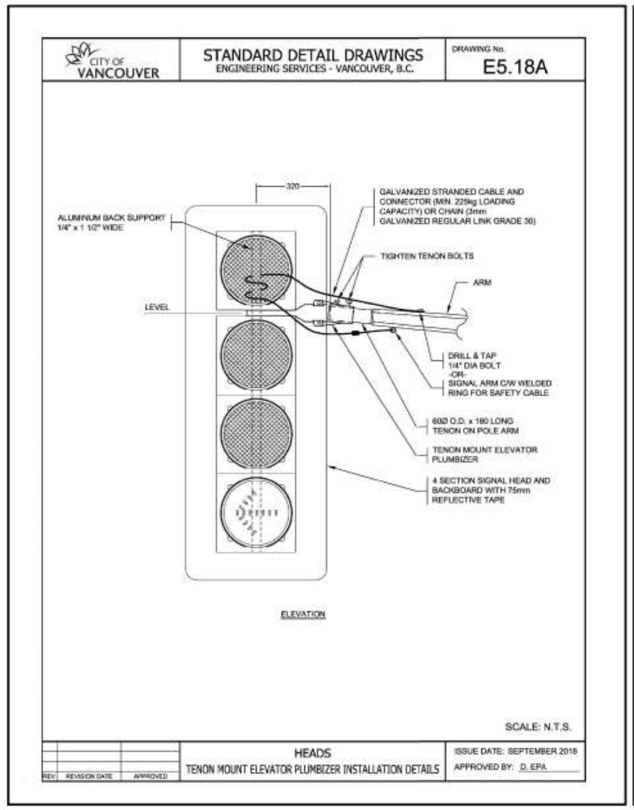
SCALE : 1:960

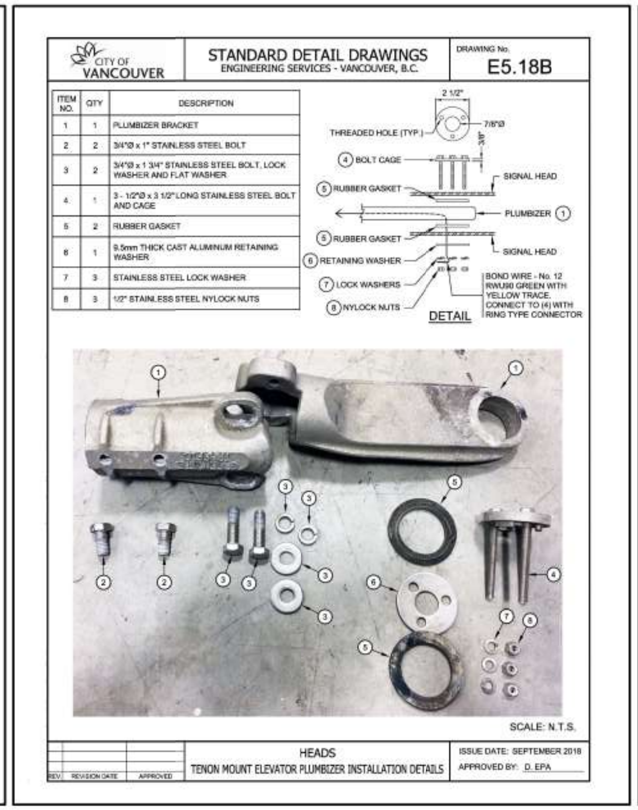
DRAWING DATE: APRIL 2025

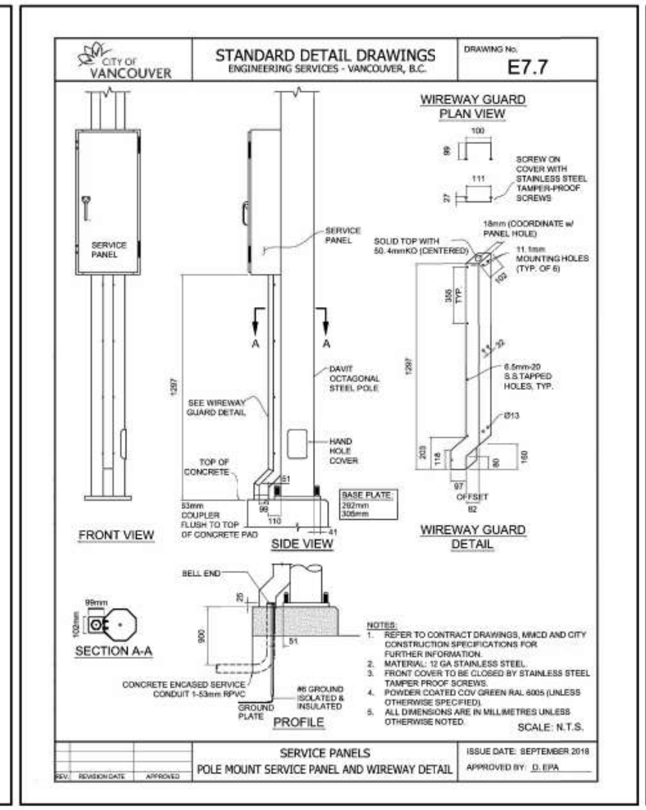
DRAWING NO. 23

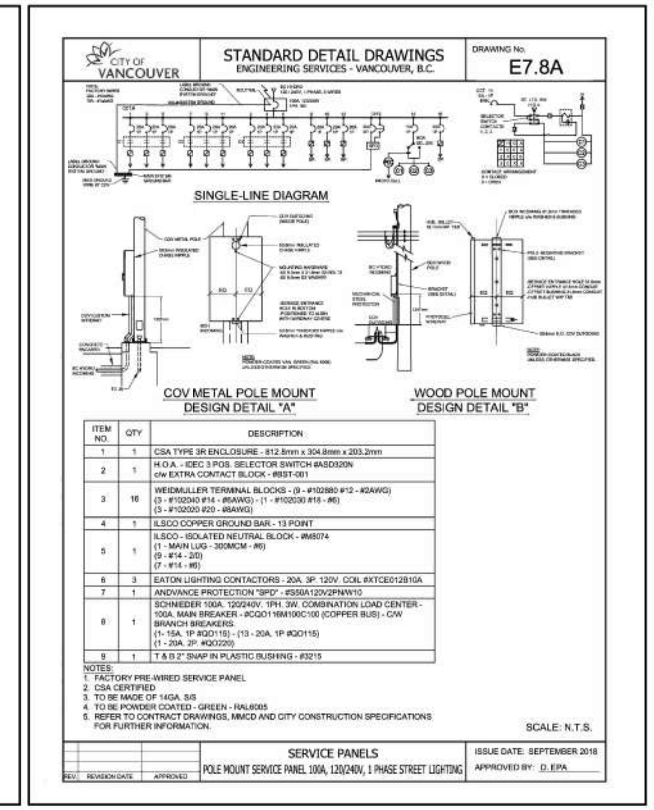
SHEET NO. 23 OF 24

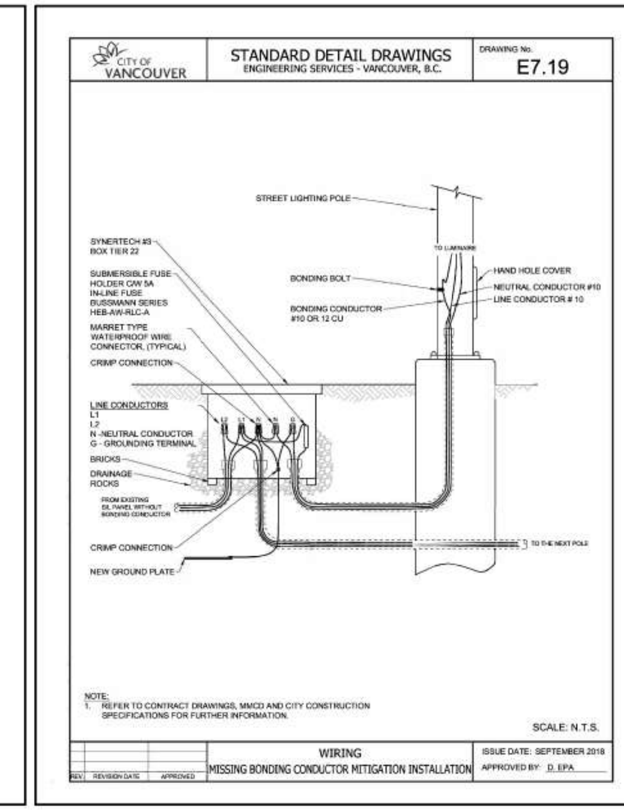
REV. 01

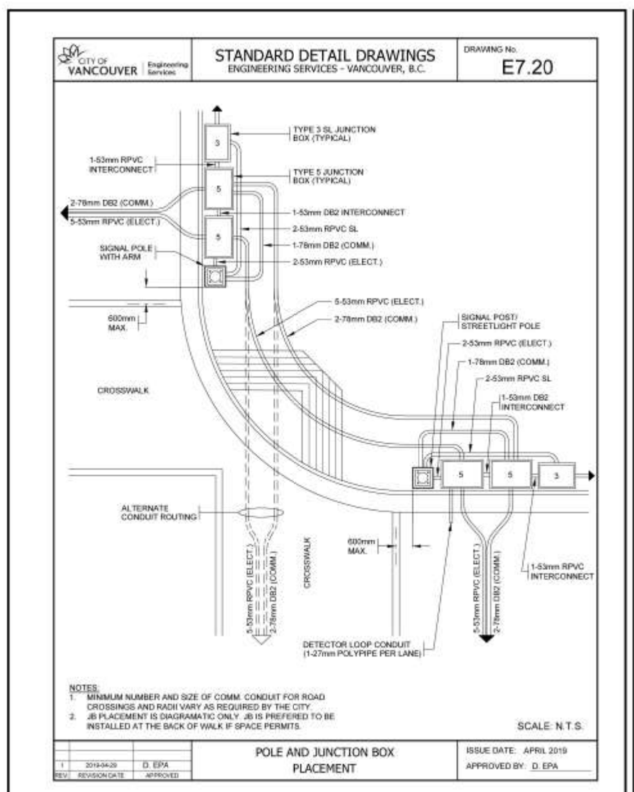


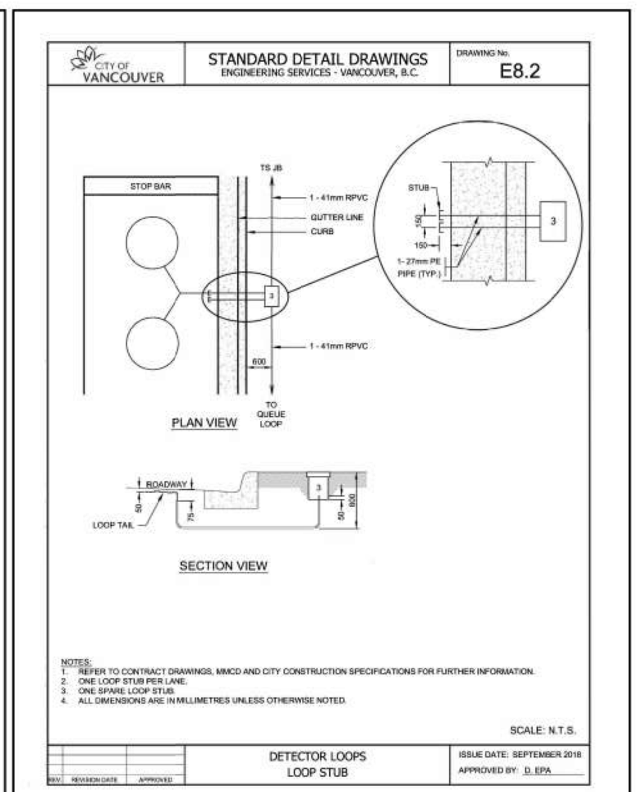












REV. NO.	DESCRIPTION	DR	DATE
01	STANDARD ELECTRICAL DETAILS (2)	CM	APR 7 2025

CAPSTONE CONSULTING

CLIENT:
UBC CAMPUS AND COMMUNITY PLANNING
6200 UNIVERSITY BOULEVARD, VANCOUVER BC, V6T 1Z4
PH. 604-221-2570

PROJECT:
CHANCELLOR BOULEVARD & EAST MALL INTERSECTION REDESIGN
UNIVERSITY ENDOWMENT LANDS

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: STANDARD ELECTRICAL DETAILS (2)

SCALE : 1:960

DRAWING NO. 24

DESIGN: CM CHECK: AZ

DRAWING DATE: APRIL 2025

SHEET NO. 24 OF 24

REV. 01