

Waterloo Train Station

Reference Design Report Building
Services

Greater Wellington Regional Council

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Figure 1: Waterloo Station and 800m Radius

Figure 2: Reference Design for Waterloo Station TOD

1 Introduction

1.1 Overview

This report has been prepared for the Greater Wellington Regional Council to support the creation of a Reference Design for the new Waterloo Train Station, a pivotal element within the broader Waterloo Station Transit-Oriented Development (TOD) Project.

Serving as a central hub, this transportation hub is designed to efficiently integrate with the wider urban environment, fostering connectivity and accessibility.

Separate from the commercial developments that form part of the larger TOD, this report focuses specifically on the building services reference design for the transportation hub itself. The design brief encapsulates the outcomes from three critical phases of the project—Define and Discover, Feasibility Study, and the Waterloo Station Reference Design.

By addressing the essential building services considerations within this reference design, the report aims to guide the delivery of a functional, sustainable, and user-friendly transport hub, aligned with the region's strategic goals for urban development and public transport enhancement.

1.2 Background

The following background is a condensed version of the excerpt that originally appeared in the Services RFP.

The current Waterloo Railway Station was constructed in 1988. In recent years the roof structure has suffered from ongoing maintenance issues and is past its end-of-life. This has provided the opportunity for the station infrastructure and surrounding urban catchment to be reconfigured in a way that supports transport orientated developments.

A transit-oriented development (TOD) is a mixed-use urban area within walking distance of a transit stop and core commercial and/or residential areas.

Waterloo Station was selected by Wellington Regional Council Leadership as the first local TOD due to:

- A need to address major and end-of-life infrastructure issues in the Waterloo Station.
- The availability of prime commercially developable land in the wider precinct
- Waterloo station and the precinct's strategic location in the Hutt Valley and larger footprint (~18,865m² of developable land).

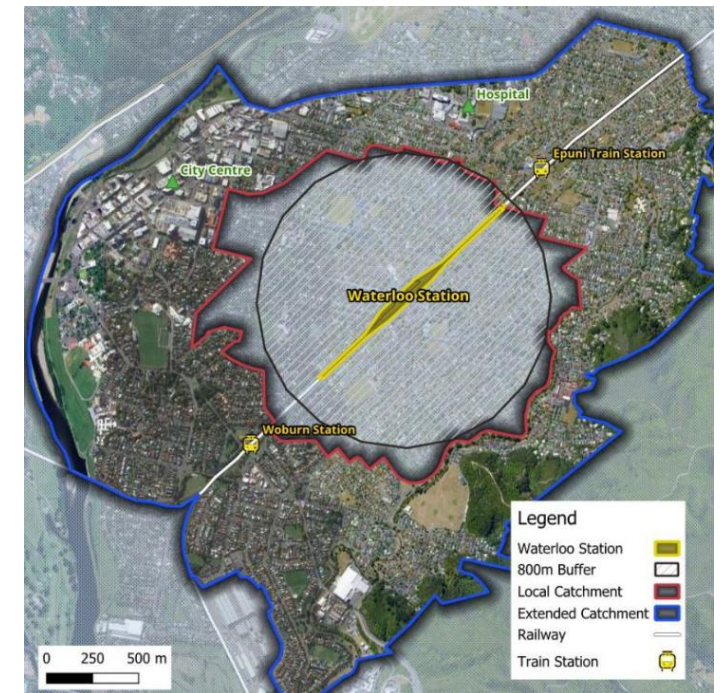


Figure 1: Waterloo Station and 800m Radius

- The potential of the Waterloo Station precinct to facilitate urban intensification, contribute to realising the Wellington Regional Growth Framework, and contribute of other positive social and health outcomes.

The project constitutes a major redevelopment of the existing Waterloo Station. The design team has progressed to the creation/development of a concept reference station design to facilitate further development of the Waterloo Station precinct.

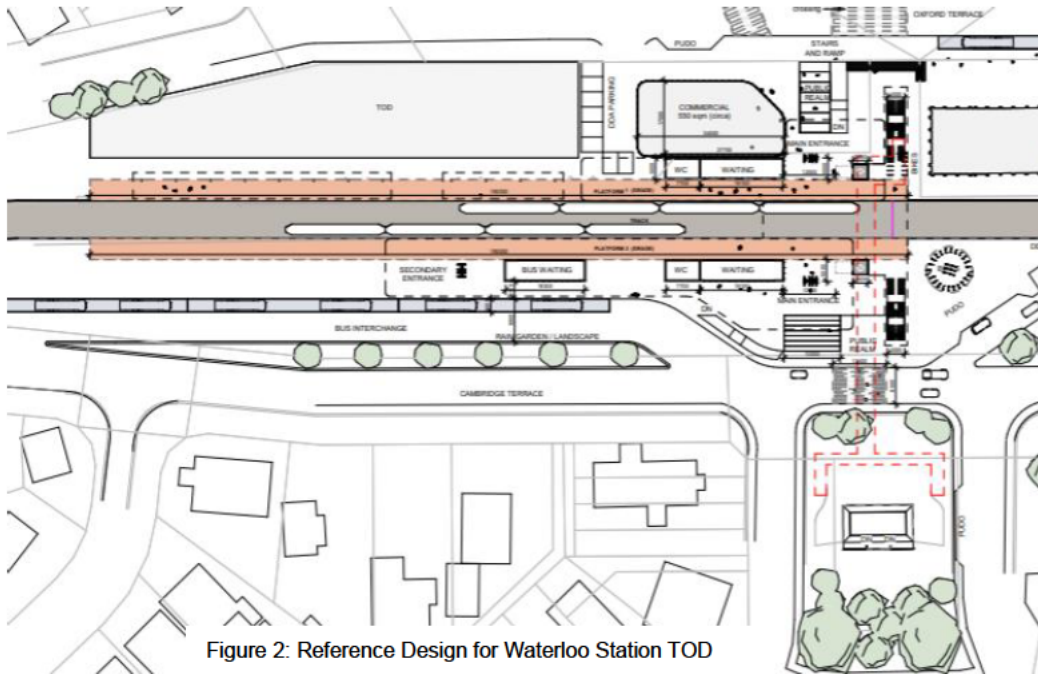


Figure 2: Reference Design for Waterloo Station TOD

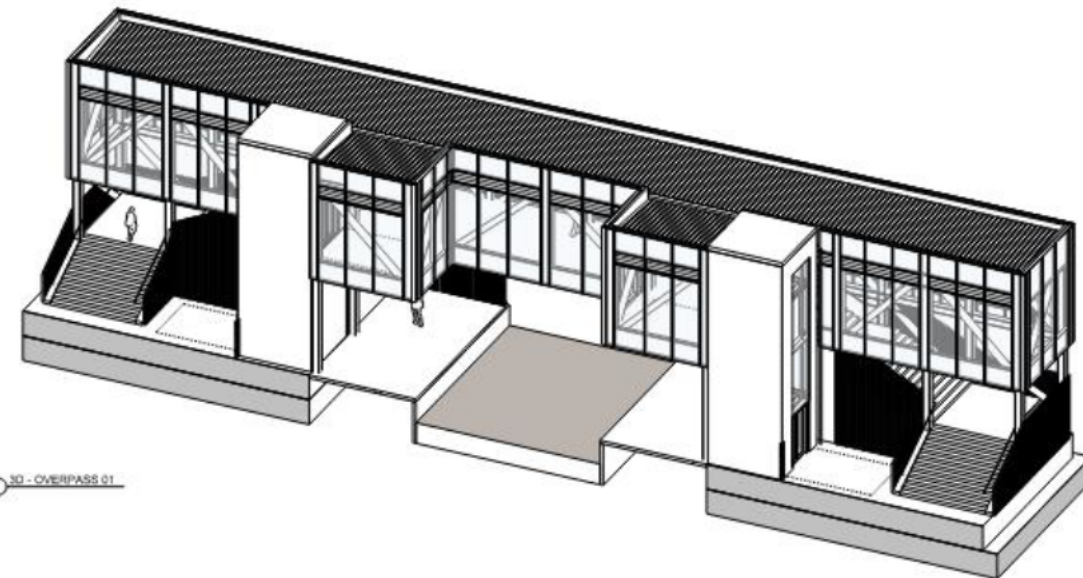


Figure 3: Waterloo Station Overpass

2 Mechanical Services

2.1 General Requirements

The mechanical services have been designed to comply with the rules and regulations of the following:

- New Zealand Building Code
- New Zealand and/or Australian Standards, as applicable
- The relevant aspects of the Fire Safety report (once received)

2.2 Mechanical Design Criteria

The mechanical systems are designed on the basis of the following design criteria:

■ Ambient Conditions	Summer	26.3°C DB / 21.1°C WB	(based on Wallaceville 1 percent design day)
	Winter	-1.4°C DB	
■ Temperature Setpoint	Cooling	23.0 ± 1.5°C	(enclosed air-conditioned spaces only)
	Heating	22 ± 1.5°C	
■ Internal Heat Gains	People	80 W/person sensible, 60 W/person latent	
	Equipment	15 W/m²	
	Lighting	10 W/m² lighting	
■ Toilet Exhaust & Adjacent Utility spaces.	25 L/s/fixture OR 10 L/s/m²		AS 1668.2 - 2002
■ Plant Rooms (Final Location TBD)	5 L/s/m²		AS 1668.2 - 2002
■ MSB	Passive Ventilation to MSB		NZBC G4
■ Comms Room Ventilation	Split System Heat Pumps sized to meet final client ICT and Security requirements		

- Waiting Spaces
 - Passive Ventilation
 - Heating and Cooling N/A based on current design
- Overpass
 - Passive Ventilation
 - Heating and Cooling N/A based on current design
- Noise Levels
 - The maximum building services internal noise levels will be as follows:
 - General Offices L_{eq} 40 - 45 dBA
 - Bathrooms L_{eq} 50 - 55 dBA
 - Railway and Bus Terminals L_{eq} 45 - 55 dBA
 - Staff Room L_{eq} 40 - 50 dBA
 - All areas will be designed to achieve design levels provided by the acoustic engineer and consent conditions.

2.3 Station Design Philosophy

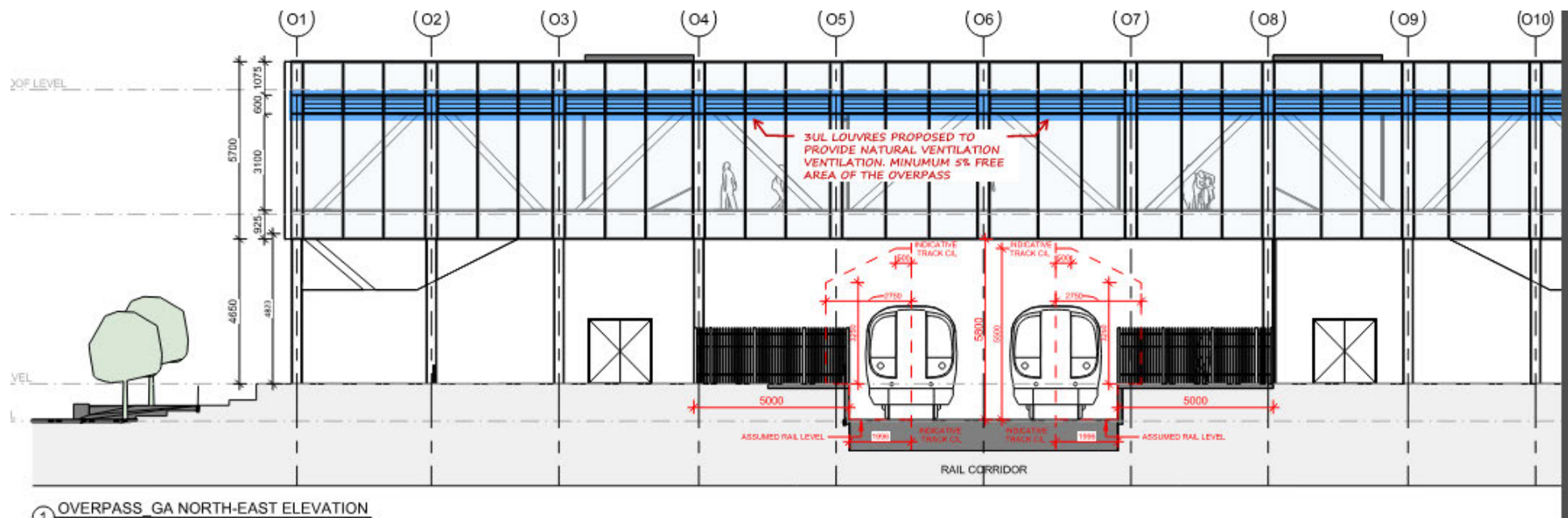
2.3.1 Bus Interchange

The bus drop-off / pick-up is external to the station with no mechanical service requirements.

2.3.2 Overpass

The pedestrian concourse bridge (overpass) will have the following design features:

- It is proposed to be naturally ventilated.
- Fixed louvres are proposed to avoid maintenance associated with operable openings. Louvres to be carefully selected to avoid water ingress.
- Internal surface finishes will need to be suitable for naturally ventilated space.



2.3.3 Public Toilets

The public toilets will utilise mechanical exhaust systems.

These systems will discharge air through roof mounted fans located above the adjacent utility area. These fans will be located to ensure appropriate separation from occupied areas.

Air will be drawn into toilets through door undercuts, door grilles or high-level louvres.

2.3.4 Train Waiting Areas

The covered train waiting areas are predominantly open on the rail side. As such these will be treated as external area and naturally ventilated with no mechanical requirements. The natural ventilation will be in accordance with the NZBC G4 VM1 and AS1 requirements. G4 requires a natural ventilation opening equivalent to at least 5% of the floor area.

2.3.5 Lifts

Lift ventilation requirements to be advised by lift supplier. Typically, the supplier's require ventilation with a free area of approximately 0.1 m².

This ventilation would be provided using either a weather louver or roof mounted cowl at the top of each lift shaft.

2.3.6 Communications Room

It is proposed to locate a communication room below the overpass. This room will likely contain the ICT, audio visual and security infrastructure.

The mechanical services for this space would likely include:

- Mechanical outside air ventilation. This system would include a fan drawing outside air through a filter, from an external louver. Outside air will then discharge directly into the space through a supply diffuser. This fan would be controlled by a timeclock
- Air conditioning using a DX split system complete with outdoor condensing unit and indoor hi-wall unit. A suitable location for the outdoor condensing unit will need to be determined that provides access for maintenance.
- If a UPS is located within this space a suitable mechanical extract may be required.

2.3.7 MSB Room

It is proposed to locate a Main Switchboard (MSB) room below the overpass. This room will likely contain the electrical infrastructure for the station, bus interchange and associated external lighting.

The mechanical services for this space would likely include:

- Passive ventilation through door mounted weather louvres.
- If a UPS is located within this space a suitable mechanical extract may be required.

Once a more detailed assessment is made of this space it is possible mechanical ventilation or cooling may be required.

2.3.8 Controls

It is proposed all plant will operate on independent standalone controls. These will include:

- Air conditioning systems are controlled via a single proprietary control wall mounted controller within the dedicated space served to control temperature.
- Toilet exhaust fans, outside air ventilation fans and general exhaust fans will run using programmable digital timeclocks or local occupancy sensor.
- The mechanical control system will be able to issue alarms if overheating ($> 30^{\circ}\text{C}$) occurs in either the ICT Room or the MSB Room.

2.3.9 Electrical for Mechanical

The power supplies for mechanical plant and equipment will be supplied from local electrical switchboards.

2.4 Commercial Area

The commercial area, which is indicated as part of the station proposal, has been documented for the purpose of the reference design as a 3-storey building (GF, L1, L2). The building has a footprint of 550sqm, with a total GFA of 1650 sqm over 3 floors. We would anticipate the mechanical services of this space would include:

- VRF/HVRF air conditioning system.
- Heat recovery ventilation
- Toilet exhaust system
- Mechanical control system
- Dedicated exhaust systems as required
- Cooling allowances for a dedicated small comms/server room

This building is subject to further development in the next phase once GWRC requirements are known.

2.5 Seismic Restraint

Mechanical services are to be seismically restrained in accordance with the requirements of NZS 4219.

3 Electrical Services

3.1 General Requirements

The electrical services will be designed in accordance with the NZ Building Code, Kiwi Rail requirements, safety in design legislation and in accordance with the following standards:

- AS/NZS 3000 Australian/New Zealand wiring rules.
- AS/NZS 3008.1 Cables for alternating voltages up to and including 0.6/1kV
- AS/NZS 3013 Electrical installations – Classification of the fire and mechanical performance of wiring systems.
- AS/NZS 2293 Emergency evacuation lighting for buildings.
- AS/NZS 61439 Low voltage switchgear and control gear assemblies - type tested and partially type-tested assemblies.
- NZS 4219 Seismic performance of engineering systems in buildings

Note: this list is not exhaustive, other AS/NZS standards may be used as required.

3.2 Incoming Supply

The station is currently supplied from the Wellington Electricity sub-station located to the north of the station at the eastern end of Knights Road. The LV supply to the station runs in an underground duct which passes under Knights Road and Oxford Terrace. It is known that there is limited spare capacity in both the supply cable and the sub-station. During the preliminary design phase, the future station load and the proposed commercial building load will be assessed as requirements become known. The suitability of the existing underground duct will also be assessed.

The current intention is that the station and the commercial building are supplied from the sub-station alleviating the need to house a transformer in the station complex. The spare capacity of the sub-station will be discussed with Wellington Electricity and investigated in the next design phase. The tariff meters will be located in the main switchboards of the station and commercial building.

3.3 Main Switchboards

A new main switchboard (MSB) will be housed in a new main switchroom located under the overpass at the northern end. The MSB will be kept to 3 metres or less in length so that a second means of egress from the main switchroom is not required.

In the preliminary design phase, the IP rating of the MSB will be finalised once it is confirmed whether the main switchroom is to be sprinklered or not. The form rating will also be determined.

The MSB will contain spare outgoing ways, surge protection, tariff metering, a power quality meter, CTs for the proposed photovoltaic installation on the platform roofs, connection point for a temporary generator, a lift safety section of busbar, and anti-condensation heaters. All MCCBs within the MSB will be electronic type.

It is currently intended to temporarily retain the existing MSB so that the station can remain operational during the station upgrade. The methodology of transferring power from the existing MSB to the new will be explored in the next design phase. The requirement for check meters for possible NABERSNZ or Greenstar rating will be investigated in the preliminary design phase.

3.4 Power Factor Correction

Power factor correction (PFC) will not be provided initially as it may not be required. The need for PFC will be determined during the first 12 months of operation when the worst-case power factor is known. This will be assessed from the lowest recorded PF by the power quality meter in the MSB. Space provision for a future PFC unit will be allocated in the main switchroom and a spare MCCB breaker allowed for in the MSB.

3.5 Generator

It is not proposed to incorporate a permanent generator for the station unless specifically asked for. Instead, a connection point for a temporary generator will be provided. The actual location will be determined during the preliminary design investigation.

3.6 Redundant Services

All redundant electrical services in the station complex including the underpass will be decommissioned, removed and safely disposed of. The full extent of this will be identified in future design phases.

3.7 Cable & Cable Management

During the preliminary design phase, the extent of the existing platform underground ducts will be determined. These will be re-used where practical.

All main and sub-main cable will be low smoke and zero halogen (LSZH). The main incoming cable and cables supplying life safety systems will additionally be fire rated.

Where possible cables will be hidden from view and run in ceiling voids, walls, underground ducts and within service ways built into the platform canopy. It is also proposed that cable ducts for power and ICT services will be built into the new overpass.

The following is proposed for the cable management for the main, sub-main and final circuit wiring:

- The existing platform underground ducts to be re-used, where possible.
- Cable tray/basket – for distribution of sub-main cables and final circuits.
- Cable tray/basket – provided for ICT services.
- Conduits – for final circuits that cannot be hidden from view.
- Underground ducts – for external power, lighting and ICT.
- Ducts provided below the screed in the concourse for power, lighting and ICT.
- Catenary wires – for final circuits that are run in ceiling voids.

3.8 Distribution Boards & Small Power

Distribution boards will house miniature circuit breakers (MCBs) and residual current devices (RCDs) for the following:

- ICT distribution boards supplied via uninterruptable power supply (UPS) units.
- External lighting distribution boards
- Platform lighting and power distribution boards

The mechanical and hydraulic services will be supplied from local distribution boards. This includes air conditioning, pumps, fans, hot water cylinders etc.

Automatic doors will be supplied from local distribution boards.

Socket outlets will be provided on the platforms. All internal socket outlets will be flush mounted where possible. Externally mounted socket outlets will be IP65 rated and of an industrial design.

In general, all socket outlets will be RCD protected except those supplying ICT racks.

Power will also be supplied to the following: -

- Ticket barrier gates
- Passenger information displays (PIDs)
- Master clock system
- Passenger help points
- Ticket vending machines
- Bus stops

3.9 Lighting

Lighting will be designed to the recommendations of AS/NZS 1680, AS/NZS 1158, CIBSE guidelines where not covered by AS/NZS 1680, the requirements of any Crime Prevention Through Environmental Design (CPTED) assessment, and requirements of GI/RT7016 produced by the Rail Safety and Standards Board in the UK.

New lighting will be provided to the station, platforms, bus interchange, and external areas leading to the station.

The roof of the station is the single most dominant architectural feature of the new development. The lighting design and the luminaires chosen will be carried out in consultation with the architect to enhance this key architectural feature. To be energy efficient we will be advising the architect to specify light surface finishes with a high reflective index to reduce the quantity and electrical load of the luminaires.

All luminaires will be LED with a minimum efficacy of 100 lumens/Watt.

Platform lighting and areas of the station open to external influences will be IP65 rated.

All recessed mounted luminaires will be fed via a plug and socket to facilitate easy and safe replacement.

The external lighting will be designed to meet the requirements of AS/NZS 1158, and to minimise the spill light onto adjacent properties in accordance with the Hutt City Council Unitary Plan.

The external lighting within the station complex will be supplied from the station power supply so that it is part of the combined station and traction earthing system, this will be subject to whether the station earthing, and traction earthing systems are combined or not.

A DALI compliant scene setting control system will provide the following control functions:

- Control the public areas of the station and platforms to come on and off at prescribed times and provide dimming up and down subject to the external lighting levels.
- Control the lighting to the public toilets to come on and off at prescribed times.
- The carpark lighting to go on at dusk and off at dawn, the actual lighting level of the dawn and dusk settings will be adjustable.

3.10 Emergency Lighting

Emergency lighting will be designed in accordance with the Fire Engineering Report and the New Zealand Building Code with AS/NZS 2293 being adopted as the acceptable solution.

It is proposed to use self-contained emergency luminaires to form a decentralised intelligent system. This is as opposed to a centralised system for the following reasons: -

- There is no single point of failure, a centralised system is far more prone to fail under a seismic event leaving no emergency lighting.
- The latest battery technology only requires replacement every 10+ years and is cost effective.

- Monitoring of the status of each individual luminaire is constant.
- Testing can be carried out automatically, remotely, and outside of operational hours.
- A central system needs 6 monthly inspections, testing and maintenance.
- No need for fire rated cupboard to house a centralised system and mechanical cooling.
- No requirement for expensive fire rated cables.
- No lost space.
- The central system is made up of multiple parts from different manufactures, with no one overarching warranty.

3.11 Earthing

The station earthing and bonding system will be designed in accordance with AS/NZS 3000 and in conjunction with the requirements of the traction earthing systems. These earthing systems may need to be separated or combined subject to separation distances. The actual requirement will be determined in the next design phase.

3.12 Photovoltaic (PV) Panels

Photovoltaic (PV) solar panels located on top of the platform canopies and commercial space are intended to be incorporated into the electrical design. The quantity and scope will be investigated in the next design phase, when it will also be agreed as to whether this will be a D&B package for a specialist PV contractor.

3.13 Lightning Protection

A lightning protection risk assessment will be carried out in accordance with AS/NZS 1768 during the next design phase to determine risk factors and whether a lightning protection system is recommended.

3.14 Sustainability

- The single biggest impact that the electrical design has upon sustainability is the use of highly efficient LED lighting.
- A lighting control system capable of dimming and switching is also proposed to reduce energy consumption.
- PVC insulated cables will be excluded from the design thereby eliminating a product that is toxic to produce and toxic to dispose of.

- Photovoltaic (PV) solar panels to be included into the electrical design of the station complex.
- Provision for electric car, bicycle and scooter charging will be investigated in the next design phase.

3.15 Commercial Area

The commercial area, which is indicated as part of the station proposal, has been documented for the purpose of the reference design as a 3-storey building (GF, L1, L2). The building has a footprint of 550sqm, with a total GFA of 1650 sqm over 3 floors. We would anticipate the electrical services of this space would include:

- New local distribution boards (db)
- Lighting
- Small power
- PV allowances

This building is subject to further development in the next phase once GWRC requirements are known. Also refer to the requirements above regarding the implementation of shared design principles (PV, ESD, etc.).

3.16 Seismic Restraint

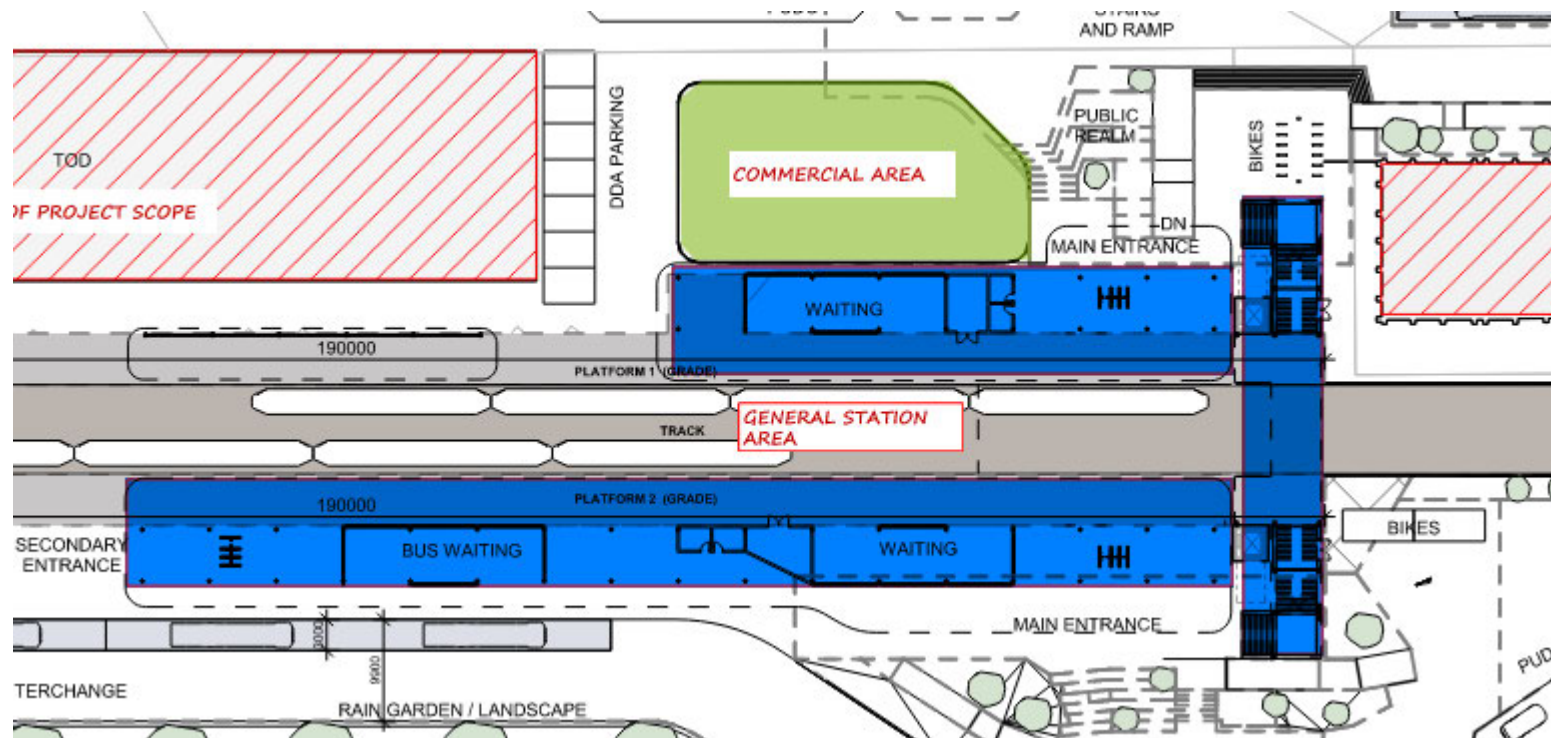
Electrical services are to be seismically restrained in accordance with the requirements of NZS 4219.

4 Fire Protection

4.1 Overview

The Fire Engineer has indicated, for the station, that fire protection systems will not be required for NZBC life safety compliance. However, GWRC will need to consider if they would like to include fire protection systems for property protection purposes.

The Commercial will require a suitable fire protection system, and this will need to be confirmed by the Fire Engineer.



4.2 General Station Area

The types of systems that could be considered for the station include audible alarms, combined with:

- Manual call points.
- Fire sprinklers or heat detectors within enclosed areas (over pass, MSB room etc).

4.3 Commercial Area

The commercial area, which is indicated as part of the station proposal, has been documented for the purpose of the reference design as a 3-storey building (GF, L1, L2). The building has a footprint of 550sqm, with a total GFA of 1650 sqm over 3 floors. We would anticipate the commercial area fire protection systems could include a combination of some of the following types of systems:

- Manual fire alarm system (manual call points)
- Heat detection system
- Smoke detection system
- Fire Sprinkler System

A fire alarm panel and a fire service attendance point will likely be required for this building. This commercial building is subject to further development in the next phase once GWRC requirements are known a fire report specific to the commercial area is provided.

4.4 Seismic Restraint

Electrical services are to be seismically restrained in accordance with the requirements of NZS 4219.

5 Hydraulic Services

5.1 General Requirements

The hydraulic services have been designed to comply with the rules and regulations of the following:

- New Zealand Building Code
- New Zealand and/or Australian Standards, as applicable
- Requirements of Wellington Water for the public sewer and water network
- Requirements of Hutt City Council

5.1.1 Hydraulic Services Design Criteria Table

Table 5-1: Hydraulic Services Design Table

Item	Proposed Design Parameters
Design Standards	AS/NZS 3500:2018
Sanitary Drainage	Pipes sized to flow 0.7 proportional depth, minimum self-cleansing velocity of 0.75m/s.
Fixture Units for Sanitary Drainage	From AS/NZS 3500 Part 2, Table 6.3(A) WHB 1 Sink 3 WC Cistern 4
Hot & Cold Water including non-potable cold water	Pipes sizes based on velocity. Maximum velocity in cold water pipework 1.2 m/s. Maximum velocity hot water pipework 0.9m/s.
Fixture Loading units for Hot & Cold-water services	From IOP Guide 2-Hot and Cold Water, Table 15 (Medium Frequency of Use) WHB 1 Sink 5 WC Cistern 2

5.2 Design Philosophy

5.2.1 Sanitary Drainage

Sanitary drainage is provided to serve the proposed commercial space, 2 x WC and plant areas, and 2 x lift pit sump pumps.

Sanitary drainage is to be gravity discharge and connects to the sitewide sanitary drainage provided under the Civil scope.

Sanitary drainage includes soil, waste, vent to all fixtures indicated on the architectural drawings and condensate drainage from air conditioning systems where required.

Floor waste gullies are provided in the west and east concourse pods, located in the cleaner's cupboard, first aid room and each of the toilets. These are connected to the main sanitary wastewater drains.

Rodding/inspection points are provided to stacks and graded drains with access points.

A moisture sensor attached to a local alarm is provided within each of the two lift pit sumps.

Each lift pit sump is pumped to an external overflow relief gully trap, adjacent to the WC/Plant areas.



Figure 5-1: Lift Sump Pump (example only)

Power supplies for the sump pumps and moisture sensors are derived from the local electrical switchboards. The moisture sensor alarms, and status/run/fault lights are located within the plant rooms.

All 100mm sewer branches are to be laid at a minimum gradient of 1 in 60. Pipe gradients for sewers within the buildings will comply with the minimum requirements of AS/NZS 3500.2. Pipes will have sufficient fall to be self-cleansing, whilst complying with AS/NZS 3500.

Sanitary drainage pipe materials are to be uPVC (both internal and external to the building).

5.2.2 Stormwater

Roof water drainage is designed to a stormwater event being an average rainfall intensity of 10-minute intervals over 100 years, which results in 123 mm/hr. Refer to NIWA HIRDS website (<https://hirds.niwa.co.nz/>) for the Waterloo Interchange location in Lower Hutt.

Downpipes discharge at the building line to a gravity discharge system and connects to the sitewide stormwater drainage provided under the Civil scope.

For roof gutter design with regards to accelerated water flows and sump design refer to Architectural documentation.

Downpipes are to be sized and provided based on architectural roof and gutter design.

Stormwater drainage pipe materials are uPVC.

5.2.3 Potable (Domestic) Hot & Cold-Water Services

Potable cold-water supply is taken from a (metered) connection to the Wellington Water main provided under Civil scope of works.

Potable cold water is reticulated within the site to serve the proposed commercial space, 2 x WC and plant areas, and various hose taps.

Hot water to 2 x WC areas is provided by local electric hot water cylinders (HWC), located in the adjoining plant rooms.

HWC's to be 45L capacity (to be confirmed).

Thermostatic Mixing Valves are provided to all limit maximum supply temperature to 45°C for the public wash hand basins.

All hot and cold-water pipes are built into walls, concealed in ducts, and pass through risers and ceiling spaces where applicable.

Backflow prevention devices are provided in accordance with AS/NZS 3500, to be provided under the Civil scope.

All reticulation will be pressure tested to a hydrostatic pressure equal to 1500 kPa for a period of 30 minutes and generally kept charged with water thereafter.

Pipe materials are to be either PEX or Copper (Class B) above ground and HDPE (High Density Polyethylene) below ground.

5.3 Commercial Area

The commercial area, which is indicated as part of the station proposal, has been documented for the purpose of the reference design as a 3-storey building (GF, L1, L2). The building has a footprint of 550sqm, with a total GFA of 1650 sqm over 3 floors. We would anticipate that dedicated Hydraulic services of this space would include connection of the following services into the site civil infrastructure:

- Storm water
- Potable Water
- Sanitary drainage

We would also anticipate the following dedicated hydraulic systems:

- Electric hot water reticulation system
- Back flow prevention systems
- Condensate as required by mechanical systems

This building is subject to further development in the next phase once GWRC requirements are known.

5.4 Seismic Restraint

Hydraulic services are to be seismically restrained in accordance with the requirements of NZS 4219.

6 Information & Communications Technology (ICT)

IT and Data systems will be provided to enable passengers, staff and operational systems to efficiently communicate and to provide an interfacing link to existing rail services and the wider area communications network.

The following ICT services will be provided at Waterloo Railway station

- Structured Cabling System (SCS)
- Building Backbone Optical Network
- Infrastructure for Public and Staff Wi-Fi
- Infrastructure for Passenger Information Displays (PIDs)
- Infrastructure for Passenger Help Points (PHPs)
- Infrastructure for Ticket Vending and Snapper top up machines
- Access Control and Intruder Detection (ACID) System
- Closed Circuit Television (CCTV) Systems
- Infrastructure for Master Clock System
- Public Address system (PA)
- Ticket barrier gates

6.1 Structured Cabling System (SCS)

The Structure Cabling System (SCS) will be provided throughout the platform. The Structured Cabling System will be Category 6A / Class EA (shielded) and support all approved applications including but not limited to analogue and digital voice applications, data, local area network, wireless, video, PHP, VRDS, PIDS and low voltage devices for building control and management on a common cabling platform to fully support the ICT requirements as laid out in this design report.

6.2 Building Backbone Optical Network

An Optical Fibre Network will be provided to link all the communications and control systems around the station. Optical fibre from the Communication Equipment Rooms will connect to the existing Rail network.

6.3 Communications Equipment Room (CER)

A Communications Equipment Room will be provided at platform level with a room size of approximately 5x4 m, housing 3no full size 1200x800 equipment racks. The racks will be seismically certified (Seismically tested to the latest Telcordia® GR-63-CORE: Zone 4). The Communications Equipment Room will have double doors with a minimum 900mm leaf for equipment access. The CER may have gas suppression subject to confirmation from the fire engineer and discussion with Metlink.

6.4 Public and staff Wi-Fi

The SCS will make allowance for data outlets and wireless access points in public and non- public areas of the station for the provision of station Wi-Fi.

6.5 Passenger Information Displays (PIDs)

The PiDs design is to provide real-time information to passengers at key decision points throughout the station. PIDs will be provided with an integrated clock. The SCS will make allowance for data outlets at PIDs locations as identified at the later stage.



Figure 6-1: Typical Passenger Information Display

6.6 Passenger Help Points (PhP)

PHPs provide passengers with the facility to make information or emergency calls to staff in the station control room. The SCS will make allowance for data outlets at PHP locations as identified at the later design phase.



Figure 6-2: Typical PHP used in Metro/Railway environments

6.7 Access Control and Intruder detection

The access control system will make specific areas of the station secure allowing access to authorised persons only. The access control field devices will be connected to a local interface which communicate via the station LAN. Access devices will include:

- Card readers
- Keypad
- Intercom
- Electronic door locks
- Reed switches

Access Control at the station will typically be provided in specific areas as listed below:

- Corridors including after-hours staff access
- Plant rooms
- switch rooms including UPS room
- Plant rooms

The intruder detection system will detect unauthorised entry into the station and activate alarms and notify staff and monitoring company. The intruder detection field devices will be connected to a local interface panel which communicates via the station LAN. Intruder detection field devices will include:

- Presence detectors
- Audible and visual alarms
- Door reed switches
- Duress alarms.

Intruder detection will be provided on all doors with electronic access control, all external doors and high-risk areas.

Specified areas listed below:

- Corridors
- Public concourse
- Switchroom
- Platform End Fire Egress routes

6.8 CCTV System

CCTV cameras will be provided throughout the platform, entrances and the bike storage area. Cameras will be a mixture of fixed and dome cameras. Cameras on the platform will be connected for monitoring and recording. All Security Systems equipment will be powered from the station 230V AC UPS. The required autonomy will be investigated during the preliminary design phase.

1 FIXED Dome Camera	Standard IP FIXED Dome camera for general indoor or semi-outdoor use across all AT business units. Weather & Vandal proof. Suitable for Low Light conditions. Frame rate 15fps or higher at HD. Must support codecs for adaptive IP bandwidth reduction, preferably H.264 standards based codec. ONVIF compliant IP camera – Profile S preferred.
2 PTZ Dome Camera	Standard IP PTZ Dome camera for general indoor or semi-outdoor use across all AT business units. Weather & Vandal proof. Suitable for Low Light conditions. Frame rate 15fps or higher at HD. Must support codecs for adaptive IP bandwidth reduction, preferably H.264 standards based codec. ONVIF compliant IP camera – Profile S preferred.
3 Hemispherical Camera (corrected)	Hemispherical 360 Camera for indoor & outdoor use across AT. Weather & Vandal proof. High performance hemispherical lens with on board digital correction (DSP) to remove 'fisheye lens effect'. Must support codecs for adaptive IP bandwidth reduction - H.264 standards based codec. ONVIF compliant IP camera – Profile S preferred.
4 PTZ Outdoor Dome	High Performance IP PTZ Dome camera for predominantly outdoor use across all AT business units, especially Rail and Bus. Weather & Vandal proof. K10 impact resistance preferred. Suitable for Low Light conditions. Frame rate 15fps or higher at HD. Must support codecs for adaptive IP bandwidth reduction, preferably H.264 standards based codec. ONVIF compliant IP camera – Profile S preferred.
5 Fixed Camera	High Performance IP Fixed Camera (long range lens) to view trains, buses, cars. Predominantly outdoors but could also be used indoors. Weather & Vandal proof. K10 impact resistance preferred. Zoom lens(15x), Auto-Iris, Auto-Focus (pref). Frame rate 15fps or higher at HD. Must support codecs for adaptive IP bandwidth reduction, preferably H.264 standards based codec. ONVIF compliant IP camera – Profile S preferred.
6 PTZ Pole Camera	High Performance, High Zoom IP camera on PTZ mechanism for specialised AT outdoor use, usually Rail or Bus stations. Weather & Vandal proof. K10 impact resistance. Zoom (15X plus), Auto-Iris, Auto-Focus, Low Light. Frame rate 15fps or higher at HD. Must support codecs for adaptive IP bandwidth reduction, H.264 standards based . ONVIF compliant – Profile S preferred.
7 PTZ Outdoor High Speed Continuous Pan	High Performance, High Speed, IP Continuous Pan PTZ Dome camera for continuous pan viewing on arterial roads and traffic intersections. Weather & Vandal proof K10 impact resistance. Zoom (10x), Auto-Iris, Auto-Focus, Frame rate 15fps or higher at HD. Codecs for adaptive IP bandwidth reduction, preferably H.264. ONVIF compliant IP camera – Profile S preferred.
8 Small Form Factor HSD Multi lens Pole Mount Camera	Small Form Factor IP Fixed Camera for indoor / outdoor use such as traffic poles to view lanes without being obtrusive. Weather and Vandal resistant K10 impact resistance. High Performance. Frame rate 15fps or higher at HD. Must support codecs for adaptive IP bandwidth reduction, preferably H.264 standards based codec. ONVIF compliant IP camera – Profile S preferred
9 Thermal Camera (fixed)	Thermal IP Fixed Camera for outdoor use in low or zero light conditions. Typically roading corridor, intersections, rail, ferry business units. Weather proof Vandal resistant - K10 impact resistance construction. Must offer adaptive bandwidth reduction, H.264 ONVIF compliant IP camera – Profile S preferred.
10 Thermal Camera (PTZ)	Thermal IP PTZ Camera for outdoor use in low or zero light conditions. Typically roading corridor, intersections, rail ferry business units. Weather proof Vandal resistant - K10 impact resistance construction. Must offer adaptive bandwidth reduction, H.264 ONVIF compliant IP camera – Profile S preferred.

Figure 6-3: Camera types

It is proposed that a security workshop be held during the preliminary design phase to establish and agree requirements.

6.9 Master Clock System

The Master Clock System provides an IP based synchronised timestamp across the station. Clock displays may be integrated into the Platform Information Displays (PIDs). The SCS will make allowance for data outlets at Clock locations as identified at the later design phase.

6.10 Public Address System (PA)

The PA system provides the facility the ability to broadcast audio announcements to passengers and staff. The PA system will be zoned for broadcasting different audio messages in areas of the station and priority levels will be programmed to allow high priority messages to override those which are less important. The headend amplifier and audio control equipment will be located in the communications room.

6.11 Exclusion

No allowance has been made for mobile, radio network and fixed telephone due to the station being at surface level. Railway Communication and signalling is not included in scope. Active network equipment UPS and Network switches are not included in the scope of work

6.12 Existing Infrastructure

The existing infrastructure will be investigated during the preliminary design phase to establish what systems can be kept, extended and connected into.

6.13 Commercial Area

The commercial area, which is indicated as part of the station proposal, has been documented for the purpose of the reference design as a 3-storey building (GF, L1, L2). The building has a footprint of 550sqm, with a total GFA of 1650 sqm over 3 floors. We would anticipate the ICT/security services of this space would include:

- Data structural cabling,
- Data cabinets,
- PA systems,
- Wifi,
- Security system

This building is subject to further development in the next phase once GWRC requirements are known. Also refer to the requirements above regarding the implementation of shared design principles

6.14 Seismic Restraint

Hydraulic services are to be seismically restrained in accordance with the requirements of NZS 4219.

7 Earthing and Bonding

7.1 General

The Earthing and Bonding section of this report describes the earthing and bonding arrangements necessary for the proper working of the services, rail and the safety of all concerned in Waterloo Station.

7.2 Regulations, Standards, Codes, and Specifications

The regulations, standards, codes, and specifications listed in the table are relevant documents for the earthing and bonding design.

Table 7-1: E&B Specific Codes and Standards

Document No	Rev / Issue	Title
SR 2010/36	2010 incorporating latest revisions (reprinted as of 4 April 2016)	New Zealand Electricity (Safety) Regulations 2010
NZEC 34	2001	New Zealand Electrical Code of Practice for Electrical Safe Distances
NZEC 35	1993	New Zealand Electrical Code of Practice for Power Systems Earthing
EN 50122-1	2011	Railway Applications - Fixed Installations – Electrical Safety, Earthing and the Return Circuit – Part 1: Protective Provisions Against Electric Shock
IEC 62128-1	2013	Railway Applications - Fixed Installations – Electrical Safety, Earthing and the Return Circuit – Part 1: Protective Provisions Against Electric Shock
AS/NZS 3000	2007 incl. A2	Electrical Installation (known as the Australian/New Zealand Wiring Rules)
E1332	1	AEP Traction Rail Bonding Installation Specification
ENA EG1	2006	Energy Networks Association – Substation Earthing Guide
IEEE Std 80	2000	IEEE Guide for Safety in AC Substation Grounding

7.3 Traction and Station Earthing Systems

During the next design phase, it will be determined as to whether the traction and station earthing systems are to be separate systems or combined. This will be based on the separation distances of the two systems.

7.3.1 Earthing and Bonding Areas

Traction and equipotential bonding are required throughout the Waterloo Station complex, the following items will be connected to earthing and bonding system.

- Zone 1
 - Canopies
 - Metallic structures
 - Fences and discrete air gaps for discontinuity
 - Metalwork
 - Overbridges: walkways and roads
 - Concourse
- Zone 2
 - Traction Overhead Line Equipment (OHLE) comprises the support masts & foundations, catenary wires, contact wires and traction earth wires, together with the associated feeder and cross span wiring, isolation, support arms, associated fittings and other attachments that traction overhead wirings are suspended and registered in position.

7.3.2 Low Voltage Electrical Supplies

The electrical services design which includes the distribution of the Multiple Earthed Neutral (MEN) and communication earth systems as per AS/NZS 3000 is covered in the electrical services section of this report.

7.4 New Primary Earth Terminal (PET) Cabinet

The requirement for a new Primary Earth Terminal (PET) cabinet will be determined as the design progresses. The PET is a critical electrical item of the traction system earthing infrastructure and provides the main point of connection for traction and equipotential bonding for the station.

7.4.1 Equipotential Bonding

The following normally non-current carrying conductive structures and equipment installed close to the Overhead Contact Line Zone (OCLZ) will be connected to the Primary Earth Terminal (PET) equipotential earth bars:

- Canopy structure
- Dual bond to the Station Main Earth Bar (SMEB)

7.4.2 Traction Bonding

The following normally non-current carrying conductive structures and equipment installed within the Overhead Contact Line Zone (OCLZ) and Current Collector Zone (CCZ) along the platforms will be connected to the Primary Earth Terminal (PET) traction earth bars:

- Dual bond to rail tracks
- Fences

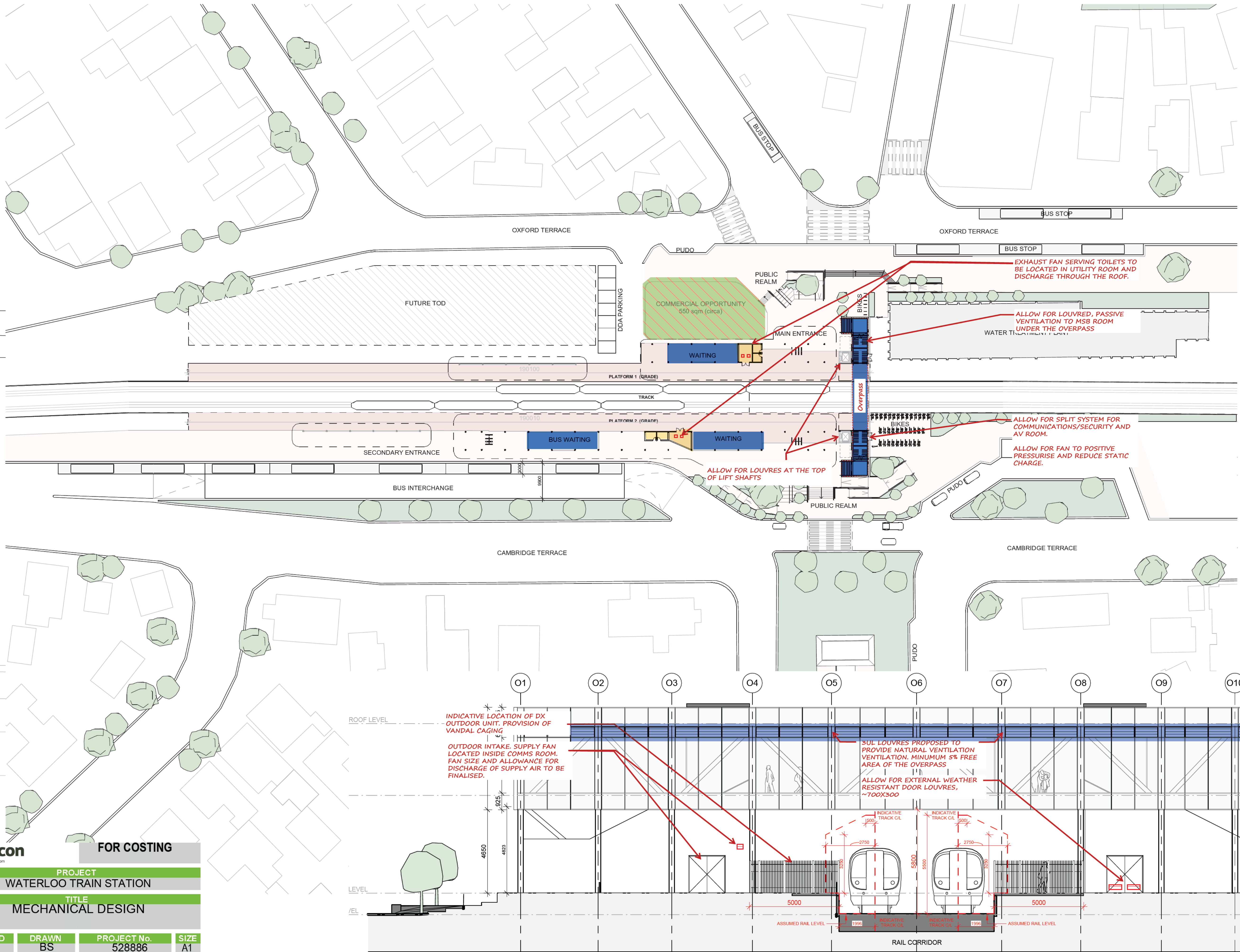
7.5 Substation Earthing System

The 11 kV HV MEN supply feeding the new station transformer can contribute to the Earth Potential Rise (EPR) at the station under fault conditions, this will result EPR at the substation and transferring potentials to other parts of the interchange facility via the connected earthing and bonding system.

ERP results analysis shows that the touch potential levels are very close to acceptable levels indicated in the AS60479 standard.

It is recommended that Wellington Electricity design the earthing system of the substation to ensure the touch and step potentials levels are below the acceptable levels.

Appendix A – Building Services Sketches



COLOURS LEGEND

- EXHAUST AIR (EA)
- KITCHEN EXHAUST (KE)
- OUTSIDE AIR (OA)
- RETURN AIR (RA)
- SUPPLY AIR (SA)
- TOILET EXHAUST (TE)

Recommended VRF/HVRF Air conditioned spaces with tempered outdoor air, general exhaust and toilet exhaust.

Exhaust air discharged through roof cowl

Passive ventilation, no conditioning

Space not directly conditioned

GENERAL NOTES

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- ALLOWANCE FOR 12 SNAPPER CARD READERS; 2 X SNAPPER TOP UP MACHINES, 6 X REAL TIME INFORMATION (RTI) DISPLAYS ON THE PLATFORMS AND 2 X RTI DISPLAYS AT STATION ENTRANCES.
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- ALL UNDERPASS ELECTRICAL SERVICES ARE DECOMMISSIONED AND REMOVED FROM SITE.
- TWO SEPARATE LOCATIONS IDENTIFIED FOR A SINGLE LIFT INSTALLATION.
- SERVICES SERVING PUBLIC TOILETS TO BE LOCATED IN ADJACENT UTILITY ROOM.

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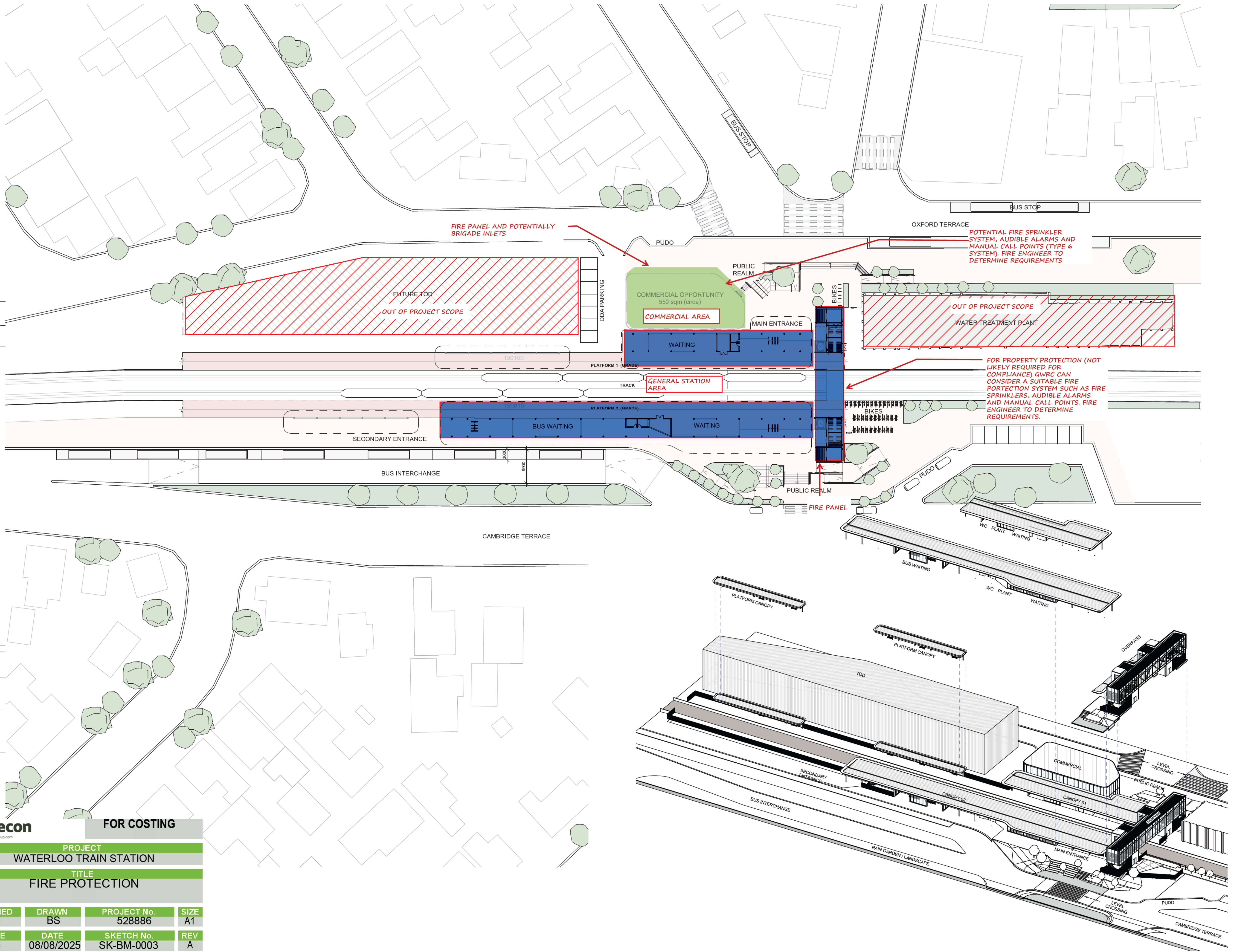
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COLOURS LEGEND

- COMMERCIAL DEVELOPMENT- (TYPE 6 SYSTEM) REQUIRED. FIRE ENGINEER TO DETERMINE REQUIREMENTS.
- Passenger Rail Area - (TYPE 2 SYSTEM) REQUIRED. FIRE ENGINEER TO DETERMINE REQUIREMENTS.

GENERAL NOTES

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- ALLOWANCE FOR 1.2 SNAPPER CARD READERS; 2 X SNAPPER TOP UP MACHINES, 6 X REAL TIME INFORMATION (RTI) DISPLAYS ON THE PLATFORMS AND 2 X RTI DISPLAYS AT STATION ENTRANCES.
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PROJECT

WATERLOO TRAIN STATION

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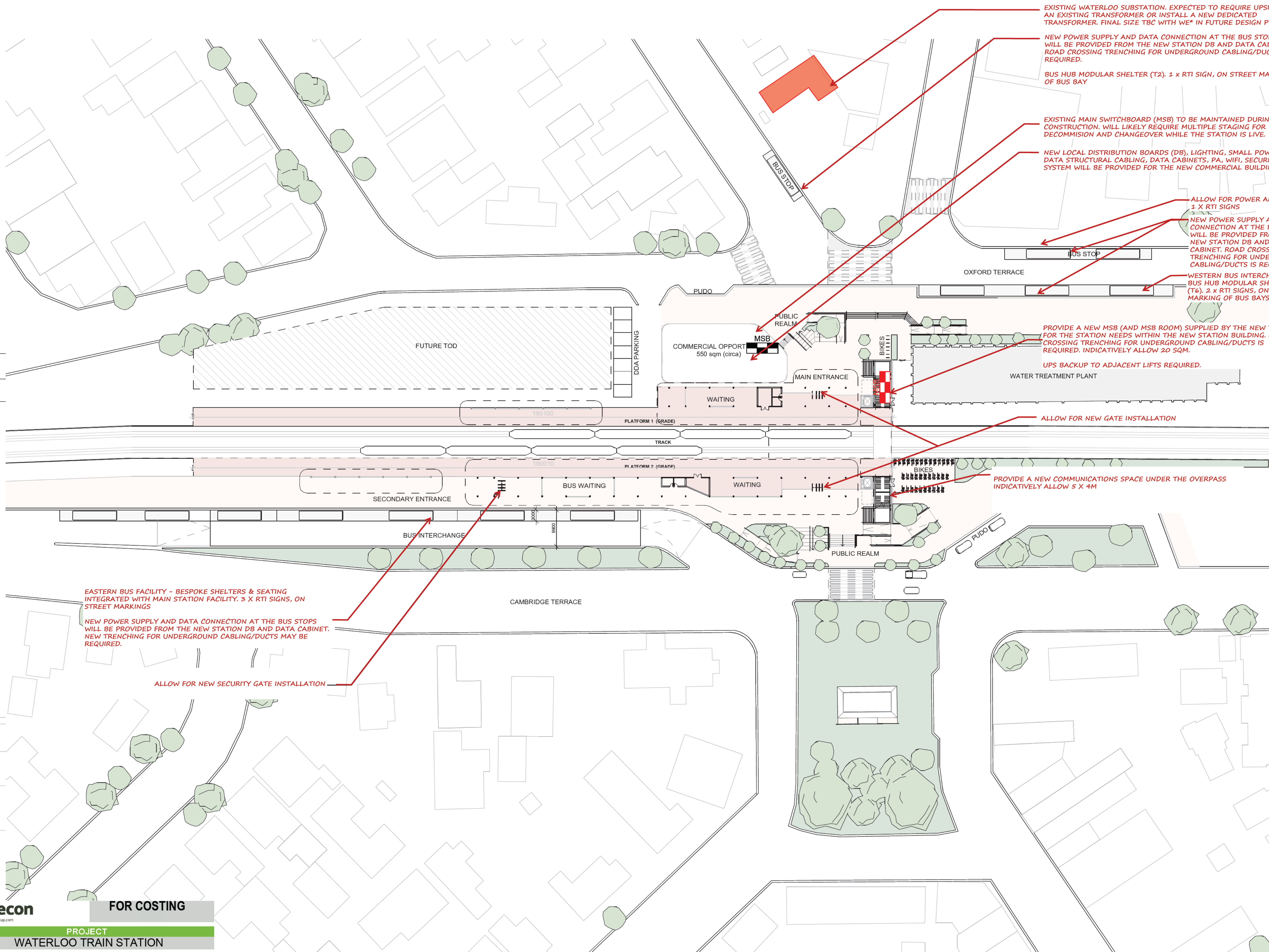
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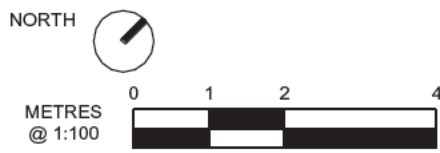
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PROJECT
WATERLOO TRAIN STATION

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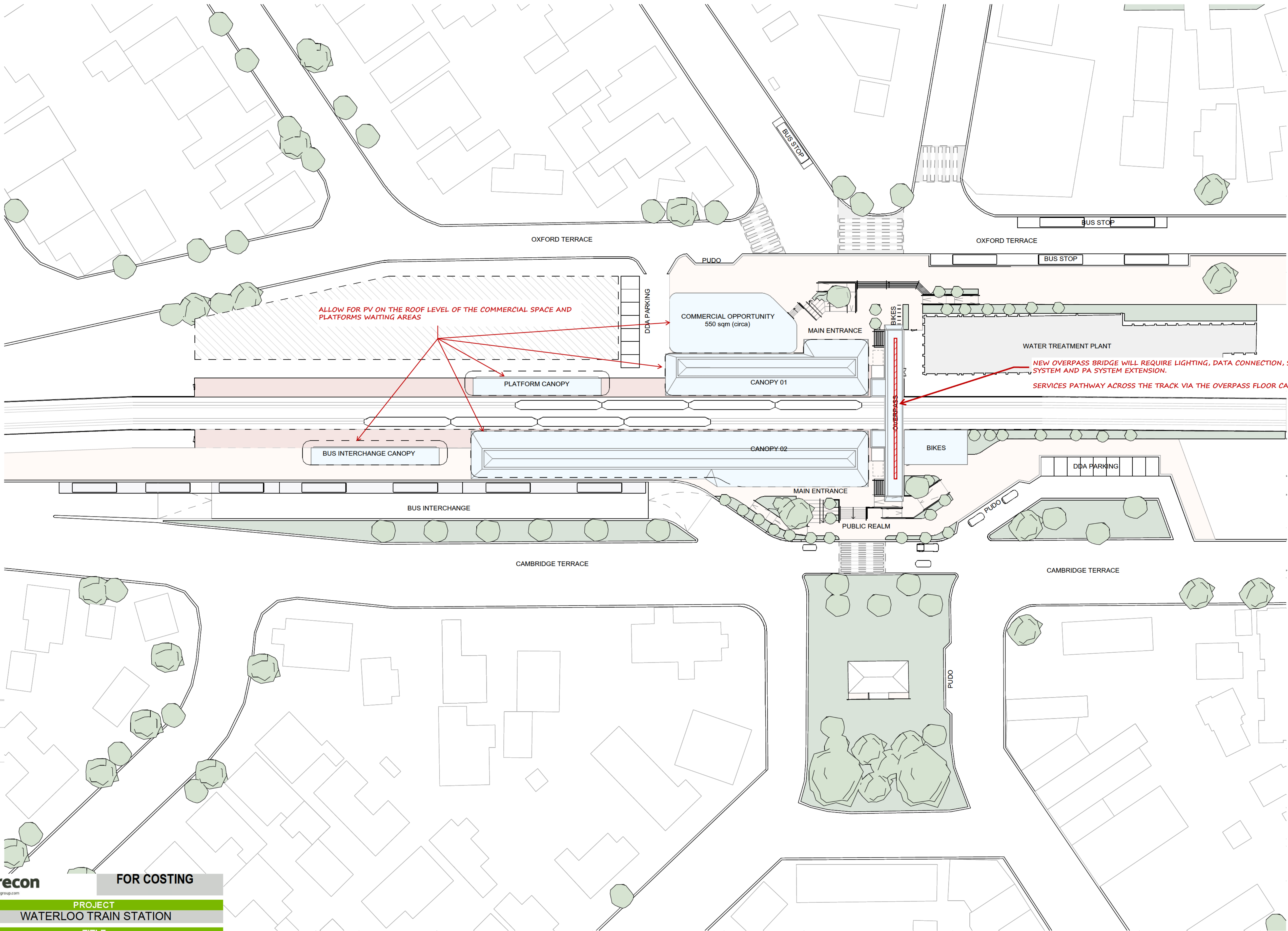
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WATERLOO TRAIN STATION

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COLOURS LEGEND

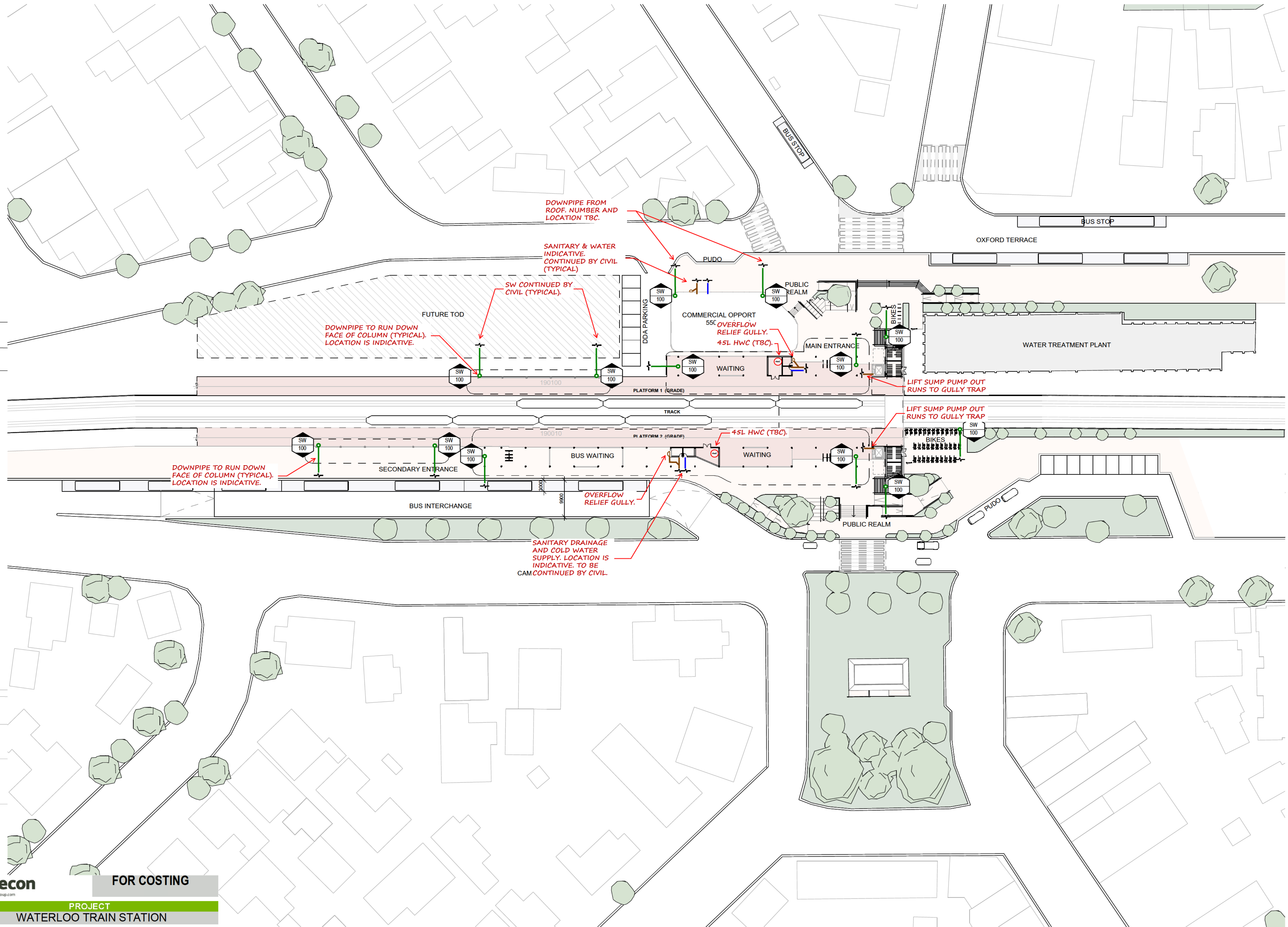
- SANITARY DRAINAGE
- STORMWATER DRAINAGE
- DOWNPIPES
- COLD WATER SUPPLY

SHEET SPECIFIC NOTES

- COLD WATER SUPPLY COMPLETE WITH IN-GROUND TOBY AND BACKFLOW PREVENTION.
- ALL PIPE SIZES TO BE CONFIRMED.
- DOMESTIC HOT WATER PLANT WILL BE REQUIRED FOR THE COMMERCIAL BUILDING.
- HOSE TAP LOCATIONS ARE NOT SHOWN.
- LIFT PIT SUMP PUMPS TO BE PUMPED TO OVERFLOW RELIEF GULLY TRAPS ADJACENT TO WC/PLANT AREAS.
- DOWNPIPE LOCATIONS AND NUMBERS ARE INDICATIVE AND TO BE CONFIRMED.

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COLOURS LEGEND

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DOWNPIPES
COLD WATER SUPPLY

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SCALE

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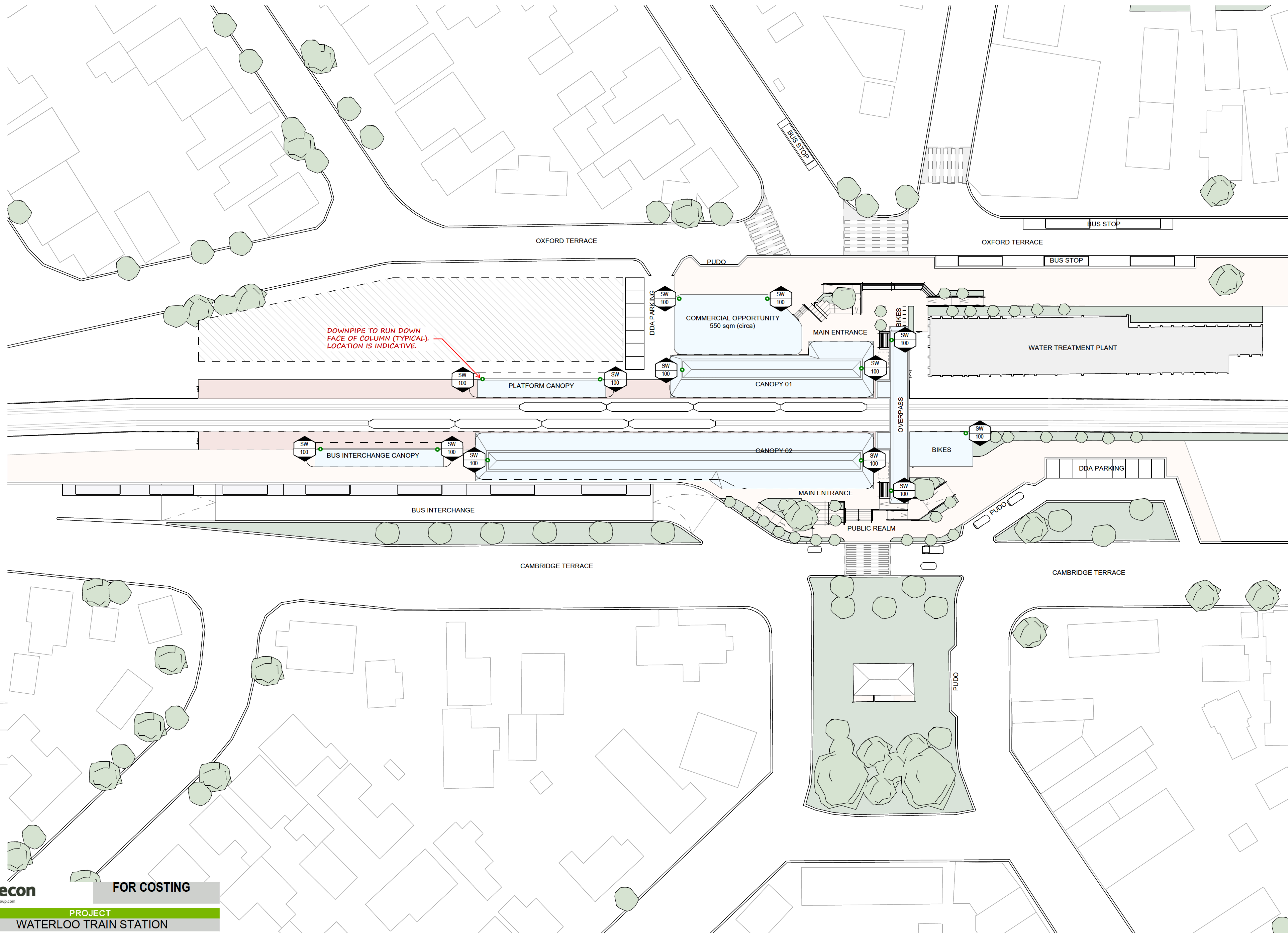
STATUS

For Information

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Document prepared by

Aurecon New Zealand Limited

Spark Central
Level 8, 42-52 Willis Street
Wellington 6011

PO Box 1591
Wellington 6140
New Zealand

T +64 4 472 9589

F +64 4 472 9922

E wellington@aurecongroup.com

W aurecongroup.com