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Memorandum

Title	**Concept-lite Design Memo**
Job Number	**8962**
To/Attn	**GWRC c/- RCP**
From	s7(2)(a) [redacted]
Date	**7/08/2025**

The following memorandum provides background to the structure proposed for the favoured shortlisted option (Short Overbridge) as well as touching on future risks and opportunities.

1 Outline

Dunning Thornton have provided structural input to Grimshaw's "Issue for Coordination" drawings dated 28th July 2025. These markups include structural materiality, likely zones for bracing elements and gravity structure.

Main elements requiring structural input are:-

- New overbridge spanning track only
- New Canopy structures
  - Two main types- double cantilever (Main Canopy #1&#2) and side column (Platform Canopy)

There is also potential for a stage 1 commercial building to be developed as part of the station re-development. This is currently shown as a two storey building in the massing model. For costing purposes, this can be assumed to be traditional steel framed building, with 8x8m grid, with piles and pile caps at column locations, with concrete foundation beams between. Assume insitu concrete floors on trapezoidal steel tray with secondary beams, and light gauge purlin roof with plywood diaphragm. There may be an option for incorporating timber elements, such as a timber roof, and/or floors which can be explored in later design phases.

The main structural driver is to limit foundation loads in order to minimise piles required. All structures need to be supported on piles, founded in gravel layer ~8m below ground, and avoid the aquifer. Refer to Tonkin and Taylor geotechnical memo for further details.

1.1 New Overbridge

Form of the overbridge, with offset lift and stair, has resulted in a more complex bridge design than in the previous phase, due to the need to hang one corner – the lift "lobby" - of the off the main span. An SHS trussed frame is proposed, with diagonal members to the elevations, as well as the roof and floor. Placement of diagonals is driven by circulation constraints with two braced bays per side per end on the longitudinal elevation. These differ on each elevation of the bridge due to position of stair flight exiting one side of the bridge.

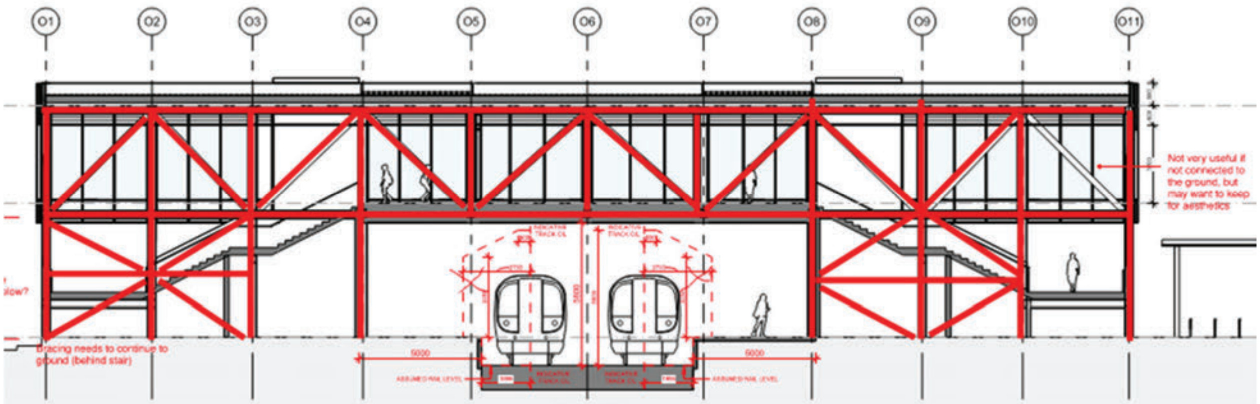

Figure 1 – Elevation of Bridge Showing Proposed Truss Arrangement

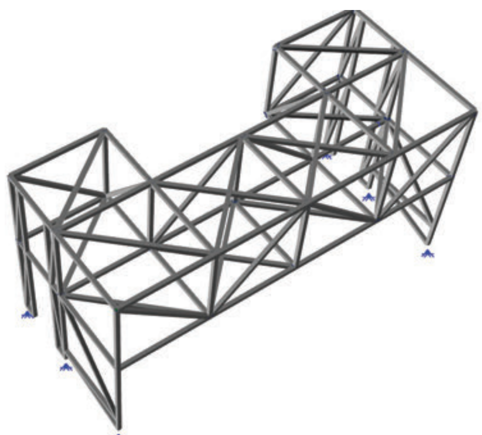

Figure 2 – Excerpt Structural Model of Bridge Spanning Portion Only

It is proposed that the floor and roof of the overbridge are CLT panels, with 80mm lightweight screed to the floor panels for wear/weathering purposes. These would sit on the top of the steel structure.

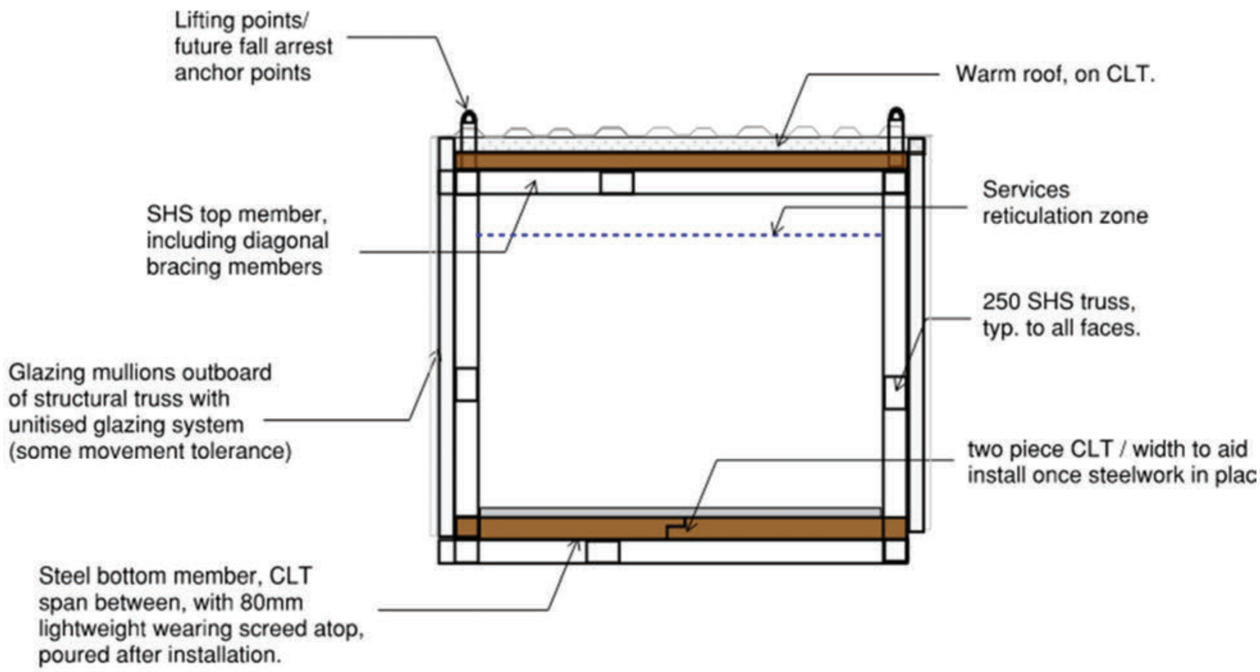

Figure 3 – Cross Section Through Bridge

Given the complexity of the trussing, it is proposed that the bridge is functionally a single element, rather than incorporating seismic movement joints. This will impact constructability of the bridge, it is currently proposed to fabricate as one element. Allowance for Category 4 piloted transport should be made.

Stairs are proposed to be steel plate on steel stringers generally, with steel plate landings. The first short flights at 90 degrees to the main bridge are proposed to be insitu concrete over void former.

It is assumed that the bridge structure will be subject to fire rating requirements – this will include protection to the roof steel elements. If specific fire assessment is done, this may be able to be omitted.

1.2 Canopies

Two different canopies are proposed, larger ~15m structures which form part of the roof of large semi-permeable shelters and smaller single span canopies over sections of the platform. It is proposed that canopies are formed of steel columns and beams, with structural cassette rooves (SIPS or pre-sheathed frames panels, overclad in architectural lining to the soffit (if not part of the cassette) and metal roofing. Additional framing will be required to achieve the canopy envelope shape.

It is assumed that the canopy structures will not need to be fire rated.

Canopy steelwork beams will be set out to avoid being penetrated by internal gutter – this is likely to drive the position/depth of steelwork.

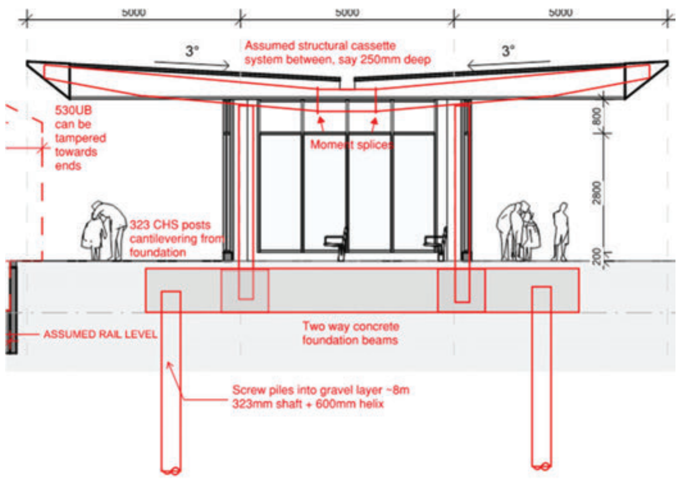

Figure 4 – Cross Section Through Double Column Canopy

Allowances for thermal movement and any differential movement will be considered in later design phases through detailing. A conservative allowance would be movement joints every 40-50m

1.3 Other Structural Items for Discussion

At the time of writing, extend of glazing to shelters is still to be determined. It is likely that secondary structural steel will be required to support the glazing.

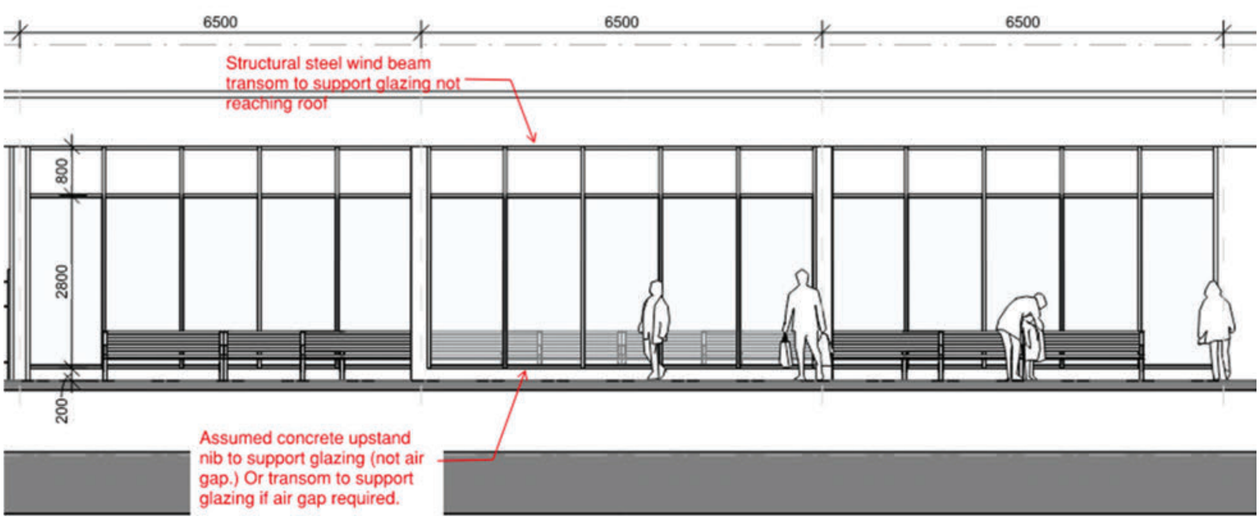

Figure 5 – Example of Glazing

Single storey standalone structures, such as plant and toilet block could either be lightweight timber structures (stick frame or CLT) with timber framed ceiling or alternatively blockwork with concrete lid. Structural solution and required ceiling height will influence integration with canopy structure.

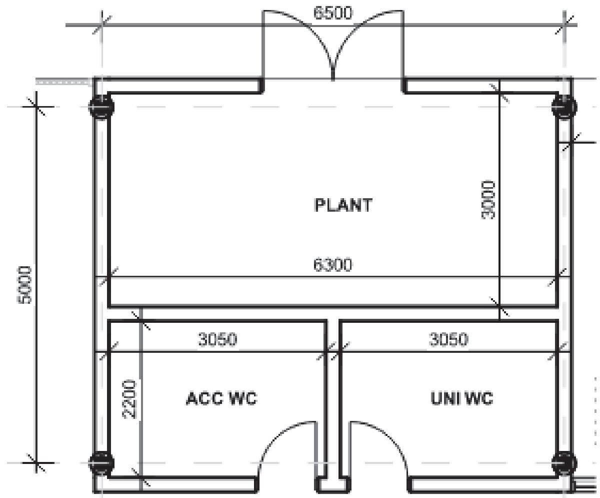

Figure 6 – Excerpt Architectural – Plant & Toilet Block

2 Key decisions to date

The architecture form of both the bridge and canopies lend themselves to primarily structural steel solutions rather than timber due to proposed spans. Similarly, the foundation constraints preclude large scale use of concrete, in order to minimise imposed loads on the foundations.

Providing medium depth piled foundations also helps to isolate the structure from effects of potential differential settlement of the ground locally. This is particularly important for the overbridge if constructed as a single unit.

3 Future Risks

The current lift position has been setout to be offset from the existing subway, to allow continued use of the subway during construction. The suitability and practicality of this will need to be examined more closely in later phases, to ensure sufficient offset has been provided. Excavation adjacent will need to consider water control risk (refer sketches).

The status of the existing subway is currently unknown at time of writing from both a durability perspective and a liquefaction susceptibility perspective. This is subject to forthcoming testing (durability) and analysis (once liquefaction trigger level is established following ground investigation.)

Importance level of the station is still subject to discussion. Current structures have been sized assuming IL2 levels of shaking. The loadings code does not require higher levels of resilience that this (unless classed as principal railway station with capacity greater than 250 people): options to add "above code" resilience for either life-safety or damage mitigation can be had during Preliminary Design along with the cost/benefits.

4 Future Opportunities

There is a future phase of work to consider station construction staging and possibility of 'hybrid' option of continuing to use existing subway prior to installation of new overbridge. This will be dependent on results of both the durability assessment of the subway and liquefaction susceptibility of the subway.

In future design stages, relative resilience of structures verses platforms should be considered. It is currently noted that platforms are formed on a gravel raft over void former, as a mid range solution between slab on grade (likely subject to liquefaction induced settlement) and fully piled solution, but this should be interrogated considering amount of bulk excavation vs post seismic remediation required once liquefaction trigger level is known.

Future design phases can consider potential for pedestrian pass through under the bridge, through alterative bracing configurations/layouts. Similarly in preliminary design, form of bracing to lift fronts can be explored to minimise structural bracing zone as much as possible.

Infilll/removal of the existing subway and options for this will also be considered in future stages.

s7(2)(a)
[redacted]

Associate