National Project of Interest; Hobsonville Deviation Project SH18 and SH16

REAAA NZ AGM Committee

2\textsuperscript{nd} April 2012

Ben Parsonage
Auckland’s Western Ring Route

SH18 Hobsonville Deviation and SH16 Brigham Creek Extension
Project Introduction

- Client: NZTA
- Contract: Lump Sum Design and Construct
- Main Contractor: HEB Construction
- Designer: Connell Wagner (Aurecon Group)
- Urban Architect: Jasmax
- Principal Advisor: Opus-Aecom
- Project Cost: $210 million
Project Scope

- Site area 100 hectares
- 1.5 million m$^3$ earthworks
- 5 interchanges at Westgate, Trig Road, Brigham Creek Road (north & south) and Buckley Avenue
- 350,000 m$^2$ pavement construction using 196,000t of deep lift asphalt
- 27 culverts (total 1,200 m) up to 2.4m diameter
- 54 km pavement drainage
Project Scope

• 1 flyover at Westgate to connect northbound SH16 to eastbound SH18
• 5 bridges - at Hobsonville Road, Trig Road, Brigham Creek Road, Buckley Avenue and Totara Creek
• 1 cable-stayed pedestrian footbridge at Clarks lane
• 400,000 (52 ha) native plants and trees
• 350 staff on site during peak
Design Innovations

- Redesign of SH18 Flyover
- Hobsonville Rd bridge construction
- Aesthetic Designs
- Green Wall
- SH16-SH18 merge / split
- Redesign of pavement to deeplift asphalt
Redesign of SH18 Flyover

• Original design consisted of a trapezoidal box beam structure with concrete deck
• Steel prices were rising significantly so changed to concrete bridge
• Had to cast in-situ, as bridge had such an angle (23°) on it, which made the beams too long (longest over 40m), and robust design also made them very heavy
• ‘Bird Cage’ structure erected to construct formwork to allow beams to be cast
Redesign of SH18 Flyover
Redesign of SH18 Flyover

SH18 Hobsonville Deviation and SH16 Brigham Creek Extension
Redesign of SH18 Flyover

SH18 Hobsonville Deviation and SH16 Brigham Creek Extension
Hobsonville Rd Bridge Construction

- Stage 1 – Realign traffic to travel around a roundabout around the construction area.
Hobsonville Rd Bridge Construction

- Stage 2 – Construct bridge in centre of roundabout & construct new ramps
Hobsonville Rd Bridge Construction

- Stage 3 – Divert traffic across new bridge and onto new ramps
Hobsonville Rd Bridge Construction

• Stage 4 – Excavate underneath new bridge to new alignment level
Aesthetic Design

• Clarks Lane Footbridge (Part 1)
Aesthetic Design

- Clarks Lane Footbridge (Part 2)
Aesthetic Design

- Noisewalls
Green Wall

• The ‘green wall’ was an integral part of the environmental effects that the Hobsonville Deviation had on the surrounding environment
• It consisted of sections of precast concrete panels with holes through them
• Behind these panels were levels of special plants that require no maintenance, and not much light or water
• A watering system that collected rainfall was also installed to water the plants
• After 6 months, there are now plants showing
SH18 – SH16 Merge/Split

SH18 Hobsonville Deviation and SH16 Brigham Creek Extension
SH18 – SH16 Merge/ Split

• The most complicated area of the job – our ‘Spaghetti Junction’
• At widest point (just south of bridge), total of 13 lanes wide
• SH16 can join SH18 when heading northbound, whilst SH18 can join SH16 when heading southbound
• Hobsonville Rd has 2 on-ramps – SH18 E/B & SH16 S/B, and 2 off-ramps – SH18 W/B & SH16 N/B
SH18 – SH16 Merge/Split
SH18 – SH16 Merge/ Split

• There is an additional bus lane on the Hobsonville Rd northbound off-ramp, which will eventually provide direct access into the new shopping centre

• Designers took advantage of local roads that could still provide for the small amounts of traffic that would need to access other directions – reducing costly on/off ramps

• From Westgate travelling north using old SH16, from Kumeu wanting to travel east on SH18, and travelling west on SH18 wanting to travel towards Kumeu would both use Brigham Creek Rd and/or Trig Rd
Re-design of Pavement to Deeplift

• Original pavement design was a continuation of a similar design to the Greenhithe section of SH18 further east. This was an unbound pavement, with a thick layer of both subbase and basecourse and surfaced with OGPA / SMA

• SH16 was also only designed as a single lane north and south, which was then upgraded to two lanes in each direction

• Decision made by designers and NZTA to go to a deeplift pavement
Re-design of Pavement to Deeplift

SH18 Hobsonville Deviation and SH16 Brigham Creek Extension
Re-design of Pavement to Deeplift

- Multiple designs created to optimise the pavement depth based on the variability of subgrade material
- High fatigue layer, with AC20 layers above, and OGPA/SMA surfacing, on unbound subbase
- Thickness of AC20 was the variable that could be altered
- All layers, apart from surfacing, paved using 3D model input into ‘PaveSet’
- Surfacing paved using laser levelling beam to average out any humps and hollows
Re-design of Pavement to Deeplift

<table>
<thead>
<tr>
<th>SUBGRADE CBR</th>
<th>SIL DEPTH (mm)</th>
<th>TNZ AC14HF THICKNESS (mm)</th>
<th>AC20 THICKNESS (mm)</th>
<th>BEAM DEFLECTION TARGET PRIOR TO 1ST LAYER ** (mm)</th>
<th>AC</th>
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**REFER TO NOTE 1**

Design Table for Pavement depths showing differences of AC20 thickness – as you can see it was in our interest to increase the subgrade strength to save on asphalt
Re-design of Pavement to Deeplift

Average NAASRA = 19.74

SH18 Hobsonville Deviation and SH16 Brigham Creek Extension
Questions?