

TRANSFORMING VICTORIA STREET – WORKING TOGETHER TO TACKLE UTILITY DESIGN

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ABSTRACT

The Victoria Street Transformation Project has provided Wellington with a tree lined boulevard, enhancing the pedestrian experience with wider footpaths and parks. This has facilitated and encouraged development within the area as well as improved traffic and cycling flows.

The project had a short timeframe from its announcement in September 2014 to its completion by 30 June 2015. In order to achieve these optimistic timeframes, the project was delivered by the already established and successful Memorial Park Alliance (the Alliance).

The challenge for wet services was to remove, replace and add new components to the water supply, stormwater and wastewater networks in a busy part of Wellington where these services were critical to the wider city network. The urban complexity meant that design and construction issues were inevitable and could only be discovered and solved once the ground was opened up. Further complications included the need to move services before other elements of the design were complete, the quantity of services underground, and the need to keep Victoria Street and Vivian Street (State Highway 1) open at all times.

The Alliance delivery model allowed for close collaboration between the design and construction teams and the owner, Wellington City Council (WCC). This enabled swift decision making which was essential to the successful completion of the project. This collaborative approach resulted in innovative and time-efficient solutions, which had a significant contribution to the project being completed on time.

KEYWORDS

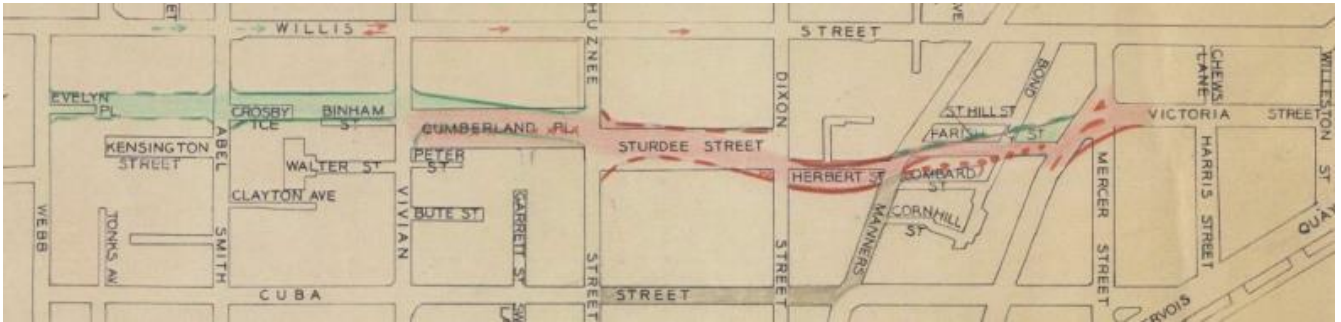
Alliance, Collaboration, Urban Complexity, Water Supply, Stormwater and Wastewater Services

1 INTRODUCTION

Victoria Street is a primary street located in central Wellington. For more than thirty years Victoria Street's primary function has been to provide a transport route to the city centre. The transformation project aimed to make the street a great place for people to pass through and spend time while also retaining its use as an important transport route. The project also aimed to attract more residential and commercial development creating a great inner-city neighbourhood.

Historic city maps suggest development of the area occurred in the late 1880s, however Victoria Street as we know it today was not constructed. Instead a different alignment consisting of several streets and lane ways was built, as shown in Figure 1 below. In the 1970s and 80s following a clearance redevelopment programme, many of the streets and lane ways were realigned to form present day Victoria Street. Though the street alignment was altered, the services were not replaced and the service routes remained the same, therefore many of the existing services below Victoria Street do not follow the current road alignment.

Figure 1: Historic City Map With Sketch of Present Day Victoria Street



The Victoria Street Transformation Project extended for three blocks of the street from Abel Smith Street intersection in the south to Dixon Street intersection in the north. The works also included the intersections with Ghuznee Street and Vivian Street (State Highway 1). Plans of the concept solution and layout of Victoria Street works are shown on Figures 2, 3 and 4. Figure 2 displays the south block between Abel Smith Street and Vivian Street, Figure 3 shows the mid block between Vivian Street and Ghuznee Street and Figure 4 highlights the north block between Ghuznee Street and Dixon Street.

Figure 2: South Block Concept Plan

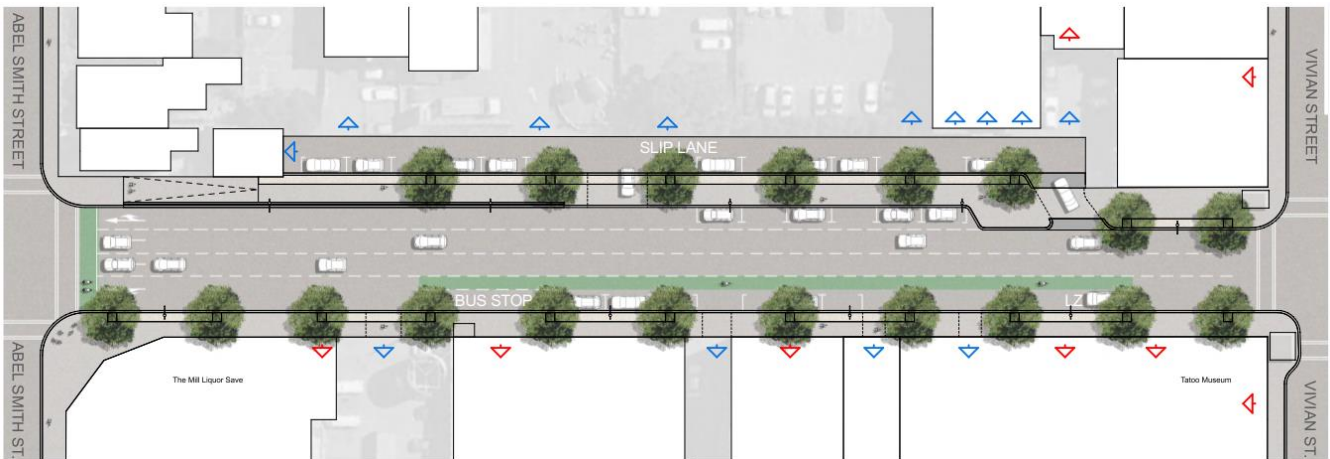


Figure 3: Mid Block Concept Plan

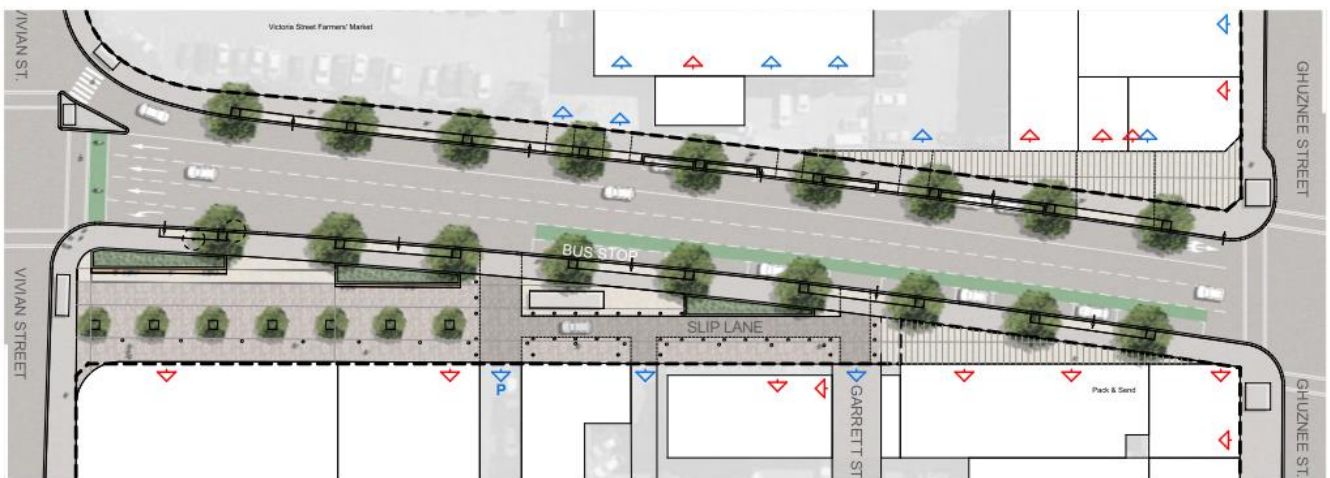
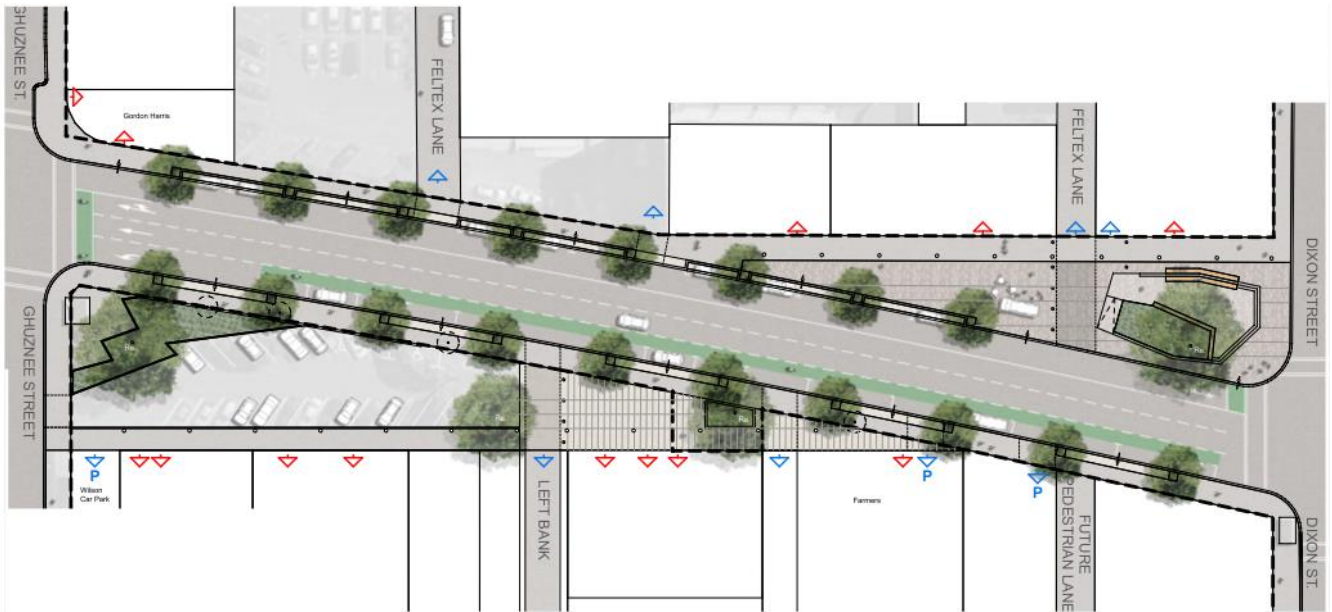


Figure 4: North Block Concept Plan



The project involved working closely with WCC, urban designers (Studio Pacific Architecture) and other stakeholders to create their vision for the street. The street was realigned to provide wider footpaths with trees planted along the street edge and pocket parks created at Vivian Street and Dixon Street intersections. The traffic improvements included reconfiguring vehicle lanes, retention of as many car parking spaces as possible and inclusion of a new cycle lane.

To enable the Victoria Street Transformation Project numerous services were required to be relocated from beneath proposed kerb lines and tree pits and from under the foot print of potential future commercial and residential developments. New services were also provided to the pocket park areas to enable food trucks and coffee carts to be set up.

2 ALLIANCE MODEL

The project was delivered by the Memorial Park Alliance, comprising; Wellington City Council (WCC), New Zealand Transport Agency, Downer, HEB, Tonkin + Taylor and URS (now AECOM). Input from Studio Pacific Architecture was also provided for urban design. The same Alliance was involved in delivering the Pukeahu National War Memorial and Arras Tunnel projects. Many challenges were experienced and overcome throughout these projects and as a result good integration of design, construction and stakeholders' requirements was achieved. The experience and relationships gathered from these previous projects were key factors in helping deliver this challenging project on time.

Regular meetings were held on site between design discipline leads and the construction team to ensure a good understanding of the interaction between various design elements and construction issues. The design process incorporated formal design review stages where feedback and input was sought from each design discipline, the construction team, and Wellington Water.

A strong partnership with both Wellington City Council and Wellington Water was developed through regular communication throughout the project, this built on the partnerships developed in previous Alliance projects where the same approach was adopted with great success. This open and honest working relationship focused on two-way idea exchange, which was very effective in identifying issues that arose during construction and finding appropriate, workable solutions.

3 PROJECT CHALLENGES AND SOLUTIONS

The challenge for utility diversions was to remove, replace and add new components to the water supply, stormwater and wastewater networks in a busy part of Wellington. Further complications included the need to move services before other elements of the design were complete, the quantity of services underground, and the need to keep Victoria Street and Vivian Street (SH1) open at all times.

3.1 PROJECT TIME FRAME

The project had a short timeframe from its announcement in September 2014 to its completion by 30 June 2015. The restricted programme (as well as traffic constraints) limited the amount of service investigations carried out on site before design began. A number of trial pits were carried out on site to confirm the location of existing services but if time had permitted, many more would have been undertaken. Consequently, it was necessary to rely on as-built information to determine the approximate location of many existing services.

The short time frame resulted in wet services construction being undertaken before the design was fully complete. Much of the urban design and geometry was still being designed while service construction was ongoing. This resulted in changes to the design location of services such as catchpits, leads and water supply pipes that had to be addressed and redesigned on site.

For the project to be completed on time, any issues occurring on site during construction had to be dealt with in a timely fashion. The design team was located in the site office to react quickly to any of the construction team's requirements. To resolve any issues, it was necessary for the design team to fully understand the construction challenges, this was achieved through site inspections and discussions with the construction team on site. A good understanding of both the design and construction constraints led to a close collaboration and allowed redesign of service routes so that a cost effective, timely solution could be constructed and delays to the construction programme could be avoided.

The good working relationships between design and construction teams that were developed during the previous Alliance projects enabled the Alliance, Wellington City Council and Wellington Water to work collaboratively and efficiently from the beginning of the project.

Early engagement of the construction team in developing the design philosophy was essential. This ensured that the correct level of design was undertaken to reflect the number of uncertainties and assumptions and flexibility built into the design where possible. The design constraints and principles were explained clearly to the construction team to assist in developing workable, efficient solutions.

3.2 EXISTING SERVICES

There were many existing services located beneath Victoria Street, which was to be expected beneath a street in central Wellington. Plans and electronic files were supplied by service providers showing existing service locations, however many services were not in the location shown on the drawings. This created issues on site as services that differed from their location on the service plan often clashed with proposed design service routes. As mentioned previously a less than desirable number of trial pits were carried out to verify locations of many existing services.

There were also many services beneath Victoria Street that were not identified on any service plans. This created further challenges because first we were unaware who owned the service and second whether the service was live or not. Service providers were called to site to identify if they owned the service and then tested the service to check if it was live or not. Although most of these services were found to be abandoned and could be removed, there were long time delays waiting for service providers to get to site and test the services.

Changes to design alignment and pipe gradients were required as construction progressed, as existing services were found in different positions, depths, sizes and gradients to their indicated position on the as-built plans. The location of existing services and proposed urban design features constrained the wet services design, including manhole positions and pipe depths, locations and gradients. Changing design during construction can be a costly and time consuming process, as outlined above the close location of the design office to the site, and the strong working relationships resulted in a collaborative approach to solving construction challenges.

Photograph 1: Existing Services at the Intersection of Victoria Street and Vivian Street



Photograph 2: Installation of Stormwater Pipe Below Existing Services



3.3 LIMITED SPACE

A boulevard of trees was proposed to be planted at either side of the street to improve aesthetics and encourage pedestrians to use the street more frequently. To support healthy tree and root growth, the trees were planted in tree pits, approximately 3m wide x 4.5m long x 1.5m deep, which were constructed below the proposed kerb and footpath. This created two challenges, firstly any services running through, or in close proximity to the proposed tree pits were, at the request of service providers, to be diverted outside the tree pit extents. Secondly, due to the necessary size and volume of the tree pits, limited space was available to divert the services beneath the footpath. The broad design philosophy was agreed with all service providers at the beginning of the project, the project aimed to construct a dry services corridor at the rear of the footpath and a wet service corridor within the carriageway.

The overall concept for diverting services was that any existing services located within the proposed tree pits were to be diverted, unless the service provider agreed to protect their service in place. Each utility diversion was taken on a case by case basis with certain tree pits designed and constructed to avoid existing services. Where existing services located adjacent to tree pits were unable to be relocated, attempts were made to re-configure tree pit dimensions to increase the clearance and services were protected in place to prevent damage from tree roots. The protection works included either concrete sleeving the pipes or wrapping the pipe joints in densotape. This was carried out on a case by case scenario depending on the distance of the pipe from the tree pits.

Photograph 3: Densotape of Pipe Joints Adjacent to Tree Pit



Photograph 4: Construction of Tree Pit Adjacent to Manhole



The limited space was exasperated at the intersections where pinch points with existing services occurred. Here new services were to be installed where existing services as well as old services constructed to the historical road alignment were located. Construction through these areas was slow and difficult. Hydro excavation was used so that no services were damaged during excavations. Pipes were installed below the existing services because the required cover was not available above the services. This was time consuming and a challenge for both the design and construction team to discover a feasible route through the existing services.

3.4 TRAFFIC MANAGEMENT

Victoria Street was required to remain live to traffic and pedestrians throughout the project. Traffic restrictions included:

- no works on the carriageway after 4pm so that the road was clear for the evening peak traffic flows;
- at least two lanes of the carriageway were required to remain clear between 7am and 9am for the morning peak traffic flows; and
- at least one lane was required to remain open during the day between 9am and 4pm.

A maximum travel time delay of 5 minutes for traffic traveling through the site was stipulated. The traffic was monitored by WCC using cameras and if traffic was delayed considerably, works in certain areas had to be paused periodically to allow an extra lane for traffic through the site. Safe pedestrian access was required to be maintained along both sides of the street at all times. Access to individual properties was also required at all times during construction.

Trenching of services beneath the carriageway was a prolonged task as works were largely constrained to 9am to 4pm. Trenches were also restricted to one lane of the carriageway at a time while the other lane remained open. The alignment of specific pipes was designed so that the pipes ran parallel to the road through one lane of the carriageway for ease of construction.

Photograph 5: Trenching Beneath Carriageway Adjacent to Live Traffic



Photograph 6: Traffic Management at Victoria Street



Trenching beneath the footpath was also challenging. Pedestrian diversions were required to be done in a safe manner so that pedestrians were clear of traffic from the carriageway and ongoing construction activities. To achieve the pedestrian requirements open trenches were usually limited to a length of approximately 10m. The pipes were then installed before the trench was backfilled and open to pedestrians again.

To assist with traffic management and to ensure construction within the tight timeframes, polyethylene (PE) pipes were used in place of concrete pipes in many locations. PE pipes are lighter, are longer lengths and were easier and quicker to install on site. PE pipes provided additional benefits when constructing in close proximity to tree pits, as pipe connections could be designed to avoid critical locations (e.g. next to tree pits).

3.5 GEOMETRY

The Victoria Street geometry varied slightly from the existing geometry and along with a slight change in alignment of the street, this resulted in stormwater catchpits needing to be shifted to new low points. This was not a major challenge and was undertaken without considerable disturbance or time delays, conversely the geometry of the new pocket parks and slip lanes created a large challenge.

New pocket parks were constructed to create areas for pedestrians. The mid block pocket park was previously a car parking area that had included a footpath with a kerb and channel adjacent to private properties. A significant fall existed across the car park towards the kerb and channel. The new design removed the kerb and channel with the proposed pocket park level tying into the existing footpath level. This created a drainage issue with stormwater falling towards the private properties, where freeboard to existing floor levels was a concern. To negotiate this, the geometry was designed so that there was sufficient fall away from the existing buildings towards the centre of the pocket park and a central slot drain installed. The urban design vision for the pocket park was a relatively level, flat area that could be utilised easily by the public. Additional constraints for the geometry were the existing levels to the north and south, which meant that the levels and falls could not be significantly altered.

Photograph 7: Geometry of Pocket Park Location Prior to Construction



Photograph 8: Geometry of Pocket Park Location After Construction with Central Slot Drain



Another geometry challenge included the slip lane located at the western side of the south block. Prior to construction there were flooding issues at the northern end of this slip lane that affected the properties in this location. Much of the surface water could not escape the existing slip lane because of a vehicle ramp at the entrance from Victoria Street. There was one sump located in this location which was not positioned in the low point of the lane and as a result the water ponded in the area. The urban design, geometry, drainage and construction teams worked together to create a solution that tied into the existing building levels while providing an effective drainage system. The design team and stakeholder manager worked closely with building owners and Wellington Water to outline the extent of existing drainage issues and the solution proposed to prevent flooding problems in the future. The solution installed created a new geometry of the area with an additional sump added positioned at the low point of the new geometry.

4 CONCLUSIONS

The Victoria Street Transformation Project has provided a premier street within the Victoria/Cuba Street Precinct. It has improved efficiency for cars, buses, cyclists and pedestrians and enhanced the pedestrian experience with inner city parks and wider footpaths. It has helped to create an inner city neighborhood which has encouraged commercial and residential development.

Given the tight deadline, the need for collaborative and flexible working the Alliance model was ideal procurement method. The integrated nature of the Alliance was key to ensuring a good understanding of interface issues, allowing for appropriate and flexible design outcomes to account for works in this inner-city site.

Good relationships and early involvement of the construction staff within the Alliance meant that the design was developed to an appropriate level for construction, which reduced unnecessary design detailing. Changes that occurred during construction due to the presence of unknown services as well as changes to urban design or structural details were resolved efficiently.

The challenge for the wet services team was to efficiently remove, replace and add new components to a complex network of water supply, stormwater, and wastewater services in a busy part of Wellington. Complications included the need to divert services with limited space available, the number of unknown unidentified services below the street and the time frame required to carry out the diversions.

Strong collaboration with other design disciplines and the construction team, as well as good relationships with authorities were critical to overcoming these challenges. Integration of the wet services into the urban design fabric was key to achieving the urban design vision for the transformation of the street.

The Memorial Park Alliance achieved delivery of the project on time, opening Victoria Street to the public on the 1st of July.

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Photos courtesy of Colin McLellan and Stephen Patience.