APPENDIX A

REVIEW OF ENVIRONMENTAL FACTORS

MCCARRS CREEK ROAD REALIGNMENT AND NEW CAR PARK

Review of Environmental Factors under Part 5 of the Environmental Planning and Assessment Act 1979

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PITTWATER COUNCIL

MCCARRS CREEK ROAD REALIGNMENT AND NEW CAR PARK

Review of Environmental Factors

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Report No 1

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This report has been prepared for Pittwater Council in accordance with the terms and conditions of appointment for McCarrs Creek Road realignment and new car park dated 15 May 2014. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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EXECUTIVE SUMMARY

This Review of Environmental Factors (REF) has been prepared for Pittwater Council (the Proponent) for the construction of a car park, land reclamation and sea wall construction and realignment of McCarrs Creek Road (the Proposal) at Church Point (the site), bordering the surrounding waterways of McCarrs Creek and Pittwater (Figure 0-1). The Proposal forms part of the infrastructure improvements identified in the adopted Plan of Management (Church Point Plan of Management, 2009), which aims to significantly improve safety and amenity for pedestrians, cyclists and motorists including a safer road alignment, a foreshore boardwalk and additional car parking for the area. This infrastructure is associated with the overall wharf and boating facilities for the precinct.

McCarrs Creek Road allows access to a unique maritime community on the shores of Pittwater. It includes a transport hub for off-shore residents adjacent to the Proposal, which provides essential services to the estimated 1500 residents who live on Scotland Island and the western foreshores.

This REF has been prepared by Arcadis (formerly Hyder Consulting) on behalf of the Proponent, to support an application for approval of the Proposal at the site. It has been prepared under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to satisfy the provisions of Clause 111 of the Act and Clause 228 of the *Environmental Planning and Assessment Regulation 2000.*

The Proposal was found to have potential for short term and minor impacts to soil, water quality, flora and fauna, local air quality, noise emissions, visual amenity and utilities. However, impacts would be readily manageable through the application of mitigation measures summarised at the end of each section. The works were not found to result in any impacts to threatened species, populations or ecological communities listed on the NSW *Threatened Species Conservation Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The Proposal would not have a significant impact on the environment, under Clause 112 of the EP&A Act, and therefore an Environmental Impact Statement (EIS) is not required.

REF McCarrs Creek

Figure 1: Locality plan

Figure 0-1: Locality plan

1 INTRODUCTION

1.1 THE PROPOSAL

Pittwater Council (Council) proposes to undertake works at McCarrs Creek Road, Church Point as identified in the adopted *Church Point Plan of Management (2009)* (Plan of Management).

The Plan of Management includes a series of Precinct Master Plans that visually portray the proposed outcomes for the Church Point area. The works proposed in this REF are identified within the Master Plan for 'Precinct One' of the Plan of Management. A key issue, raised within the Plan, is the need for additional parking as well as safety and amenity improvements for pedestrians and road users that would be provided as part of the overarching wharf, boating facilities and associated car parking. The following works are to be undertaken as part of the Proposal:

- Construction of new seawall and reclamation of land;
- Realignment of McCarrs Creek Road between the Church Point Ferry Wharf and Rosstrevor Reserve;
- Provision of street level parking, along with an additional structural level constructed over the top. This would provide a total of 120 additional car spaces established next to the base of cliff line, with entry and exit off McCarrs Creek Road; and
- Pedestrians catered for by a new boardwalk which would form part of the recently upgraded commuter wharf.

The car park component of the Proposal will provide additional parking for the locality.

Council has consulted relevant stakeholders and the community in their consideration of options for the car park and identified a preferred option. A concept design of the preferred car park option, along with the realignment of McCarrs Point Road and construction of a new sea wall, has been developed and subsequently adopted by Pittwater Council as the preferred option and is the subject of assessment in this report (Figure 1-1).

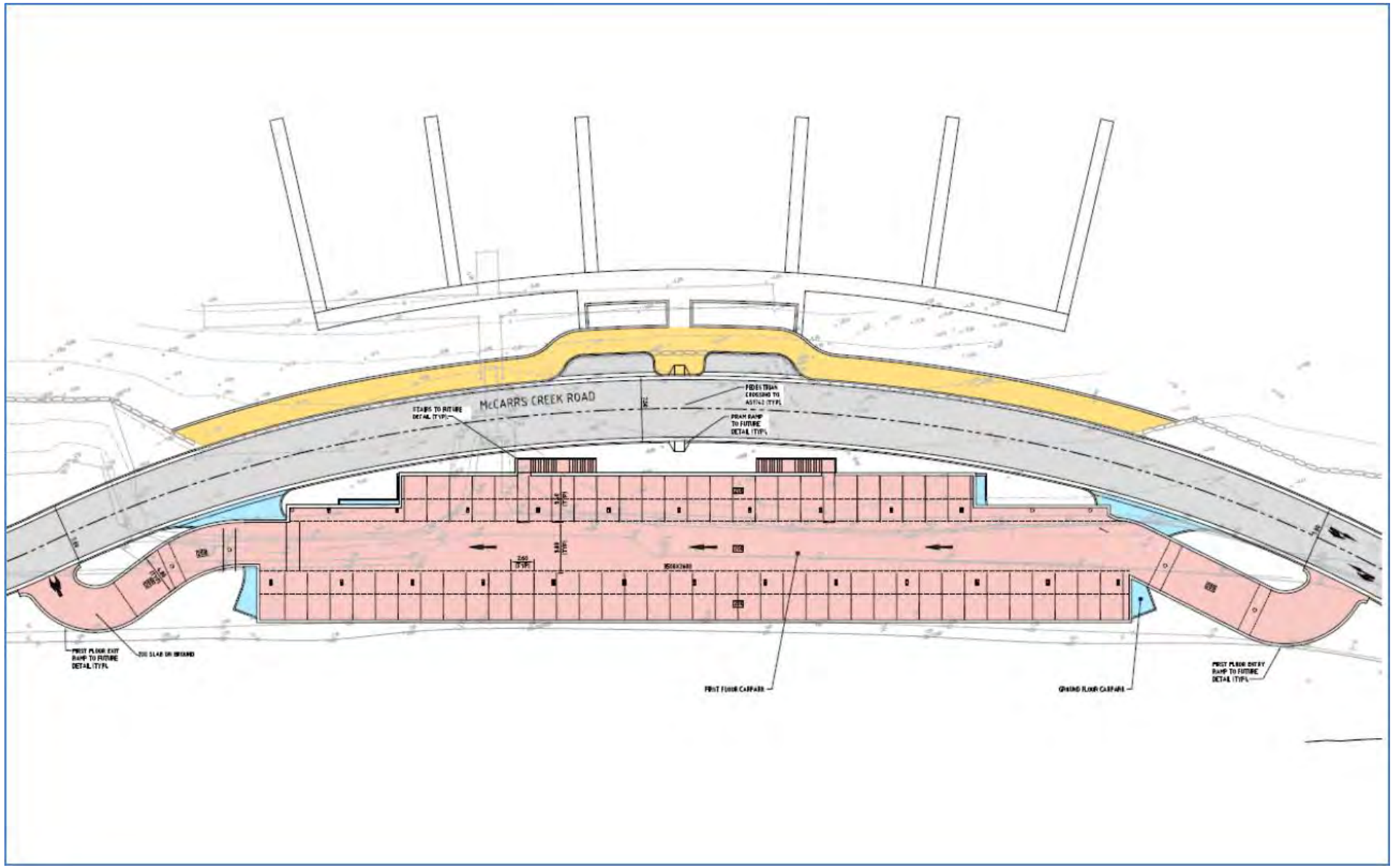

Figure 1-1 : The adopted design for the Proposal

1.2 BACKGROUND TO THE PROPOSAL

Church Point is a local and regional transport node and tourist destination. The area functions as an interchange for boats and vehicles for the approximately 560 households that reside offshore as well as local residents and visitors. Church Point provides community access to Pittwater and the Ku-ring-gai Chase National Park and supports a number of local businesses.

For many decades, issues at Church Point, in particular car parking pressures and recreational space had continually been raised by the community but with no successful outcomes. Due to safety issues, an estimated 125 former 'spaces' have been removed and/or reconfigured the past 3 decades, with no replacement. This in turn has significantly added to the pressure on remaining spaces. The need for a master plan was established to provide a consolidated approach for the management of issues across the whole of Church Point.

Pittwater Council, in conjunction with local community associations and the NSW Government including agency feedback, prepared the *Church Point Plan of Management* (Plan of Management) to 'ensure that Church Point retains its environmental, recreational, scenic, cultural and social values, while key issues relating to the management of the study areas are addressed'. The Plan of Management was adopted by Council under the *Local Government Act* and by the State Government Minister under the *Crown Lands Act*.

Having completed the upgrade to the commuter wharf, Council's next priority project is that proposed in this REF, McCarrs Creek Road realignment and car park facility, in order to progress improvements for the overall Church Point precinct.

1.3 PURPOSE OF THIS DOCUMENT

This Review of Environmental Factors (REF) has been prepared by Arcadis (formerly Hyder Consulting) on behalf of Pittwater Council. Pittwater Council is a public authority and are the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to undertake an activity including the realignment of McCarrs Creek Road and construction of a car park and sea wall (the Proposal) at Church Point.

This REF has been prepared to satisfy the provisions of Clause 111 of the EP&A Act and Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulations).

The purpose of this REF is to describe the Proposal, to document the likely impacts of the Proposal on the environment, to detail mitigation measures to be implemented and to seek approval (under Part 5 of the EP&A Act) for the proposed works.

2 OBJECTIVES AND NEED FOR THE PROPOSAL

2.1 PROPOSAL OBJECTIVES

The Plan of Management details objectives for the broader Church Point area. Objectives relevant to this Proposal are:

- Effectively manage transport interchange facilities, allowing for pedestrian, cyclist, car, bus and boat user access and safety;
- Provide adequate and appropriate parking facilities without destroying amenity; and
- Establish sustainable facilities for on-shore and off-shore residents, and promote suitable commercial activities within the study area.

Specific objectives have been developed for the Proposal and are outlined below:

- Provide additional car parking spaces to help alleviate the current chronic shortage;
- Provide increased road and pedestrian safety on McCarrs Creek Road between the Church Point Ferry Wharf and Rosstrevor Reserve;
- Provide a new seawall on a new alignment;
- Provide flexibility for future developments in the Church Point area; and
- Provide a reasonable quadruple bottom line outcome that takes into account social, environmental, economic and governance aspects.

2.2 STRATEGIC NEED FOR THE PROPOSAL

This Proposal forms part of the adopted Plan of Management framework to progress improvements for the overall Church Point precinct. Both Pittwater Council (owner as well as Care, Control & Management) and the Department of Lands (owner of Crown Land) agreed to the Plan of Management.

The Plan of Management identified a number of issues surrounding the site. The key issues relevant to the Proposal include:

- The existing seawall is in a state of disrepair with sections beginning to fail and fall into the estuary;
- McCarrs Creek Road is particularly dangerous, where the existing road is narrow and vehicles tend to travel at excessive speeds;
- Lack of available parking for local residents (particularly for those offshore) and visitors; and
- Pedestrian walkway adjacent to the road is too narrow.

The Plan of Management set out strategies, actions and a Masterplan to address the above issues, which include:

- Realignment of McCarrs Creek Road as indicated in the Masterplan to reduce curvature and generally improve sight lines and pedestrian safety;
- Construct seawall as indicated in the Masterplan. Seawall to ensure habitat for aquatic organisms;

- Provide 2.4 metre cycleway/pedestrian path along foreshore as per the Masterplan; and
- Establish a car park adjacent to cliff line; exploring options for two storeys and subject to a resident parking scheme.

The Proposal seeks to address the management issues and enable the proposed strategies and actions through the following:

- Design and construction of a new piered seawall on a new alignment to replace the current failed and temporary sandstone boulder seawall. This would include reclamation extending from the existing road formation edge, beyond the low tide range and infill over the current intertidal area;
- The piered seawall would incorporate sandstone boulders (retrieved from the existing wall where reasonable and feasible) and placed along the seabed interface to provide alternative marine habitat;
- Realignment of McCarrs Creek Road on a continuous arc which would significantly reduce the current sharp bend in the road at the junction of Pittwater Rd and McCarrs Creek Road. This would result in an improved safety / sight distance for motorists and pedestrians;
- Provision of 120 additional car parking spaces in a user pays two storey car park for off-shore residents which will free up existing car parking spaces for visitors; and
- Provision of a dedicated 2.4 metre cycleway/pedestrian path between the realigned road and the commuter wharf to further improve pedestrian safety.

To date a number of actions have already been carried out at Church Point as per the adopted Plan of Management, including:

- A change to the reserve status to include urban services which include commuter parking;
- Removal of the general Pittwater parking exemption. As such all users now pay for parking at Church Point (State Government requirement);
- Introduction of a Commuter Sticker user pays fee for longer term parking (State Government requirement);
- Upgrades to the main car park area (Church Point Car Park next to ‘Pasadena’ restaurant) including improved disabled parking facility, motor bike area, shared car scheme area and improved lighting;
- Reconstruction of the fixed Church Point Wharf; and
- Replacement and expansion of the Commuter Wharf and introduction of a user fee for its use.

Having completed these upgrades and established the user pays car parking arrangement, the next priority project is that proposed in this document, the Precinct 1 - McCarrs Creek Road realignment and car park facility. The proposal is consistent with the intention of the Masterplan.

3 SITE DESCRIPTION

3.1 SITE LOCATION

Church Point is located in northern Sydney, approximately 32 kilometres north of the Sydney central business district and at the southern end of the Pittwater Estuary. McCarrs Creek Road connects to Pittwater Road near the Church Point Ferry Wharf and extends west past Rosstrevor Reserve to Ku-ring-gai Chase National Park. The Proposal encompasses an area within Precinct One under the Council's Church Point Plan of Management (2009) (refer to Figure 3-1 and Figure 3-2).

Figure 3-1: Church Point Masterplan (from Church Point Plan of Management, 2009)

Figure 3-2: McCarrs Creek (Precinct 1) Masterplan (from Church Point Plan of Management, 2009)

3.2 LANDFORM AND ENVIRONMENTAL FEATURES

A mix of managed landscapes associated with the Reserves and 'naturally occurring' vegetation provide important habitat connections along the shores of Pittwater, connecting with Ku-ring-gai Chase National Park.

The existing road is relatively narrow and runs between a dilapidated sea wall and a rock (escarpment) cutting. Above this rock cutting, the steep hillside has vegetated slopes characterised by Spotted Gum Forest with dominant canopy species of Spotted Gum (*Corymbia maculata*) and Grey Ironbark (*Eucalyptus paniculata*). At the top of the escarpment, there are a number of residential properties with views overlooking Pittwater. A network of public roads provides access to these properties from Pittwater Road and McCarrs Creek Rd.

A (low) sandstone boulder seawall separates the (built environment) current edge of the road formation and the Pittwater estuarine waterway. The Pittwater Waterway is a slowly infilling drowned river valley with a surface area of 17.5 square kilometres. The partially closed body of water, open to the sea, forms a transitional ecosystem with a rich diversity of estuarine habitats including mangroves; seagrasses; intertidal mud flats; rocky shores and sandy beaches. Seagrass beds have been previously identified in areas around the Commuter 'dinghy' Wharf, extending from the General Store to the Cargo Wharf. Portions of exposed rock rubble in the intertidal zone provide habitat for a variety of molluscs and oysters. There are no mangroves and no substantial algae growth.

3.3 EXISTING DEVELOPMENT

Along the southern foreshore, Pittwater Road and McCarrs Creek Road were constructed predominantly by cutting into the hillside and infilling. As such, the current road and surrounding open spaces are on largely modified foreshore. Further modification of the foreshore was undertaken to provide the Precinct 3 Church Point Reserve / car park as well as the Bayview to Church Point scenic walkway.

There is currently existing parallel and angle parking extending along McCarrs Creek road to the west of the Site as well as angle parking to the east of the Site, at the adjoining Thomas Stevens Reserve. Precinct 2 is centred on Thomas Stevens Reserve which includes the Mini Mart, public wharves and 'The Pasadena'. Precinct 3 is centred on the Church Point Reserve which provides the majority of the parking as well as a foreshore corridor and sandy beach.

The Commuter 'dinghy' Wharf is located between the Cargo Wharf and the General Store. This has been recently upgraded and expanded by Council. This is located adjacent to the proposed works. The wharf was realigned in an arc shape to facilitate the new seawall and road realignment.

At the western extent of the proposed works is the Cargo Wharf, a heavy duty timber wharf that provides access to barges collecting and delivering building materials, household items and general heavy goods to off-shore properties etc. An area of land reclamation to the south and east provides vehicular access and parking. Immediately to the west of the Cargo Wharf is Rosstrevor Reserve, which provides an open grassed buffer between McCarrs Creek Road and the Pittwater estuary. A rubble stone wall runs along the water's edge with stepped access to a sandy beach and shallow waters. A key feature of the reserve is a memorial obelisk located along the western boundary. A concrete pedestrian footpath and landscape buffer edge the southern boundary. Adjacent to the reserve there is an additional section of parallel parking.

A Dial Before You Dig (DBYD) search was undertaken for the site which provided information from the following utilities: Optus (Telecommunications), Sydney Water (Sewer and Potable Water), Ausgrid (Power), Telstra (Telecommunications), Jemena (Gas) and storm water drainage information was obtained from the existing survey data available.

The investigation identified the following services that could be affected by the Proposal: Optus underground duct and cable, Sydney Water. VCP Sewer Main, Ausgrid 2 x PVC electricity duct and cable, Telstra aerial cable and existing stormwater drainage.

Any impact upon the above mentioned utilities may affect the broader community of Church Point and surrounding areas. These impacts may include a disruption of power, communication, sewerage and stormwater services. The detailed design report would provide information regarding the potential removal, movement or replacement of these utilities.

3.4 SURROUNDING DEVELOPMENT

The wider Church Point precinct is made up of a series of distinct areas that combine to form the Church Point Village. Key surrounding features are:

- Thomas Stephens Reserve. This area is defined by its unique social attributes as a recreational resource, meeting place and transport hub. The surface is predominantly hard paved with a small raised planter adjacent to Pittwater Road. Scattered trees of varying quality provide shade to picnic tables, seats and bollards. A new ferry pontoon and access ramp was constructed in 2005 A small shelter provides some weather protection on the pontoon. A recently upgraded public walkway edges the grassed area providing access between Thomas Stephens Reserve and Church Point Reserve (car park);
- The Church Point General Store. The General Store, which in part immediately adjoins the site of the Proposal, has serviced the local communities since the late 1800's. The old timber building accommodates the Church Point Post Office, café and general store. The timber jetty surrounds extend over Pittwater to provide an outdoor eating area and access to the 'old' ferry wharf;
- 'Pasadena' restaurant. The Pasadena restaurant is currently closed to business and is the subject of a proposal to redevelop the restaurant and function centre building. The existing surrounds include public short-term parking off Pittwater Road and an open grassed area between the 'Pasadena' and the Pittwater shoreline;
- Church Point Reserve (car park). The reserve area to the east of the Pasadena restaurant was created by the reclamation of land in the early 1960's. Approximately 80% of the reserve is covered by formal car parking; and
- Bennett's Beach. To the south-east is Bennett's Beach, a small beach and grassed foreshore with a neglected boat shed adjoining the car park area. A formal foreshore public walkway extends south-east from Bennett's Beach to Winnererremy Bay. An informal track continues through Church Point Reserve beneath the Casuarina trees on the water's edge.

4 DESCRIPTION OF THE PROPOSAL

4.1 ALTERNATIVES AND OPTIONS CONSIDERED

Council made a resolution on 15 October 2012 to evaluate and compare options for Precinct 1 (McCarrs Creek Road component) in line with the Church Point Plan of Management concept Masterplan. Arcadis (formerly Hyder Consulting) were engaged to provide independent analysis and advice to Council in regards to the options put forward for assessment. Following analysis, Council prepared the *Church Point Carparking - Precinct One Options - Comparison & Evaluation - Way Forward* to report the outcomes of the assessment and identify the preferred option. Council's report is provided in Appendix C. This section provides an overview of the options considered.

All car park options require a realigned seawall and infill and would result in similar costs. The seawall is the most expensive works item and therefore has been important to select the most efficient design to satisfy current needs and objectives including providing flexibility into the future.

All car park options also depend on a 'user pays' system, the cost of which varies under each option. This is discussed further in Section 4.4.

In accordance with Australian Standard AS2890.1:2004 provision for parking shall take in to account the following which have been considered as the key benchmarks for review of each option:-

- The need for traffic to move to and from the frontage road with minimum disruption to through traffic and maximum pedestrian safety;
- Provision of adequate capacity in circulation roadways and parking aisles to handle peak period movements;
- Provision of minimum length travel paths between entry/exit points and parking spaces;
- Safe treatment of points of conflict and with pedestrians and other road users; and
- Provision of parking spaces and accessible pedestrian paths for people with disabilities.

4.1.1 CAR PARK AND ROAD CONCEPT DESIGNS

Option 1 – Curved road alignment with at grade car park for 60 cars as per adopted Plan of Management

Option one is a 60 car space facility at road level as shown on the Master Plan within the Plan of Management.

The overall layout for this option proposes the realignment of the existing McCarrs Creek Road on a continuous arc and the adjacent sea wall between the Church Point Ferry Wharf and Rosstrevor Reserve to provide an area of reclaimed land. The reclamation provides space for a total of 60 parking spaces; pedestrian walkways and landscaped areas between the sea wall and existing cliff face (refer to Figure 4-1 for layout).

The car park layout proposes 90 degree parking only (2.6 metre x 5.4 metre bays) maximising space count and manoeuvrability throughout the car park. As stated in AS 2890.1:2004, 90 degree parking will in most cases be found to be the most efficient use of space in a large area.

A driveway aisle width of 5.8 metres is provided, creating a larger queuing area and allowing cars to pass each other through the car park. This minimises congestion internally within the car park and externally on McCarrs Creek Road. This also benefits pedestrians due to the increased available space between parked cars and the vehicle driveway.

Pedestrian safety is provided for through designated and controlled travel paths avoiding routes immediately adjacent to McCarrs Creek Road. The layout also creates a dedicated waiting area at the pedestrian crossing with travel paths between entry / exit points and parking spaces minimised through a central crossing area to the wharf.

Designated parking for people with disabilities has been provided adjacent to access points as is required to comply with AS 2890.6.

Under this option the parallel car spaces shown on the Plan of Management which adjoin the cliff side (of McCarrs Creek Road) and not within the separated car park ‘cell’ have been removed for improved safety.

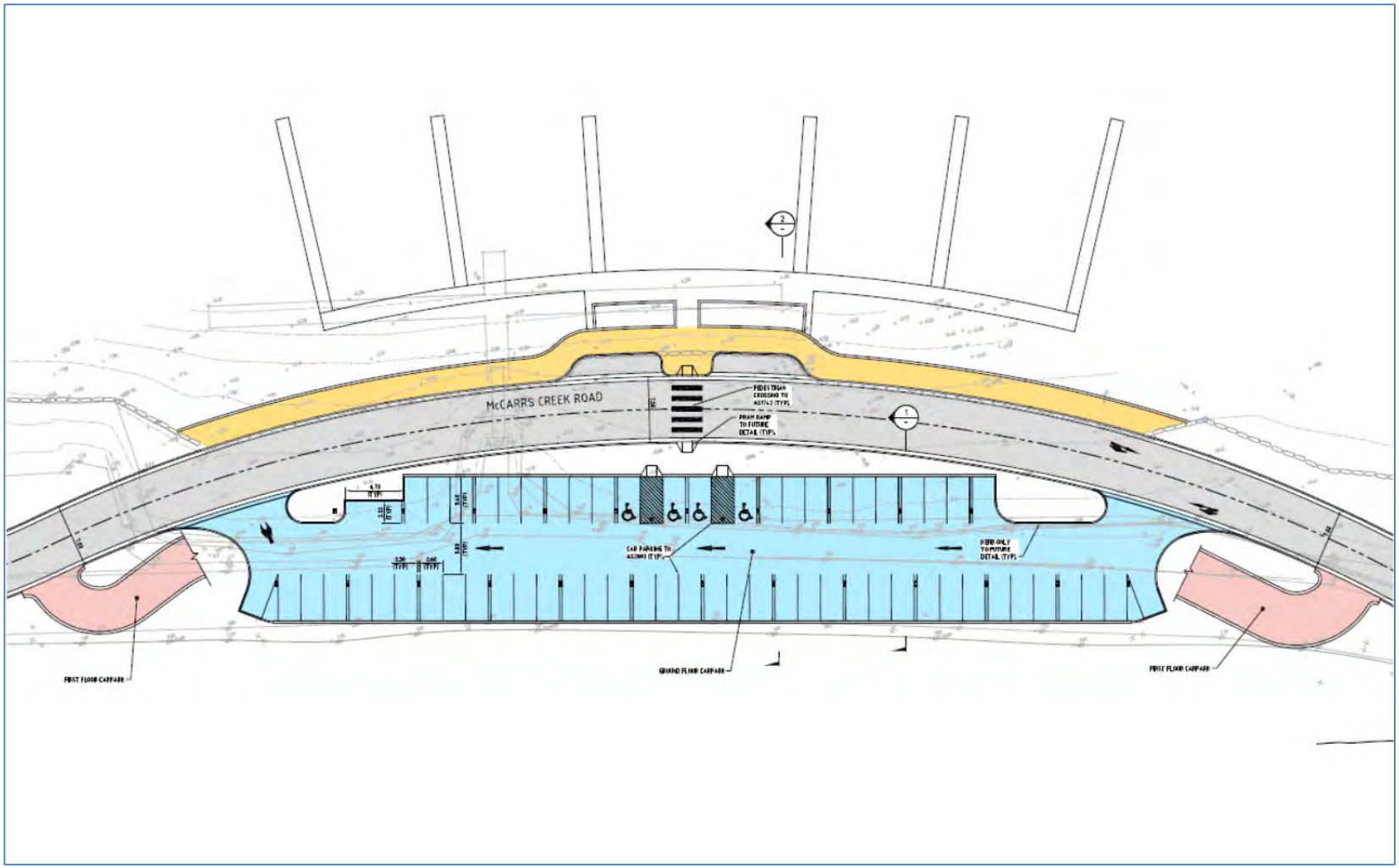

Figure 4-1: Option 1 – 60 space car park as per Plan of Management

Option 2 – The adopted Proposal incorporating a 120 car space facility (60 at grade with 60 on a single deck over) as per adopted Plan of Management

Option 2 is a 120 car space facility utilising the same footprint for Option 1 (60 spaces) and adding a single deck over with a further 60 spaces as identified in the adopted Plan of Management.

As per Option 1, the overall layout for Option 2 proposes the realignment of the existing McCarrs Creek Road and adjacent sea wall to provide an area of reclaimed land. The reclamation provides space for a total of 120 parking spaces, comprising 60 ground floor spaces (Option 1) plus a first floor deck providing a further 60 parking spaces. As with Option 1, pedestrian walkways and landscaped areas between the sea wall and existing cliff face are all also provided (refer to Figure 4-2 for layout).

Both ground floor and first floor layouts propose 90 degree parking only (2.6 metre x 5.4 metre bays) maximising space count and maximising manoeuvrability throughout the car park.

The aisle width of 5.8 metres has been maintained for both ground floor and upper deck to allow manoeuvrability, again providing increased available space for pedestrians between parked cars and the vehicle driveway.

Queuing area for both ground and first floor ramp entrances has been maximised, minimising congestion internally on both floors of the car park and externally on McCarrs Creek Road. Separating entry/exits for each floor has the benefit of minimising traffic congestion internally.

Pedestrian safety is also improved through designated and controlled travel paths and the provision of steps down to the pedestrian crossing to the wharf.

Designated parking for people with disabilities has been provided on the ground floor adjacent to access points as is required to comply with AS 2890.6.

Under this option the parallel car spaces shown on the Plan of Management which adjoin the cliff side (of McCarrs Creek Road) and not within the separated car park ‘cell’ have been removed for improved safety.

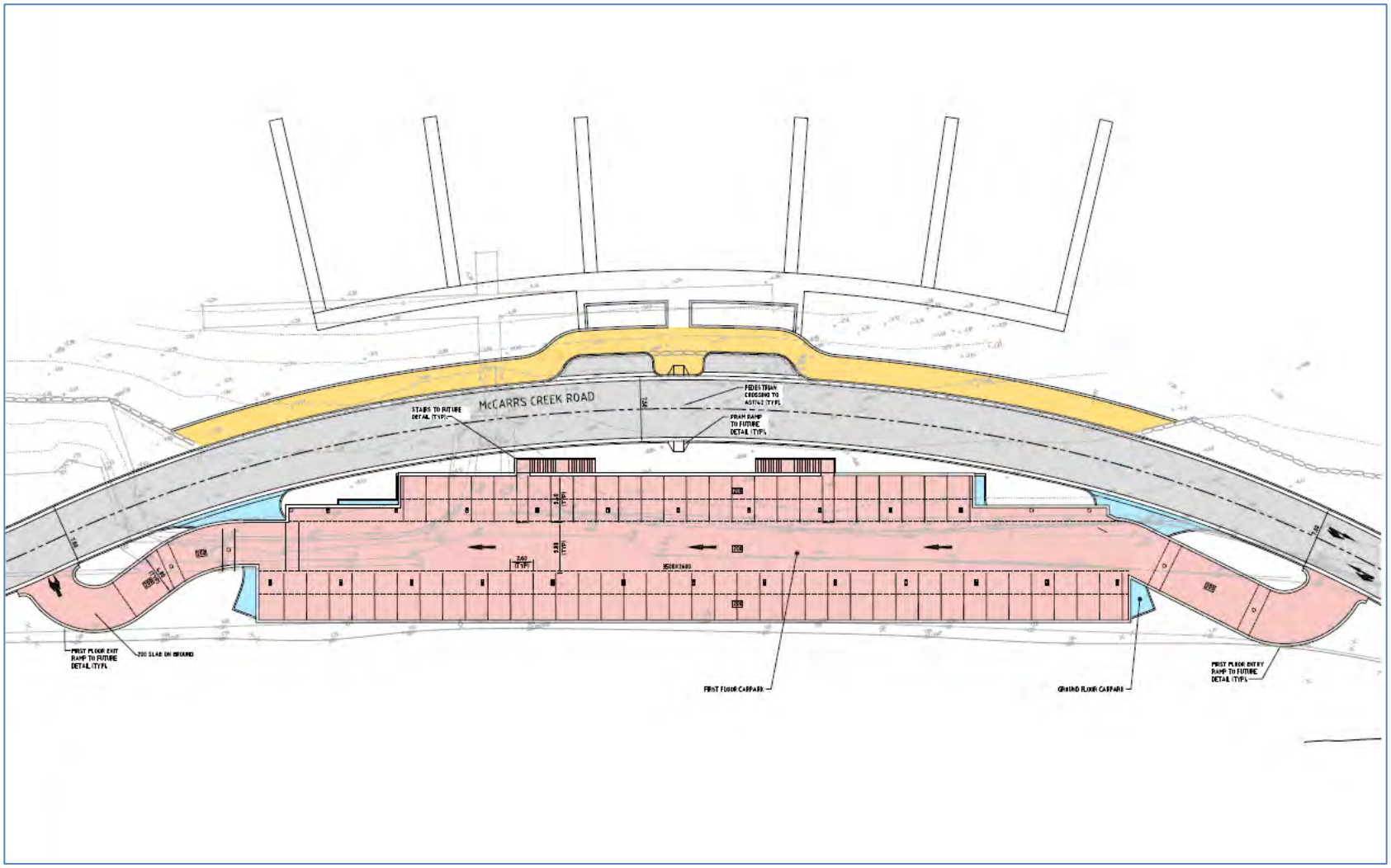

Figure 4-2: Option 2 - 120 space car park as per Plan of Management

Option 3 - Alternative Proposal by Church Point Friends – not supported by Council

The original proposal for Option 3 provided for a total of 50 parking spaces combining parallel parking with 45 degree parking to reduce the overall width (refer to Figure 4-3). Upon review, it was established that this proposed option did not comply with Australian standards in a number of key areas, which included:

- Insufficient space for a pathway adjacent to the cliff (minimum width required is 1.0 metre);
- Proposed aisle width of 4.2 metres. AS2890.1 section 2.4.4(a) requires an aisle width of 7.2 metres for 5.9 metre long parking bays or 6.0 metres width for 6.3 metre long parking bays; and
- Lack of disabled parking bays.

Adopting complying aisle widths, as well as adequate provision for pedestrians, would add 3 metres and 0.7 metres respectively to the width of the parking area.

A number of the proposed parking spaces had the potential to cause obstruction to vehicles entering or exiting the car park. The limited queuing area could be expected to have an adverse effect on McCarrs Creek Rd around the entrance to the car park.

The seawall design proposed in this option (using rip rap) is not deemed suitable to cater for required loads noting that the actual use of rip rap is to armour shorelines streambeds, bridge abutments, pilings and other shoreline structures against scour, water or ice erosion.

This Proposal realigns McCarrs Creek Road to be tighter to the southern cliff which introduces tighter bends in the road alignment at either end. The nature of the parallel parking option increases the longitudinal extents of the car park which places the entry and exit at the extremes of the car park area. This results in much tighter turns and reduced road safety due to the angle of the driveway intersections with McCarrs Creek Road. The increased extent of the parking area also pushes McCarrs Creek Road further into the foreshore area at each end, particularly at the landscaped reserve adjacent to the cargo wharf and introduces tighter radius bends on McCarrs Creek road to get around the parking area. Flattening these bends to suit RMS road geometry requirements would likely reduce parking numbers.

So as to make a fair comparison with previous options to date, the option was revised into a compliant format which required adjustment of the parking layout including:

- Adjust offset to cliff to be 1.6 metres to allow pedestrian access;
- Adjust Aisle width to 6.0 metres (this is the narrowest for double sided parallel parking on one way aisle);
- Adjust parking lengths to be: 6.3 metres for mid spaces, 6.6 metres for end spaces and 7.8 metres for disabled spaces (parking width remains as 2.1 metres or adjusted to 3.2 metres for disabled);
- Removal of a proposed additional 10 parking spaces along McCarrs Creek Road as these spaces can be common to all options and are not supported due to the additional cost of excavation and stabilisation, reduced ability to control usage, restricted pedestrian access, their isolation from the main parking area and safety concerns; and
- Removal of the trees within the parking area as these will require planter beds approximately two metres wide each which will reduce parking numbers.

The revised compliant format reduced the number of available car spaces to 39. Construction of this option would require increased traffic management due to the narrow nature of the site and close proximity of the proposed filling works and existing road.

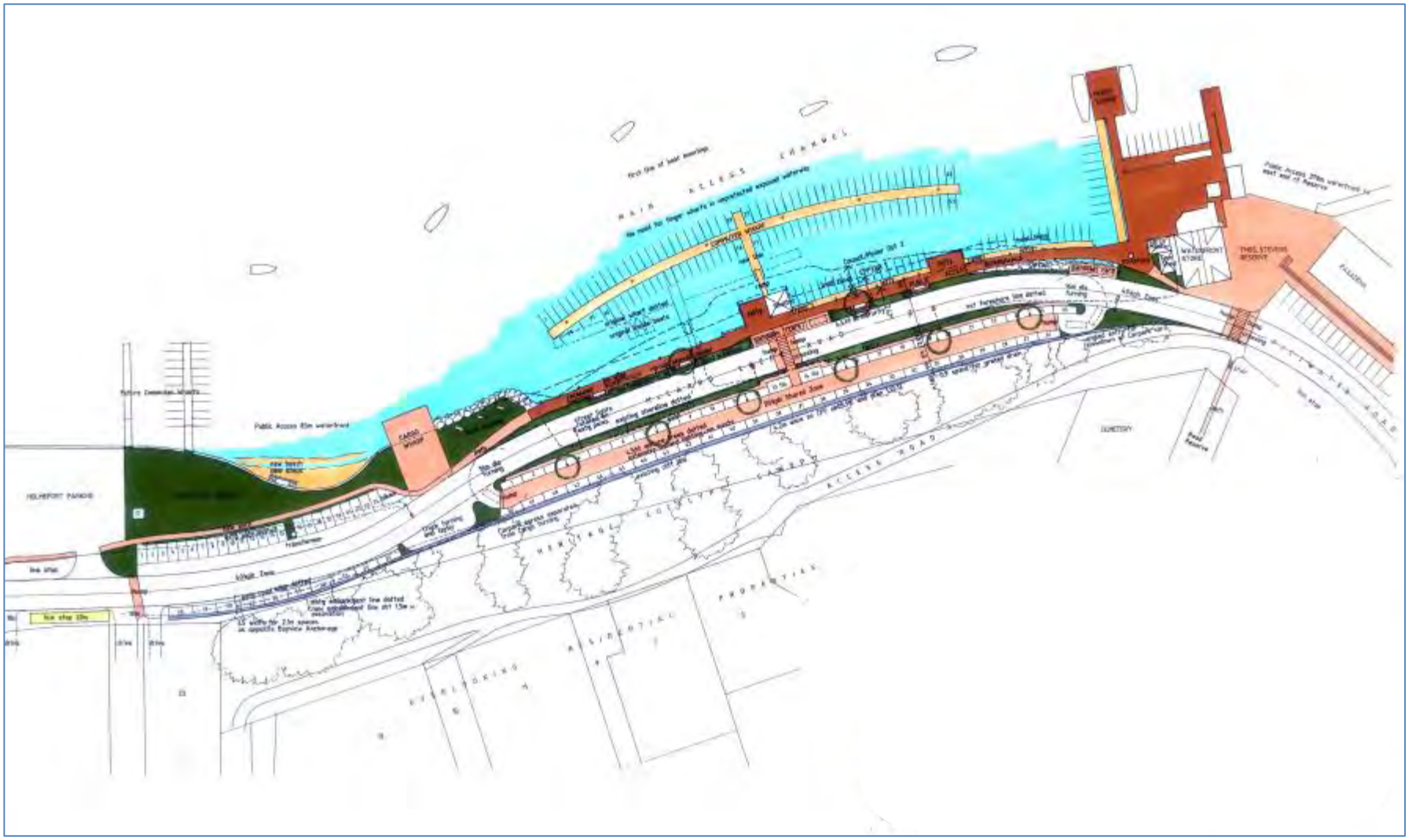

Figure 4-3: Option 3 – Minimum infill with 37 space car park

Option Comparison

The following table presents a comparison of the key attributes of the three options considered (Table 4-1).

Table 4-1: Options comparison

Option One	Option Two	Option Three
60 car parking spaces are provided for in this option. This option provides some flexibility as the layout allows for the future addition of a first floor deck. Manoeuvrability throughout the car park is maximised.	120 car parking spaces are provided by the addition of a first floor deck. Compared to options 1 and 3, this option provides the greatest flexibility for future use by maximising space count and maximising manoeuvrability throughout the car park.	39 spaces or less (based on a complying layout) are provided for in this option. Compared to options 2 and 3, this option provides the least flexibility for future use due to the restricted area number of car spaces that could be provided. This option also restricts the potential for future expansion which option 1 provides.
Pedestrian safety is improved through designated and controlled travel paths avoiding routes immediately adjacent to McCarrs Creek Road. The layout also creates a larger waiting area at the pedestrian crossing with travel paths between entry/exit points and parking spaces minimised through a central crossing area to the wharf.	As per option 1, pedestrian safety is improved through designated and controlled travel paths avoiding routes immediately adjacent to McCarrs Creek Road. Additionally, pedestrian safety is provided through the provision of steps down to the pedestrian crossing to the wharf.	The original option provided insufficient space for a pathway adjacent to the cliff.
The road alignment design provides significantly improved sight distance for the current sharp bend in the road at the junction of Pittwater Rd and McCarrs Creek Rd, resulting in a smoother and safer transition.	As per option 1, the road alignment design provides significantly improved sight distance for the current sharp bend in the road at the junction of Pittwater Rd and McCarrs Creek Rd, resulting in a smoother and safer transition.	This option has tighter bends in the road alignment at either end of the proposed upgrade extent. The longitudinal extents of the car park place the entry and exit at the extremes of the car park area, resulting in much tighter turns and reduced road safety due to the angle of the driveway intersections with McCarrs Creek Road. The option also introduces tighter radius bends on McCarrs Creek road to get around the parking area.
Compared to Option 3, this option only marginally extends beyond the Option 3 sea wall (max. 3.6m at its furthest point). Being on a continuous	As with Option 1, this option only marginally extends beyond the Option 3 sea wall (max. 3.6m at its furthest point). Being on a continuous	The increased extent of the parking area pushes McCarrs Creek Road further into the foreshore area at each end, particularly at the landscaped

Option One	Option Two	Option Three
arc this design, compared to Option 3, has marginally more width of reclamation in the central portion and less at the ends.	arc this design, compared to Option 3, has marginally more width of reclamation in the central portion and less towards the ends.	reserve adjacent to the cargo wharf. The net result is that there is estimated to be marginally more infill associated with this option (refer to Figure 4-4 below). In addition, there would be an impact on the toe of the hillside as well as Rostrevor Reserve – estimated to affect an area of 400sqm (refer to Figure 4-5). The seawall design proposed in this option (using rip rap) is not deemed suitable to cater for required loads.
McCarrs Creek Road can remain open under 2 way traffic for most of the seawall and construction activity and then swap over. Therefore, would provide far less disruption to the travelling community, in particular Pittwater residents and bus services to the west of this part of Church Point along McCarrs Creek Road.	McCarrs Creek Road can remain open under 2 way traffic for most of the seawall and construction activity and then swap over. Therefore, this would provide far less disruption to the travelling community, in particular Pittwater residents and bus services to the west of this part of Church Point along McCarrs Creek Road.	This option would require increased traffic management provisions due to the narrow nature of the site and close proximity of the proposed filling works and existing road. Area of site facilities is also constrained and would likely require the use of the existing parking spaces to the west.
Estimated net cost of $4.1 million average net cost per space of $69,000 with a corresponding estimated Commuter sticker. User fee of $350 p.a. indexed.	Estimated net cost of $6.1 million with an average cost per space of $51,000 with a user fee of $300 p.a. to $560 p.a. indexed dependent upon the number of allocated spaces (up to 60 proposed).	Estimated net cost of $4.1 million with an average cost per space of $105,000 and an estimated Commuter Sticker fee of greater than $350 p.a. indexed.

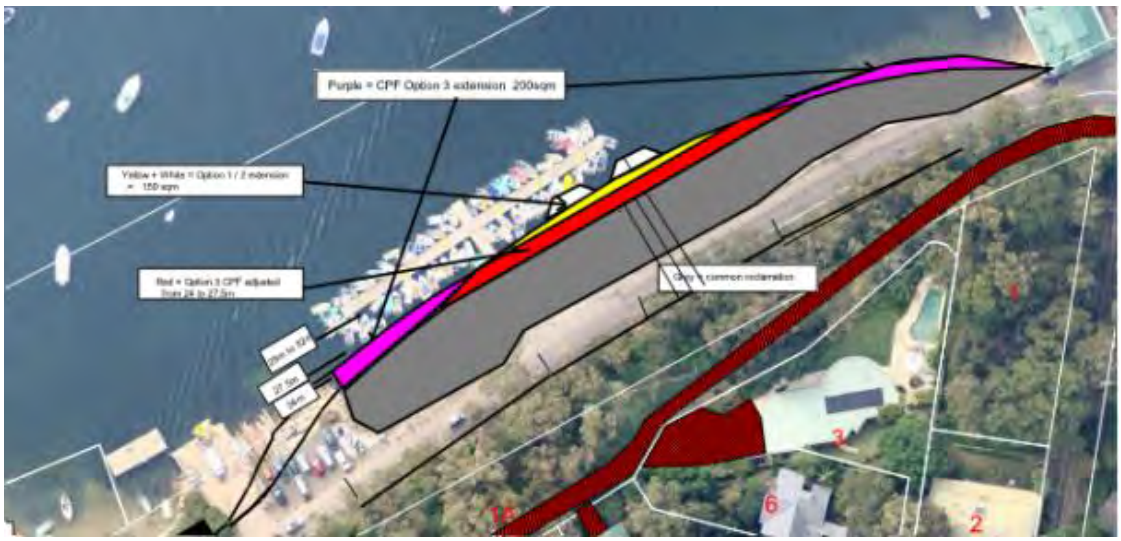

Figure 4-4: Outline of Options showing differences in the extent of infill

Note: grey is the common area of infill for all of the options, red is the Option 3 adjusted width, yellow is the projection of Options 1 & 2 beyond the mid-point of the arc; and white is the set down bays associated with Options 1& 2 (Option 2 also requires set down bays at the mid-point). Purple is where Option 3 extends beyond Options 1 & 2. The net result is that there is estimated to be marginally more infill associated with Option 3.

Figure 4-5: Additional impact on Rosstrevor Reserve and the toe of the hillside associated with Option 3

Preferred option – Option 2: incorporating 120 car space facility as adopted by Pittwater Council 16 December 2013

The preferred option is Option 2 single deck layout which has the following key attributes:

- It provides an optimum cost effective car park that provides tangible additional car parking to significantly reduce the current chronic shortage for the benefit of offshore, onshore and visitors;
- Its location has least impact slotted against the cliff. Its visual impact will be suitably ameliorated by landscape and façade treatments;
- It involves a new seawall and associated infill as has been the case with much of the road and car park infrastructure provided already; and
- The subject location is already high activity with commuter vessels, cargo wharf and ferry and close by car parking already taking place.

4.2 DESCRIPTION OF THE PROPOSAL

4.2.1 CAR PARK AND ROAD DESIGN

McCarrs Creek Road would be realigned on a continuous arc (similar to the recently upgraded Commuter Wharf) which would allow the road realignment to provide significantly improved sight distance for the current sharp bend in the road at the junction of Pittwater Rd and McCarrs Creek Rd. This would result in a smoother and safer transition.

The car park proposed design allows for provision of a total of 120 spaces, with 60 provided at current road level and a further 60 spaces via an additional single deck over the ground level car park area. The single deck would have connecting ramps at either ends plus step access in the central area associated with the pedestrian crossing point.

The car park would be positioned behind the realigned road and against the existing cliff. The floor slab of the deck would be approximately 2.4 metres height above the ground level of the new car park, providing an open undercroft (road to underside of slab) with a 1.4 metre parapet, as shown in Figure 4-6. Columns and beams would be interspersed on the ground level to provide support for the deck.

Both ground floor and first floor layouts propose 90 degree parking only (2.6 metre by 5.4 metre bays) maximising space count and maximising manoeuvrability throughout the car park. Four designated parking spaces for people with disabilities would be provided on the ground floor adjacent to access points.

Both the ground floor and the upper deck have an aisle width of 5.8 metres, again allowing for manoeuvrability and providing increased available space for pedestrians between parked cars and the vehicle driveway.

The queuing area for both ground and first floor ramp entrances has been maximised, minimising congestion internally on both floors of the car park and externally on McCarrs Creek Road. Separating the entry and exits for each floor assists in minimising traffic congestion internally. Pedestrian safety is also improved through designated and controlled travel paths and the provision of steps down to the pedestrian crossing to the wharf.

Between the road and the car park there will be suitable landscaping and façade clad with a suitable treatment such as recycled timbers, cascading plants and potential to incorporate community art / garden treatment where feasible (refer to Figure 4-6 and Section 7.3). The final façade treatment and landscaping would be developed during detailed design.

McCarrs Creek Road can remain open under 2 way traffic for most of the seawall and construction activity and then swap over - minimising disruption to the travelling community, in particular Pittwater residents and bus users to the west of this part of Church Point along McCarrs Creek Road.

This option has been assessed as fully technical compliant with the relevant standards[1].

[1] All relevant standards will be complied with during detailed design. This includes complying with *Disability (Access to Premises - Buildings) Standards 2010* for access for people with disabilities.

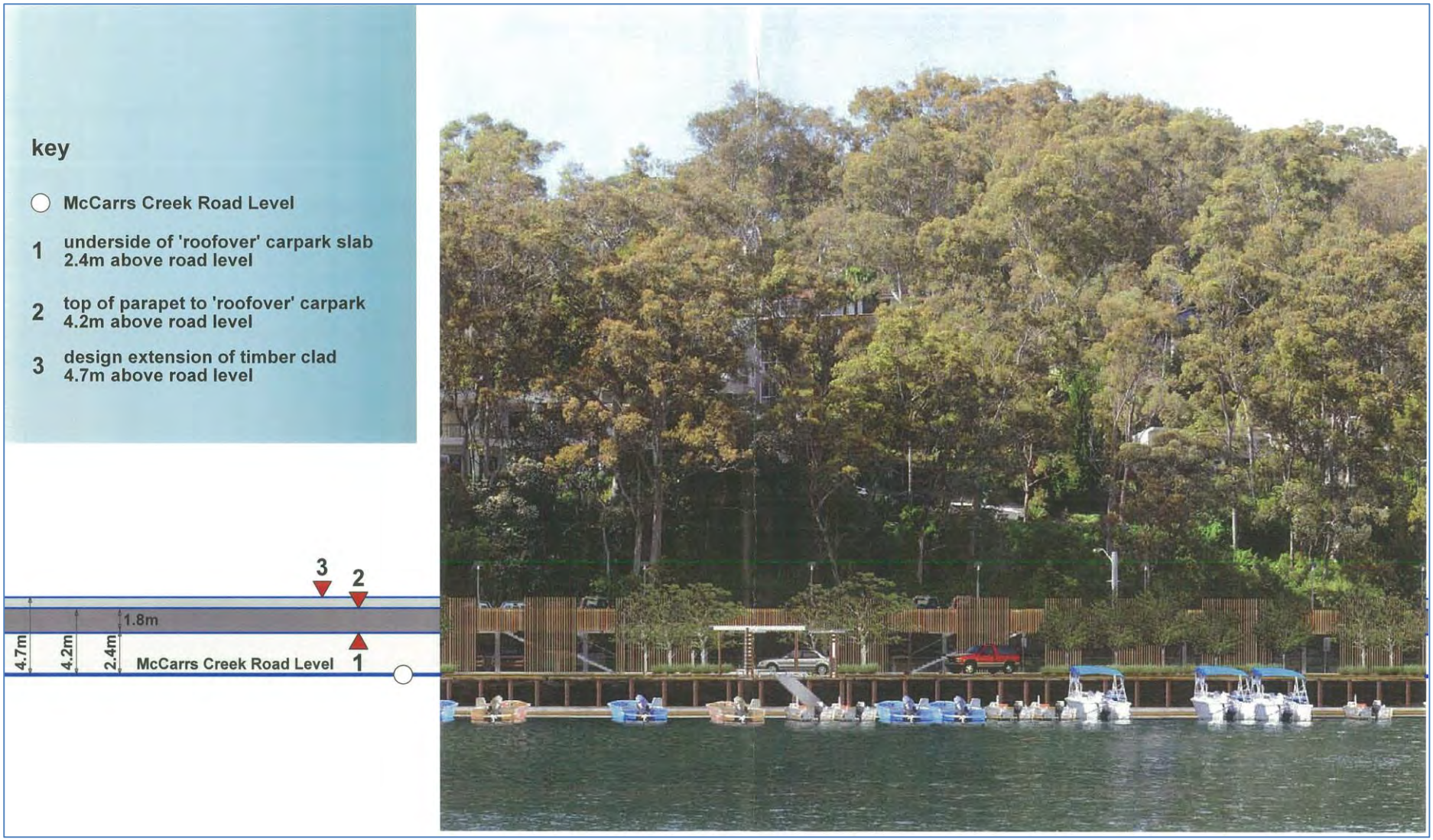

Figure 4-6: Artists impression of proposed car park showing height from ground level and example of possible treatment

4.2.2 SEAWALL DESIGN AND RECLAMATION

A new piered seawall would be constructed on infill to replace the current failed and temporary sandstone boulder seawall. The sea wall would form an arc shape with the distance from the base of the cliff to the outside edge of the piled seawall varying between 12.5 metres to 32.7 metres. The seawall would have a height of between 2.6 metres and 6 metres above the estuary bed. Of this, only the upper 2.5 metres would be visible above low tide level. The outer face will have 'rip rap' sandstone boulders in a stable configuration placed under the suspended boardwalk to provide marine habitat. The boulders would be placed in a formation that would not affect the navigation channel.

The piered seawall provides the necessary structural stability for the realigned road with its associated traffic movements and is a cost effective and efficient system given the soft marine sediments. This type of sea wall was also recommended by an independent geotechnical investigation (Crozier Geotechnical Consultants, 2012).

The construction of the sea wall would involve the installation of a temporary outer sheet pile wall followed by the driving/boring a row of piles along the seawall face. Upon completion of pile driving, a reinforced concrete capping beam may be poured along the top of the piles for the entire length of the retaining wall. This beam will assist in distributing loads, and is also more aesthetically appealing for pedestrians walking along the seawall.

Between the new seawall and the existing road there will be suitable infill to construct the new road and car park. As per the Quantity Survey (Appendix D), the volume of infill is estimated to be 6,700 cubic metres which equates to approximately 13,500 tonnes.

4.2.3 TIMBER BOARDWALK

A timber boardwalk is to be constructed for pedestrian access and would be located adjacent to the new seawall. This structure shall be designed to tie in with the seawall, as a cantilevered structure. The timber decking of the boardwalk may be built with recycled timber.

A one metre high marine grade aluminium handrail shall be provided along the seaward edge of the boardwalk for pedestrian safety. A raised concrete barrier such as an elsholtz kerb shall also be provided between the boardwalk and McCarrs Creek Road. This type of kerb can deflect vehicles at the speeds envisaged for this road – an example of the median can be found on Mona Vale Road at the Ba'hai bend and also along the central median at Newport shops.

As described in Section 3, there is possibility to recycle blocks from the existing seawall and place them in front of the new seawall. This means that the blocks will ultimately be located under the timber boardwalk. It is recommended that the timber boardwalk should be installed prior to placement of these blocks.

4.3 CONSTRUCTION ACTIVITIES

Below is a brief outline which addresses the key construction constraints of traffic management, site establishment, site clearance/demolition, existing services and the significant or major activities of work.

4.3.1 CONSTRUCTION PHASING

It should be noted that works may be staged to minimise disruption to traffic (vehicle, pedestrian and cyclist) and create a more streamlined work flow. Potential construction phasing and methodology is outlined below:

1) Identify services to be protected and/or relocated;
2) Site establishment, including site office, storage and any stockpile areas;
3) Sea wall realignment and bulk earthworks;
4) Installation of relocated and new services;
5) New road pavement construction and associated road works, including kerbing and lighting;
6) Existing road closure and transfer to new alignment;
7) Car park pavement, construction of car park deck and ancillary works such as lighting, wheel stops, road marking and hand rails; and
8) Hard and soft landscaping works.

4.3.2 SITE CLEARANCE AND ESTABLISHMENT

The proposed location is bounded immediately to the north by the shoreline and existing cliff face to the south. There is limited space available for site facilities such as site office, storage and plant-on-site, whilst also considering sensible construction and maintenance access.

It may be possible to locate site facilities immediately to the west of the proposed car park on the north side of McCarrs Creek Road as there is an existing area of land used currently for parking. Should this be insufficient in size the next suitable location could be the grassed area further west.

Demolition of the existing McCarrs Creek Road and ancillaries (such as signage, lighting and line marking) is required. Both underground and overhead services are impacted and will require relocation. This will be addressed during detailed design.

4.3.3 MAJOR WORKS

There are three major work items associated with the Proposal; land reclamation, sea wall construction and the construction of the first floor deck.

Land reclamation involves infill using suitable bulk earthworks and pavement materials to accommodate the realigned road and new car park. The amount of fill required is approximately 6700 cubic metres.

Seawall realignment involves the installation of temporary sheet piling to facilitate the construction of a contiguous piled seawall socketed into the underlying stratum.

The car park upper deck is a concrete structure similar to many car parks, involving deck slab, columns, access ramps and steps. Additional activities associated with these works include material delivery, storage, and plant. It is possible to construct the deck together with the ground floor parking as the concrete works can commence once the bulk earthworks and services are completed. Upon deck completion, the ground floor pavement works can then commence. To complete, parking ancillaries can be installed/constructed simultaneously for both floors.

4.3.4 UTILITIES

A Services Infrastructure Report has been completed by Arcadis (formerly Hyder Consulting) (2015) (Appendix E) for the Proposal and provides details on the impact of the existing and proposed utility services in the vicinity of the Proposal. This section provides a summary of this report.

A Dial Before You Dig (DBYD) investigation was undertaken on 8 March 2013 and renewed on 30 July 2015, which identified the following services that could be affected by the Proposal:

- Optus underground duct and cable;
- Sydney Water sewer main;
- Ausgrid overhead electricity cable;
- Telstra aerial cable; and
- Existing stormwater drainage.

The Sydney Water sewer main is likely be impacted by the Proposal and, as a result, consultation has been undertaken by Arcadis (formerly Hyder Consulting) with Sydney Water to determine the most appropriate course of action. Overall, no significant impacts are expected and consultation would continue with Sydney Water until construction is complete.

The Optus underground cable may be impacted by the Proposal, although detailed design would confirm if the utility requires protective treatment or relocation. Consultation would be undertaken with Optus during detailed design to determine the most appropriate course of action to reduce or prevent any impacts to this utility.

Ausgrid and Telstra overhead cables would require relocation as they will be impacted by the Proposal. Consultation would be undertaken with, Telstra and Ausgrid prior to construction and as necessary relocations or augmentation works would be incorporated into the detailed design.

Any impact upon the above mentioned utilities may affect the broader community of Church Point and surrounding areas. These impacts may include a disruption of power, communication, sewerage and stormwater services.

During detailed design, survey would be undertaken to accurately locate any utilities potentially affected by the Proposal.

Utilities would be identified on plans and construction drawings and their physical location marked clearly prior to construction. Where required, utilities would be protected during construction. Utility plans would be checked and updated if required during the construction period to retain accurate records.

4.3.5 TRAFFIC MANAGEMENT

The majority of the proposed construction of the road is clear of the existing road allowing more of the works to be carried out whilst the existing road is still in use. The new realigned road can then be opened and the construction activity shift to the inner car park. Where required, traffic management controls would be put in place. This may include reduced speed limits and temporary partial road closures.

4.4 OPERATIONAL MANAGEMENT

At the completion of construction of the project this segment of McCarrs Creek Road will include an upgraded curved alignment with a designed pedestrian access areas and suitable traffic calming. The road lane widths will accommodate shared use with cyclists. The outer timber boardwalk will provide shared path access for pedestrians and recreational cyclists.

The new carpark is intended to be managed as part of the Church Point precinct and as such be covered by Pay & Display ticket parking as well as the Church Point Sticker parking scheme. It is noted that one of the car park floors is intended to be made available for leased spaces which will attract a higher fee for use. This will assist the loan repayment schedule and as such help reduce the necessary increase in the general fee.

5 STATUTORY AND PLANNING FRAMEWORK

5.1 APPLICABLE LEGISLATION

The following table provides a summary of legislation applicable to this Proposal (Table 5-1).

Table 5-1: Legislative requirements applicable to the Proposal

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
Commonwealth				
Environment Protection and Biodiversity Conservation Act 1999	EPBC Act	The EPBC Act aims to provide for the protection of the environment, particularly Matters of National Environmental Significance (MNES).	Part 3 of the EPBC Act provides requirements relating to MNES.	Under the EPBC Act a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on MNES or the environment of Commonwealth land. These are considered in Appendix A. The assessment of the Proposal's impact on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant MNES. Accordingly, the Proposal has not been referred to the Australian Commonwealth Department of the Environment.
State Acts				
Crown Lands Act 1989	CLA	The Crown Act aims to provide for the administration and management of Crown land	Section 45-Licence from the Minister Section 61 and 62-Enclosure of roads and watercourses on application	Church Point Reserve is predominately Crown Land administered under the provisions of the *Crown Lands Act, 1989* (CLA 1989). The objects of this Act include:

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
			Section 135-Minister acquiring land under the Land Act	▪ *the management of Crown land having regard to the principles of Crown land management contained in this Act,* ▪ *the proper development and conservation of Crown land having regard to those principles,* ▪ *the regulation of the conditions under which Crown land is permitted to be occupied, used, sold, leased, licensed or otherwise dealt with.* A number of amendments to the Crown Land Act in 2005 are of particular relevance to this Proposal, specifically: ▪ Section 34A allows the Minister to enter into a lease or licence over Crown land that has been reserved for a public purpose. This allows for the Minister to give regard to uses of Crown reserves outside the stated public reserve purpose and allows the Minister to enter into a lease or licence over that land. ▪ The Minister can now authorise an additional purpose for a Crown reserve by the provision of section 112A by way of a Plan of Management or by directly Gazetting a new purpose under section 121A. Pittwater Council manages the affairs of the reserve trusts affected by this Proposal, namely Crown Reserve R1012329 (bed of Pittwater and Crown Land within the region, including all reserved Crown lands)

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
				reserved for Access and Public Requirements Rural Services, and Environmental and Heritage Conservation. The Church Point Plan of Management was signed by the Minister for Lands on 8 November 2010 and adopted under s114 of the CLA. The Plan of Management also authorises all existing leases and licences applying to the study area until the expiry of their current term.
Environmental Planning and Assessment Act 1979	EP&A Act	The EP&A Act is the primary State legislation guiding planning, environmental assessment and approval of developments.	Part 5 of the EP&A Act sets out the requirements for environmental assessment of public infrastructure projects that do not trigger the need for assessment under Part 4 of the Act. Under Section 111 of the EP&A Act the determining authority for the Proposal must examine and take into account to the fullest extent possible all matters which are likely to affect the environment.	This REF has been prepared to satisfy the requirements of Section 111 of the EP&A Act.
Environmental Planning and Assessment Regulation 2000	EP&A Regulation	The EP&A Regulation assists the EP&A Act in guiding planning, environmental assessment and approval of developments.	Clause 228 (2) of the EP&A Regulation sets out a number of factors to be considered for assessments under Part 5 of the EP&A Act to assess the	Appendix A has been prepared to assess the Proposal against the factors in Clause 228 of the EP&A Regulation. In summary, the Proposal would generally result in minor impacts on the environment subject to mitigation measures being implemented

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
			likely impact of the activity on the environment.	and therefore this assessment under Part 5 of the EP&A Act is considered suitable.
Fisheries Management Act 1994	FM Act	The FM Act provides for the identification, conservation and recovery of threatened fish, aquatic invertebrates and marine vegetation. The Act also covers the identification and management of key threatening processes which affect threatened species or could cause other species to become threatened.	Part 7A of the FM Act relates to threatened species conservation. Clause 199 of the FM Act relates to dredging and reclamation undertaken by public authorities. Section 218 and 219 of the FM Act relates to obstruction of fish passage by public authorities.	If a planned development or activity is likely to have any impact on a threatened species listed under the FM Act, an Assessment of Significance must be undertaken. Further discussion regarding impacts of the Proposal to threatened species and habitats is discussed in Section 7.1 of this report. Public authorities must provide written notice to the Minister of any proposed dredging and reclamation and consider matters concerning the Proposal raised by the Minister within 28 days of providing written notice. Consultation with NSW Fisheries has been undertaken to date (refer to Section 6) and will continue through the detailed design and construction phases. The Proposal would require dredging and reclamation to construct the new road, seawall and car park. Permits would be required under sections 199-203 for dredging and reclamation works, and under s204-205 for proposed harm of marine vegetation. Consultation with Fisheries NSW to date have also advised the requirement for these permits and advocated their support once a permit

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
				application under Part 7 of the FM Act is made.
Noxious Weeds Act 1993	NW Act	The NW Act aims to reduce the negative impacts of weeds on the economy, community and environment by establishing control methods and provide for monitoring and reporting on the effectiveness of management of weeds in NSW.	Clause 8 of the NW Act outlines the different weed classes which identify control requirements. Weed classes are generally declared according to Local Government Area (LGA).	A site visit was undertaken by Arcadis (formerly Hyder Consulting) on 10 June 2014. As discussed in Section 7.1, no noxious weeds declared under the *NSW Noxious Weeds Act 1993* for Pittwater Council were recorded on the site.
Roads Act 1993	Roads Act	The objects of the Roads Act 1993 (Roads Act) are to: ▪ Set out the rights of members of the public to pass along public roads. ▪ Set out the rights of persons who own land adjoining a public road to have access to the public road. ▪ Establish the procedures for the opening and closing of a public road. ▪ Provide for the classification of roads. ▪ Provide for the declaration of RMS and other public authorities as roads authorities for both classified and unclassified roads. ▪ Confer certain functions (in particular, the function of		Section 138 of the Roads Act requires consent to be obtained from the appropriate roads authority before certain works and structures can be undertaken. These works and structures comprise: ▪ Erection of a structure or carrying out a work in, on or over a public road, or ▪ Digging up or disturbing the surface of a public road, or ▪ Removing or interfering with a structure, work or tree on a public road, or ▪ Pumping water into a public road from any land adjoining the road, or ▪ Connecting a road (whether public or private) to a classified road. Pittwater Council is the roads authority for the section of McCarrs Creek Rd subject to this Proposal.

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
		carrying out road work) on RMS and on other roads authorities. ▪ Provide for the distribution of the functions conferred by this Act between RMS and other roads authorities ▪ Regulate the carrying out of various activities on public roads.		
Threatened Species Conservation Act 1995	TSC Act	The TSC Act provides for the protection and management of threatened species, populations and ecological communities.	Threatened species, populations and ecological communities are listed under the schedules 1, 1A and 2 of the Act.	If a planned development or activity will have an impact on a threatened species, population or ecological community listed under the TSC Act, an Assessment of Significance under section 5A of the EP&A Act must be undertaken. If the impacts are likely to be significant, an SIS must be prepared and the Director-General of the OEH must agree to the development approval. An assessment of impacts to threatened species, populations and ecological communities has been undertaken in Section 7.1 of this document. The assessment indicated the Proposal is unlikely to significantly impact any threatened species, populations or ecological communities.
Waste Avoidance and Resource Recovery Act 2001	WARR Act	The WARR Act aims to encourage the most efficient use of resources to reduce environmental harm and ensure that resource management		The Proposal would result in the generation of waste as a result of replacement of road infrastructure, car park construction and seawall construction. The

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
		is undertaken in a logical, sustainable and organised manner. The WARR Act promotes the preparation of a waste strategy for the state by the Director General and improve the responsibility for waste reduction in the industry.		impacts of this have been assessed in Section 7.11. The waste management hierarchy outlined in the objects of the act would be followed with regard to waste management for the Proposal.
Water Management Act 2000	WM Act	Controlled activities carried out in, on or under waterfront land are regulated by the WM Act. The NSW Office of Water (NOW) administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. A Controlled Activity Approval must be obtained from the NOW before commencing a controlled activity.	Clauses 91 and 92 of the Act relate to Controlled Activity Approvals.	Controlled Activity Approvals are required for controlled activities undertaken on or under waterfront land. In the context of the WM Act a "controlled activity" means: ▪ the erection of a building or the carrying out of a work (within the meaning of the EP&A Act), or ▪ the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or ▪ the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or ▪ the carrying out of any other activity that affects the quantity or flow of water in a water source. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
				Pittwater, the water body adjacent to the site, meets the definition of an estuary under the WM Act and as such the works would be undertaken on waterfront land. The Proposal would constitute dredging and reclamation as they would require removal and deposition of material. Clause 38 of the *Water Management (General) Regulations 2011* states that a public authority is exempt from Section 91E (1) of the Act in relation to all controlled activities that it carries out in, on or under waterfront land. Pittwater Council is prescribed as a public authority under the EP&A Act; therefore a controlled activity approval for the Proposal is not required.
State Environmental Planning Policies				
State Environmental Planning Policy (Infrastructure) 2007	ISEPP	ISEPP aims to facilitate the effective delivery of infrastructure across the State.	Part 3 Division 13 Port, wharf and boating facilities	Clause 67 includes the following definitions: ***facilities*** includes: (a) facilities for the embarkation or disembarkation of passengers onto or from any vessels, including public ferry wharves, and (b)facilities for the loading or unloading of freight onto or from vessels and associated receival, land transport and storage facilities, and (c)wharves for commercial fishing operations, and

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
				(d) refuelling, launching, berthing, mooring, storage or maintenance facilities for any vessel, and (e) sea walls or training walls, and (f) administration buildings, communication, security and power supply facilities, roads, rail lines, pipelines, fencing, lighting or car parks. ***public ferry wharf*** means a wharf or any associated facilities used for the purposes of public passenger services provided by ferries. ***wharf or boating facilities*** means a wharf, or facilities associated with a wharf or boating, that are not port facilities. Clause 68(4) permits development for the purpose of wharf or boating facilities to be carried out by or on behalf of a public authority without consent on any land. Clause 68(4A) permits development for the purposes of associated public transport facilities for a public ferry wharf to be carried out by or on behalf of a public authority without consent on any land. Clause 68(5) permits development for the purposes of construction works (including land reclamation) if the development is in connection the facilities outlined above. The sea wall, associated land reclamation and car park facilities are ancillary to the commuter wharf and public ferry wharf and

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
				therefore the works satisfy the definition of facilities. The proposed works are therefore permitted without consent under Part 3 Division 13 clause 68(4) and (4A) and (5). The ISEPP does not outweigh the permit requirements under section 200 and 205 of the Fisheries Management Act 1994.
Coastal Protection (SEPP 71)	SEPP 71	The Coastal Protection (SEPP 71) planning instrument aims to ensure that the coastal zone is protected in accordance with the principles of ecologically sustainable development.	Part 5 Master Plans	SEPP 71 defines a category and development assessment process for development in sensitive coastal locations, including land within 100 metres above mean high water mark of the sea, a bay or an estuary. The provisions of this SEPP were considered in the development of the Plan of Management.
Local				
Pittwater Local Environmental Plan 2014	Pittwater LEP	The Pittwater LEP aims to make local environmental planning provisions for land in the Pittwater Council area.	Part 2 Permitted or prohibited development and Land Use Table	The Proposal is located on predominantly on land zoned RE1 Public recreation on the Pittwater LEP Land Use Map. However, the reclamation area and seawall encroach on land zoned W1. The objectives of the RE1 zone are: ▪ To enable land to be used for public open space or recreational purposes. ▪ To provide a range of recreational settings and activities and compatible land uses.

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
				▪ To protect and enhance the natural environment for recreational purposes. ▪ To allow development that does not substantially diminish public use of, or access to, public open space resources. ▪ To provide passive and active public open space resources, and ancillary development, to meet the needs of the community. The objectives of the W1 zone are: ▪ To protect the ecological and scenic values of natural waterways. ▪ To prevent development that would have an adverse effect on the natural values of waterways in this zone. ▪ To provide for sustainable fishing industries and recreational fishing. ▪ To ensure development does not adversely impact on the natural environment or obstruct the navigation of the waterway. ▪ To provide opportunities for private access to the waterway where these do not cause unnecessary impact on public access to the foreshore. Roads are permitted without consent in the RE1 Zone, however works associated with the road will need to be constructed in the W1 Zone. Roads are prohibited in this zone under the Pittwater LEP 2014.

Legislation	Abbreviation	Aims	Relevant Section of Planning Instrument	Application to the Proposal
				Car parks are also prohibited in the RE1 and W1 zones. Acid Sulfate Soils under LEP 2014 requires consent for works below natural ground surface in Class 1 and Class 2 areas. The area subject to the Proposal is considered to contain Class 2 and highly likely Class 1 due to sea wall construction and reclamation works. Notwithstanding this, as discussed above, under Part 3 Div 13 clause 68(4), (4A) and (5) of the ISEPP development for the purposes of wharf and boating facilities, including roads, car parks, sea walls and land reclamation is permissible without development consent, on any land, when undertaken by a public authority.

5.2 STATUTORY CONTEXT

The Proposal includes provision of a car park, new seawall and land reclamation, along with works to the existing road infrastructure by Pittwater Council, whom is considered a public authority under the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP). Part 5 of the EP&A Act facilitates the approval of certain works, or 'activities' by, or on behalf of, a public authority without development consent. Section 111 of the EP&A Act and Clause 228 of the EP&A Regulations provide matters for consideration for environmental assessment under Part 5 of the EP&A Act. Section 112 of the EP&A Act provides criteria for the public authority to determine whether works, known as 'activities' by the Act, are suitable to be assessed under Part 5 of the EP&A Act. One of the key criteria for an activity to be suitable for assessment under Part 5 of the EP&A is that it does not 'significantly affect the environment'. Should works significantly affect the environment then the Proposal would require the preparation of an Environmental Impact Statement (EIS) and assessment under Part 5.1 (State Significant infrastructure - SSI) of the EP&A Act.

The ISEPP provides further guidance on works that do not require consent and therefore are suitable for assessment under Part 5 of the EP&A Act.

The proposed works are considered ancillary to the commuter wharf and public ferry wharf and satisfy the definition of facilities as provided in clause 67 of the ISEPP. The Proposal is therefore permitted without consent under Part 3 Division 13 clause 68(4) and (4A) and (5).

This REF has been prepared to consider the potential environmental impacts of the Proposal to inform approval, without development consent, in accordance with the provisions of Part 5 of the EP&A Act. As discussed in Section 7, the Proposal would not significantly affect the environment, subject to the implementation of the identified mitigation measures, and therefore the preparation of an EIS is not required.

6 CONSULTATION

6.1 STATUTORY CONSULTATION REQUIREMENTS

Fisheries Management Act 1994

Section 199 of the *Fisheries Management Act 1994* (FM Act) states that consultation with the Minister (Minister for Primary Industries) must be undertaken by a public authority prior to carrying out dredging or reclamation works.

An initial letter was sent by Council to the NSW Department of Primary Industries (DPI) on 5 March 2009 seeking comment on the draft Plan of Management. DPI responded on 29 April 2009, raising concern over the possible impact of the proposed works on seagrass populations. NSW DPI would consider issuing permits for the dredging and reclamation and harm of marine vegetation provided other options to provide car parking in the area do not exist. The concept plan was amended by Council to result in minimal harm of seagrasses. The requirement for a permit under the FM Act to dredge and reclaim was confirmed.

NSW DPI were forwarded a copy of the revised Plan of Management incorporating changes requested and responded on 6 July 2009. This letter stated there were no objections to the Plan of Management, provided impacts to seagrasses and marine habitat were minimised.

A further letter was sent to Fisheries NSW from Council on 12 June 2014 regarding approval of Stage 1 of the Church Point Master Plan (at McCarrs Creek Road). Fisheries NSW provided in-principle support of these works. Fisheries NSW also stated that final approval of the proposed works would be issued once a permit application under Part 7 is made. An updated REF (this report), Aquatic Ecology Survey and plans accompanied the permit application. Fisheries NSW granted a permit to harm 70 m^2 of fringing *Zostera* seagrass with *Halophila* in areas on 11 September 2015.

State Environmental Planning Policy (Infrastructure) 2007

Clauses 13 - 16 of Part 2 of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Clause 17(1)(c) however, states that Clauses 13-16 do not apply if they would require notice to be given to a council or public authority that is carrying out the development or on whose behalf it is being carried out. The Proposal has been assessed against the relevant clauses in Table 6-1.

Table 6-1: Consultation requirements under Clauses 13-16 of the ISEPP and their relation to the Proposal

Item	Response	
Clause 13		
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?		✓ No
Are the works likely to generate traffic to an extent that will strain the existing road system in a local government area?		✓ No
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?		✓ No
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?		✓ No

Item	Response	
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? No, as the design of the Proposal would still allow movement of traffic throughout the construction period. If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?		✓ No
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	✓ Consultation exempt under Clause 17 (1) (c)	
Clause 14		
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than minor or inconsequential? There are two heritage items in close proximity to the Proposal, being the General Store and the Cemetery. The heritage assessment contained in Section 7.8 addresses the potential impacts which are considered to be minor or inconsequential.		✓ No
Clause 15		
Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent?		✓ No
Clause 16		
Are the works adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974*?		✓ No
Are the works adjacent to a declared aquatic reserve under the *Fisheries Management Act 1994*?		✓ No
Are the works adjacent to a declared marine park under the *Marine Parks Act 1997*?		✓ No
Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*?		✓ No
Do the works involve the installation of a fixed or floating structure in or over navigable waters? The Proposal involves a suspended boardwalk around part of the foreshore, however this was taken into consideration with the adopted Plan of Management and does not affect the navigational area.		✓ No
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?		✓ No

The Proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by *State Environmental Planning Policy No. 14 - Coastal Wetlands*, *State Environmental Planning Policy No. 26 - Littoral Rainforests*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (Transitional Major Projects) 2005*.

Based on the above information, it is concluded that no consultation is required under the ISEPP for this Proposal.

6.2 STAKEHOLDER AND COMMUNITY CONSULTATION

Consultation has been undertaken with the local Church Point and offshore communities as well as the general public for over two decades. Records of consultation are provided in Appendix B. More recently, The Plan of Management involved extensive consultation to gain an understanding of the local and broader community needs. This included the involvement of representatives of the communities that hold a stake in the study area, including:

- Pittwater Council;
- Department of Lands;
- Bayview – Church Point Residents Association Incorporated;
- The Church Point Reserve Association (CPRA);
- Scotland Island Residents Association (SIRA); and
- West Pittwater Community Association (WPCA).

Two community forums were held in October and November of 2006 which provided the community an opportunity to voice their opinions, concerns or interest in matters affecting the Church Point area. The information gained from the forums together with other consultation activities was used to prepare an 'Issues and Options Paper' which was publicly exhibited in December 2006.

Conceptual plans were developed to investigate land reclamation and car parking provision along McCarrs Creek Road following the review of the feedback received on the Issues and Options Paper. The conceptual plans and car parking options were presented at community forums held on 20 May 2007 at the Scotland Island Bushfire Brigade and on 22 May 2007 at the Mona Vale Community Hall.

A preferred option (Master Plan) was developed and presented to the community during a joint community forum held on 4 December 2007 at Mona Vale Community Hall. The plan was generally accepted by attendees as the 'way forward', supported by Pittwater Council and Lands Department.

The draft Plan of Management was placed on public exhibition and a number of submissions were received and considered. In addition, the document was independently peer reviewed. The Plan of Management was adopted by Pittwater Council in November 2009 and subsequently endorsed by the State Government. The above mentioned, clearly demonstrates the extensive community consultation that has been carried out.

A Working Party was reconvened in 2013 to consider two options for the road realignment and car park. The Working Party consisted of two representatives from each Association mentioned above along with two representatives from the Friends of Church Point Group. The Working Party met on three occasions, with each Association, along with the Friends Group, having been provided and having utilised the opportunity to make verbal and written submissions.

A summary of this consultation and the issues raised is a follows:

- An Initial Design Group meeting provided the opportunity to re-establish the Design Group and for the Friends Group to preview their alternative car park layout which was changed at their request from their original submission to a 45 degree/parallel layout.
- A second meeting was held on 30 May 2013. Arcadis (formerly Hyder Consulting) (engaged by Council to provide an independent evaluation and comparison of options) provided its independent report and presented its findings of the evaluation and comparison of the options. Following this meeting, there was opportunity for the Design Group members to make further submissions. Each of the Resident Associations plus the Friends group made subsequent submissions. Detailed responses by Council staff to each of these submissions / issues were provided in the form of a table that was provided to the Design Group and Councillors.
  - A web page (www.pittwater.nsw.gov.au/churchpoint) with typical questions and answers was established and is well utilised as a further communication mode.
- A third meeting was held on 20 September 2013. This was focussed on the evaluation and comparison as well as a triple bottom line assessment. An alternative option was put forward by the Friends group just prior to this meeting, and their original option withdrawn. Following this meeting, Arcadis (formerly Hyder Consulting) was engaged for a further independent analysis of the Friends group latest alternative layout.
- Further Submissions were subsequently received from members of the Design Group once the Arcadis (formerly Hyder Consulting) Report relating to the Friends group alternative option had been received and circulated.

A brochure outlining the three options under consideration and an invitation to a Community Forum on Parking in Church Point was sent to the Bayview, Church Point and off-shore post codes and the Community Meeting advertised. A Community Forum on Church Point car parking was held on 6 November 2013. This forum was well attended. Council provided a presentation on the options under consideration including an evaluation and comparison. A Question & Answer session then provided the opportunity for feedback and comment.

In addition to the specific submissions from the Design Group and the resident associations & CPFG involved in that process, Council received 135 separate public submissions. The public submissions received were in three primary categories:

- Support for one (or more) of the options;
- None of the options/alternatives proposed; and
- Pause and Reassess or more information required.

Of the 89 respondents indicating support for a car park option:

- 12% supported Option 1;
- 67% supported Option 2; and
- 20% supported Option 3.

The majority of responses for 'none of the options and/or other alternatives' were from on-shore respondents with a number of alternatives suggested. Of these:

- 16 did not support any option or sought delay (pause and reassess) for more information/other;
- 11 suggested alternate locations such as Rowland Reserve, Mona Vale with shuttle service;
- 6 suggested either decking or undergrounding the current Church Point car park;
- 6 recommended demand management measures;
- 4 recommended a bridge or car ferry to Scotland Island or opening up Western Foreshore access; and
- 2 indicated use of Pasadena for parking.

The adopted Church Point Plan of Management includes a car park facility and as such, the 'no car park' was not taken forward. A number of the suggested alternatives had already been considered during the development of the Plan of Management and excluded because they were not feasible, affordable or practical.

Council, at its meeting on 16 December 2013, considered a report titled *Church Point Carparking - Precinct One Options - Comparison & Evaluation - Way Forward*, which provided a summary of the options development along with a discussion of the submissions received and feedback from the Public meeting. Council resolved the following recommendations:

- That based on the comparison and evaluation of car park options including Triple Bottom Line Assessment; along with the analysis of submissions received and the intent of the adopted Plan of Management, that Option 2 – the car park that provides for 120 car spaces – be adopted as the car park layout to take forward for Precinct 1 at Church Point;
- That a further report be presented on transport options, resident parking scheme, availability of parking stickers and other mechanisms to reduce parking demand at Church Point for consideration by Council; and
- That a detailed Review of Environmental Factors (REF) and Part V Assessment be undertaken for Option 2 and reported to Council prior to physical commencement of the project.

This REF is required for this project and is to be reported to Council, along with the other matters listed.

7 ENVIRONMENTAL ASSESSMENT

7.1 ECOLOGY

7.1.1 EXISTING ENVIRONMENT

Marine and estuarine flora and fauna

Pittwater is an estuarine waterbody, with a rich diversity of estuarine habitats including mangroves; seagrasses; intertidal mud flats; rocky shores and sandy beaches. Previous aquatic ecology studies were undertaken in 2007, 2012 and 2014 by Marine Pollution Research Pty Ltd (MPR) and provide the basis of this section of the REF. Field habitat investigations were undertaken by MPR in September 2014. Fisheries NSW also visited the site on 31 August 2015 to assess the Proposal's impact on seagrass and inform the details regarding a Fisheries permit for dredging and reclamation and harm to marine vegetation (under the *Fisheries Management Act 1994)*.

The offshore seabed from the site is composed of silty sand on the eastern side of the commuter wharf and soft muddy sand on the western side. The intertidal zone supports a variety of molluscs and a defined oyster band, with no substantial algal growth on the intertidal rocks.

One of the most important Endangered Ecological Communities (EEC) found in the Pittwater Waterway is Coastal Saltmarsh. It can be found in the intertidal zones on the shores of estuaries and saltwater lagoons around Pittwater. However, no Coastal Saltmarsh or Mangrove stands have been identified in the vicinity of the study area.

A significant habitat identified within the shallow waters of the study area is the aquatic seagrasses. Seagrass beds are known to be rich in species diversity and are therefore high in productivity, providing valued habitats for fish, snails, amphipods, various crustaceans, echinoderms and isopods and a variety of algae and other epiphytic flora.

Two species *Zostera capricorni* and the endangered *Posidonia australis* are found near the Proposal site (refer to Figure 7-1). Additionally, the listed pest algae species *Caulerpa taxifolia* has been identified near the site, extending from Church Point Reserve, under the public wharves and General Store, and west to at least the Cargo Wharf. Moreover, *Halophila* and *Sargassum* algae have also been noted in the study area, although not considered threatened.

Figure 7-1: 2014 location of *Zostera, Posidonia* and *Caulerpa* patches

Field investigations (MPR, 2014) found that inshore strips of seagrass at the site include *Zostera* beds and a *Posidonia* patch comprising of a small core patch of relatively dense *Posidonia* with a wider distribution of individual shoots around this core patch. However, the largest and most significant patch of *Posidonia* near the site is located approximately 200 metres to the east of the site, near the Church Point ferry wharf and shops. Given the distance the Proposal is away from this core patch, it is considered unlikely to be impacted.

The FM Act and the EPBC Act list a number of marine estuarine and teleost fish species as Vulnerable Species under Schedule 5 of the Act. Syngathiformes (seahorses, sea dragons, pipefish, pipe-horses and sea-moths) are protected under both the EPBC Act and the FM Act.

The Black Rock Cod (*Epinephelus daemelli*) was the only teleost fish species that could occur within the rocky reef areas in Pittwater, although unlikely to be found within the scattered rock rubble at the site. There is seagrass habitat for syngathids at the site, however, due to the patchiness and sparseness of the seagrass, syngathids are also considered unlikely to occur at the site. It should be noted that more general and non-endangered fish species including gobies, luderick and bream have all been observed at the site.

The Grey Nurse and Great White shark species could visit the site, although it is likely to be rare and mainly in the pursuit of mobile prey. Therefore, these species are considered unlikely to make use of the habitat at the site.

Other notable aquatic species or ecological communities and migratory species listed under the TSC and EPBC Acts include Little Penguins, which have been observed fishing and feeding throughout Pittwater and could occur at the site. Various cetaceans, marine mammals, marine reptiles and seabirds have also been observed in Pittwater. However, of the species that may occur in the vicinity of the site, few would be utilising the resources of the site to any great extent and would generally be in the area as transient or opportunistic feeders. Furthermore, the above mentioned species are unlikely to occur at the site noting the existing boating activity immediately adjoining the commuter wharf. The foreshore also comprises rock rubble and sediments from prior collapsed seawalls and fill embankments. This erosion impact will be curtailed by the installation of the new seawall.

Terrestrial flora and fauna

Database searches were undertaken to identify existing records of threatened entities and Matters of National Environmental Significance (MNES) on the 2 July 2014. Interrogation of the following databases was undertaken:

- The NSW Wildlife Atlas (Bionet) which is managed by the OEH. A co-ordinate search was undertaken to determine threatened species records listed under the TSC Act to within 10 kilometres of the study area.
- The Protected Matters Search Tool which is managed by DotE. A co-ordinate search was undertaken to determine protected matters listed under the EPBC Act to within 10 kilometres of the study area.
- Threatened and protected Species Records Viewer, which is managed by DPI (Fisheries). A search of the Pittwater Local Government Area (LGA) was undertaken to determine records of threatened fish species in the area.
- The NSW Vegetation Information System (VIS) which is managed by DotE. A search of the Pittwater LGA was undertaken to determine the vegetation types in the area.

A mix of managed landscapes associated with the Reserves and 'naturally occurring' vegetation provide important habitat connections along the shores of Pittwater, connecting with Ku-ring-gai Chase National Park. Church Point contains a range of environments of variable quality.

Municipal plantings within reserve areas are juxtaposed with bushland vegetation. However, habitats, where viable, are mostly degraded and comprise of weeds. Limited opportunity for vegetation establishment is compounded by restricted space and compacted growing medium.

The original open-forest structure, with a lower canopy of shrubs and ground flora including ferns, groundcovers, grasses and native vines was once widespread but now exists as woodland or remnant trees. A narrow strip of vegetation runs along the escarpment directly behind (south) the Proposal. This vegetation is characterised by Spotted Gum Forest with dominant canopy species of Spotted Gum (*Corymbia maculata*) and Grey Ironbark (*Eucalyptus paniculata*), although only a few individual species are present. Pittwater LEP Biodiversity Map lists this area as Biodiversity.

The undertsorey on the strip of land is currently dominated by a carpet Asparagus Fern (*Asparagus aethiopicus*), individuals of Ochna (*Ochna serrulata*) and Morning Glory (*Ipomoea indica*). As part of the Proposal this would be removed and locally native groundcovers and shrubs used to replace and improve the corridor. However, this will need to ensure that there is no change to the stability of the rock face and may if possible take a long period of time.

The site does not contain any designated areas of Pittwater and Wagstaffe Spotted Gum EEC as determined in the Pittwater Council Development Control Plan (Pittwater Council DCP). The presence of remnant Spotted Gums is indicative of the Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion – profile.

A seven part test has been prepared for the site (Appendix G) even though the site does not contain any designated areas of Pittwater and Wagstaffe Spotted Gum EEC under the Pittwater Council DCP.

Common Eastern Froglets have been identified 450 metres to the south of the site and 285 metres to the west of the site, however, none were recorded within the site boundary and are therefore unlikely to be affected.

Koalas have been identified within a 10 kilometre radius under a Bionet search. These were identified to the west of the site within Ku-Ring-Gai National Park and isolated patches to the south and west within residential communities. One Squirrel Glider was also identified in the suburb of Avalon, 8 kilometres northeast of the site. No records were identified within the site.

7.1.2 POTENTIAL IMPACTS

The most significant potential impact regarding flora and fauna within the site is the direct loss of *Posidonia* and *Zostera* seagrass habitat through construction of the seawall and land reclamation for the new road. According to the 2014 aquatic ecology report, the remnant patches of *Posidonia* which are left are of no consequence, and would be unaffected if the inshore *Zostera* remains unaffected. Notwithstanding, Fisheries NSW has granted a permit to harm 70 m^2 of fringing *Zostera* seagrass with *Halophila* in areas and has been mitigated by offset compensation. Furthermore, there is still the potential to impact the seagrasses indirectly. Indirect impacts associated with the work activities associated with the Proposal include: increased turbidity from runoff and chemical runoff; shading seagrasses; and potentially poisoning them. These impacts would be readily managed through the mitigation measures outlined below.

Tree removal will be required to undertake the Proposal. This tree removal is associated with the need for a small modification of the road reserve opposite Church Point Wharf, and the removal of vegetation which is currently leaning from the current rock wall and overhanging the current carriageway. This will require the removal of the following vegetation:

- Large 10 m plus

2 x mature Pittwater Spotted Gum (note: one of which should be removed regardless of carpark construction as in the long-term they will cause problems to wall stability).

- Medium under 10 m

1 x Broad Leaf Privet (*Ligustrum lucidum*) - Noxious Weed

4 x *Acacia longifolia* – Wattle currently in poor condition

2 x *Corymbia maculata* – Pittwater Spotted Gum - (note: should be removed regardless of carpark construction as in the long-term they will cause problems to rock wall stability).

- Small 0-5 m

7 x *Corymbia maculata* – Pittwater Spotted Gum (note: should be removed regardless of carpark construction as in the long-term they will cause problems to rock wall stability)

6 x *Acacia longifolia* – Wattle currently in poor condition

1 x *Allocasuarina torulosa* - Forest Oak

2 x Broad Leaf Privet – Noxious Weed

1x Jacaranda (*Jacaranda arborea*) – Excluded from Tree Preservation Order.

The trees listed above, groundcover of previously disturbed land and potentially overhanging tree branches that may hinder construction activities would be removed during construction. Furthermore, no tree removal would be undertaken unless unstable or with an adverse lean over the carpark and limited shrub removal directly along the rock escarpment is expected. Fauna corridors would not be compromised.

The seven part test (Appendix G) determined that the Proposal is unlikely to have a significant environmental impact. No threatened species would be affected by the Proposal.

To offset the removal of two mature Spotted Gums, four Spotted Gums will be planted in the immediate vicinity of the Proposal. To offset other tree losses 24 other locally native tree species will be used in the landscaping of the carpark itself.

Fauna corridors would not be compromised. The current corridor will also be regenerated subject to the stability of the area. Fish and fauna habitat loss would be minimal due to construction works and would not significantly impact these species as described above.

7.1.3 MITIGATION MEASURES

Feasible and reasonable mitigation measures would be implemented to minimise impacts to ecology during construction and operation and would include (Table 7-1):

Table 7-1: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
An aquatic CEMP, or equivalent, would be prepared prior to reclamation of land, and construction of the seawall and car park.	Pittwater Council	Pre-construction
Establishment of steel sheet piling and floating sediment curtains in Pittwater, surrounding the site for the duration of construction. These structures are to be maintained in working order during construction.	Construction manager	Pre-construction
A rock rubble toe is to be placed at the foot of the concrete piled section of seawall.	Construction Manager	During construction
The eastern end of the seawall is to key into the existing seawall at the Church Point General Store. Detailed plans of the seawall to be constructed at this site are to be provided to Fisheries NSW prior to construction.	Construction Manager	Pre-construction and during construction
No native vegetation, with the exception of groundcover, those trees as discussed above and trees which are deemed unstable or with an adverse lean over the car park, would be removed for the Proposal or for the establishment of compound/stockpile sites.	Construction manager	During construction
The loss of two Spotted Gums (*Corymbia maculata*) on the site would be compensated by planting four on site or within the vicinity of the site. Other tree losses are to be compensated by planting 24 locally native tree species.	Pittwater Council	Post construction
If practical and feasible, the adjacent strip of vegetation along the top of the escarpment directly behind (south) the Proposal be regenerated. This would be subject to retaining the stability of the site	Pittwater Council	Post construction

Mitigation measure	Responsibility	Timing
Site access, the construction footprint and retained vegetation would be clearly identified on construction drawings.	Construction Manager	Pre-construction
During general site induction the 'no-go areas' as identified on the construction drawings would be highlighted / shown to staff and their value and importance explained. This would include both terrestrial and marine 'no-go' areas and associated control plans.	Construction Manager	Pre-construction
Site access would be from the existing road. No vegetation would be cleared for site access.	Construction manager	During construction
Woodland vegetation would be identified as a 'no-go' zone including any hollow-bearing trees.	Construction manager	Pre-construction
Compound/stockpile areas would be established on previously disturbed areas and away from the waterway and riparian vegetation, above the 1:100 year flood level (where reasonable and feasible). Stockpiles and/or dewatering areas should be appropriately controlled by sediment fencing or other materials prescribed in the "Blue Book" to ensure sediments do not enter the waterway.	Construction manager	During construction
No plant, equipment or vehicles would be parked beneath the drip line of trees.	Construction manager/workers	During construction
If unexpected threatened flora or fauna are discovered, works would stop immediately and Pittwater Councils Environment Representative would be contacted.	Construction manager/workers	During construction
Notification to DPI (Fisheries) of reclamation/dredging works would be undertaken prior to construction. Consideration would be given to any response within 28 days of notification.	Pittwater Council	Pre-construction

Mitigation measure	Responsibility	Timing
Consultation under Section 199 of the FM Act, would be undertaken with Minister for Primary Industries (Department of Primary Industries) a minimum of 28 days prior to works commencing.	Pittwater Council	Pre-construction
If any construction involves waterway use i.e. barge, ensure anchors and any temporary attachments to the substrate are free of *Caulerpa* before exiting the area and followed in accordance with measures outlined in the DPI *Caulerpa* Control Plan (NSW Fisheries 2004).	Construction manager/workers	During construction
Works would be undertaken during periods when heavy rain is not forecast and where feasible.	Construction manager	During Construction
Disturbed soil would be graded to as close as reasonable and feasible to its original topography.	Pittwater Council/Construction manager	During and post construction
Prior to use at the site and/or entry into the waterway, machinery is to be appropriately cleaned, degreased and serviced.	Construction manager	Pre-construction and during construction
A layer of geotextile fabric is to be placed between the inner edge of the seawall and fill material used in the reclamation.	Construction manager	During Construction
The site shall not be dewatered, unless a Dewatering Management Plan is prepared and submitted as part of the Construction Environmental Management Plan required under Condition 7 of the Fisheries NSW permit. Any Dewatering Management Plan shall specifically consider any potential off-site impacts as a result of the dewatering operations and contain mitigation controls to effectively treat any discharge waters to prevent offsite pollution of any receiving waters. A copy of the dewatering plan is to be attached to the Fisheries NSW permit.	Pittwater Council / Construction manager	Pre-construction and during construction

Mitigation measure	Responsibility	Timing
A visual inspection of the waterway for dead or distressed fish (indicated by fish gasping at the water surface, fish crowding in pools or at the creek's banks) is to be undertaken daily during the works. Observations of dead or distressed fish are to be immediately reported to the Contact Officer by Pittwater Council. In such a case all works are to cease until the issue is rectified and approval is given to proceed. If requested, Pittwater Council is to commit resources to the satisfaction of the Contact Officer for an effective fish rescue, if in the view of that officer, a fish kill event is imminent and likely to occur within or adjacent to the works area due to conditions associated with weather, water quality and other parameters.	Pittwater Council / Construction manager	During construction

7.2 NOISE

7.2.1 EXISTING ENVIRONMENT

The site is located in a generally suburban area, surrounded by Pittwater and McCarrs Creek waterways and further to the west is Ku-ring-gai Chase National Park. The ambient noise environment in the study area is controlled by traffic noise from McCarrs Creek Road, activities from the nearby commuter wharf, water activities such as powered marine vessels and general nature. There are also noise sources from the commercial use of buildings within the area, including the Church Point café and post office.

Long-term noise monitoring was conducted to establish the background noise levels for the setting of car park and construction noise goals. Long-term noise monitoring was conducted on site from Monday 11 to Wednesday 20 August 2014. The noise monitor was installed adjacent to the residential access road on the escarpment, outside 3 McCarrs Creek Road, and the measured levels represent the existing acoustic environment of the nearest receivers.

A summary of the long-term noise monitoring results are presented in Table 7-2 below, in accordance with EPA monitoring guidelines.

Table 7-2: Long-term noise monitoring results

Monitoring location	LA90 Rating Background Level (RBL) dB(A)			LAeq Ambient noise levels dB(A)		
	Day	Evening	Night	Day	Evening	Night
M1	44	35	30	61	50	46

Notes: Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays

Evening: 18:00-22:00 Monday to Sunday & Public Holidays

Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

The closest noise sensitive receivers to the site are residential houses located directly behind (south) of the site. Commercial establishments (Church Point café, post office and wharfing facilities) are also located directly adjacent the site to the east, north and west. Potentially impacted receivers from both car park and construction noise were identified during background monitoring, and have been used as assessment points when conducting noise modelling. Figure 7-2 shows the location of noise sensitive receivers in relation to the site.

Figure 7-2: Location of noise sensitive receivers within the vicinity of the site

7.2.2 POTENTIAL IMPACTS

A noise and vibration assessment was undertaken by Renzo Tonin and Associates to:

- Assess noise impacts from car park operation;
- Comment on potential change in traffic noise from McCarrs Creek Road; and
- Assess potential noise and vibration impacts from construction works associated with the project.

The full report is attached at Appendix B.

Construction

Noise

Construction noise management levels are determined by the NSW 'Interim Construction Noise Guideline' (ICNG). Table 7-3 below (reproduced from Table 2 of the ICNG) sets out the noise management levels (NMLs) for residences and how they are to be applied.

Table 7-3: Noise management levels at residential receivers

Time of day	Management level L_{Aeq} (15 min)	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: ▪ times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences ▪ if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

It is expected that the project construction will occur during standard daytime hours only.

Predicted noise levels assume all listed equipment for individual tasks are operating concurrently. This approach is conservative and has been adopted to ensure the full extent of possible noise impacts are assessed (what might occur in the worst-case). Therefore, the noise generated during construction works will generally be below the predicted levels.

Plant and equipment used during construction will include cranes, dump trucks, excavators, chain saws, jack hammers and vibrating rollers. The noisiest equipment includes piling rigs, pneumatic jack hammers and road milling machines. Appendix B contains a full list of equipment and noise levels.

Construction phase noise levels at nearby residences are expected to exceed the NMLs for most activities, and for some activities, one residence is “highly noise affected” (3 McCarrs Creek Road). The commercial receiver near to the works at 1860 Pittwater Road are also expected to be impacted and “highly noise affected” during some activities where works are occurring at the north-eastern end of the site. However, the mitigation measures outlined in Section 7.2.3 would assist in reducing potential impacts to these receivers.

As construction noise is predicted to exceed the daytime NML at a number of receivers, in accordance with the ICNG, the proponent or contractor should:

- Apply all feasible and reasonable work practices to meet the noise affected level.
- Inform all potentially impacted residences of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Techniques and options for controlling construction noise and vibration, where considered reasonable and feasible, include:

- Time constraints – limit works to daylight hours;
- Schedule noisy activities for less sensitive times of the day;
- Low-noise plant and equipment;
- Limit activity duration;
- Use quieter and less vibration emitting construction methods where possible. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts;
- Educating staff on noise sensitive issues and the need to make as little noise as possible.

There is one residence, 3 McCarrs Creek Road, that is predicted to experience noise levels above 75dB(A) and be "highly noise affected". Where a property is highly noise affected, the ICNG recommends that respite periods be offered, taking into account:

- Times identified by the affected community when they are less sensitive to noise;
- If the community is prepared to accept a longer overall period of construction in exchange for restrictions on construction times.

Where actual construction activities differ from those assessed in this report, more detailed design of noise control measures may be required once specific items of plant and construction methods have been chosen and assessed on site. The mitigation measures listed below would be implemented as a minimum to manage noise during construction.

Vibration

The nearest residential building is approximately 25 metres from the proposed construction works. The equipment with the ability to generate the greatest vibration is a vibratory roller. Cosmetic damage with a vibratory roller is very unlikely at 25 metres. Human comfort vibration levels (felt vibration) can sometimes be exceeded at 25 metres if a large vibratory roller is used, however large rollers are usually reserved for large scale road projects, which this is not. Therefore it is not expected that felt vibration would be an issue.

The nearest commercial development is the Heritage listed General Store, which adjoins the eastern 'tie in' end of the site. Construction activity, in particular earthworks and pavement compaction, will be conducted in a manner to minimise vibration impact to the building and customers.

All other construction plant and equipment are not predicted to have any adverse reactions with respect to vibration.

Operation

Car park

For the purpose of noise predictions, it has been assumed that both the ground floor and first floor car park will be filled from empty to full capacity over a one hour period in either the daytime or evening assessment periods. That is 60 movements on the ground floor, plus 60 movements on the first floor of the car park, in a one hour period. This allows for a conservatively high level of use during peak periods when commuters are most likely to use the car park.

During the night time period between 10 pm and 7 am, it is not known how many vehicles might access the car park. If car park usage can be estimated by the busyness of McCarrs Creek Road at a corresponding time, then traffic counts conducted on McCarrs Creek Road in March 2014 indicate there would be very little usage of the car park during the middle of the night, possibly only a few vehicles per hour. The peak movements prior to 7 am would likely be on weekdays in the early morning shoulder period between 6 am and 7 am.

Weekday traffic movements on McCarrs Creek Road between 6 am and 7 am are roughly half of the peak hour movements. Therefore noise levels from the car park in this shoulder period would likely be lower than during the evening peak, yet the noise criteria is 2dB(A) higher than the evening criteria. Therefore the critical period of assessment is the evening period.

The full results of the noise model predictions for both the day and evening periods are presented in Appendix B. Based on the worst case scenario, there is potential for exceedances of the noise criteria in the evening period (18:00-22:00 Monday to Sunday & Public Holidays) at 4 residences; 3, 5 and 7 McCarrs Creek Road, and 6 Quarter Sessions Road. Daytime noise levels comply with the criteria. The predicted noise exceedances are due to vehicles on the first floor of the car park and not the ground floor. These exceedances are expected to be short-term in duration (less than five minutes) per event. Furthermore, mitigation measures outlined in Section 7.2.3 would reduce any potential impacts on these properties.

The current evening noise environment is often disturbed due to activities from the nearby commuter wharf and water activities such as powered marine vessels. These are also short-term random events which are not factored into the noise model due to the difficulty in predicting duration and frequency. Following construction of the car park, further noise monitoring is recommended to determine actual noise levels and detect any exceedances due to the car park. If exceedances are found, further management measures will be considered.

The potential for sleep disturbance due to maximum noise level events such as car door slams or engine starts was also assessed. It was concluded that sleep disturbance from car park activities is unlikely.

McCarrs Creek Road realignment

As the car park is being proposed to cater for existing traffic in the area, the development is unlikely to cause an increase in the total traffic using McCarrs Creek Road. However, the realignment of McCarrs Creek Road may alter the road traffic noise level at residences after the realignment works are complete.

This is due a number of factors:

- The road is shifting in alignment up to approximately 25 metres from the original location, further away from the residences,
- The road alignment is being shifted away from the existing rock cutting and into view of residences previously shielded by the cutting,
- The car park is providing some shielding of the road.

Cursory noise modelling of road traffic noise of the existing and proposed road alignments has been undertaken and the general outcomes are as follow;

- For residences nearest to the road realignment section (numbers 3 to 11 McCarrs Creek Road), noise levels are predicted to decrease slightly, with a reduction of up to 3dB. The reduction is mainly due to the road alignment moving further away from the residences, as well as, some dampening effect within the undercroft of the carpark deck.
- For residences further back from the road (residences on and near Quarter Sessions Road), noise levels are predicted to increase slightly, with an increase of up to 3dB. The increase is mainly due to the realigned road being more visible and less shielded from the existing rock cutting.

For this realignment, any property which is predicted to experience an increase in traffic noise of more than 2dB(A) is set back from the road and receives an absolute level of traffic noise that is below the noise criteria of 55dB(A). All other properties either receive a reduction in noise, or remain the same. Therefore traffic noise from the road realignment is compliant.

7.2.3 MITIGATION MEASURES

Feasible and reasonable mitigation measures would be implemented to minimise noise impacts during construction and operation and would include (Table 7-4):

Table 7-4: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
Consultation with any potentially affected land owners during construction would be undertaken	Pittwater Council	Pre-construction
Construction plant and vehicles would be switched off when idle	Construction manager/workers	During construction
Limit, where reasonable and feasible, plant and vehicle movement between access roads and site	Construction manager/workers	During construction
All construction plant on site would need to be maintained in accordance with manufacturer's requirements and, where applicable, fitted with suitable noise suppressing equipment to limit engine noise emissions	Construction manager	During construction
Any noise or vibration complaints would be addressed, investigated and responded to with a suitable approach. Measures would be reviewed in response to any noise or vibration complaints received and amended if necessary	Pittwater Council/Construction manager	During construction
Demolition methods that have the least vibration and noise levels would be selected where possible	Construction manager	During construction
Construction methods that have the least vibration and noise levels would be selected where possible. For example, when piling is required, bored piles rather than impact-driven piles would be selected	Construction manager	During construction
Scheduled construction staging to minimise multiple use of the noisiest equipment or plant items, and to limit noisy activities in conjunction with peak hour use of commercial facilities, where practical	Construction manager	During construction
Construction materials that have the least vibration and noise levels would be selected where possible. This may	Construction manager	During construction

Mitigation measure	Responsibility	Timing
include treatment to the car park concrete to prevent tyre 'screech'		
A carpark use protocol, signage and associated education program such as 'consider our neighbours' will be implemented to limit noise associated with car parking and conversations.	Construction manager and Pittwater Council	During construction and operation
Appropriate management methods to reduce operational vehicle noise in the car park. This could involve designating the potential licenced/leased spaces to the top or bottom level to reduce the amount of vehicle movements at different times of the day. Council would determine appropriate designation of spaces post-construction	Pittwater Council	During operation
Council would consider further noise monitoring post-construction to determine noise levels from the car park and other surrounding activities and whether further mitigation measures are required such as applying treatments to affected homes e.g. window glazing	Pittwater Council	During Operation
A dilapidation report would be prepared for the General Store pre and post construction to assess any vibration impacts	Pittwater Council	Pre-construction and operation

7.3 VISUAL AMENITY

7.3.1 EXISTING ENVIRONMENT

A Visual Assessment Report has been prepared by Corkery Consulting (2015) (Appendix F) and will form the basis of this section of the REF.

The Proposal is located at Church Point in the southern portion of Pittwater east of Ku-ring-gai National Park and south of Scotland Island. The high scenic quality of the area is created by the strongly undulating topography with forest-covered steep slopes extending to the waterfront and contrasting with the horizontal plane of the reflective water surface.

Views from the foreshore are dominated by the water surface with numerous boats either moored or moving on it. Residential buildings located on the slopes and ridges at Church Point, Scotland Island and Elvina Bay are partly visible through the extensive surrounding tree canopy cover. Views to the west from Church Point are dominated by the forest covered slopes and ridgeline in Ku-ring-gai National Park. The visual character of the foreshore at Church Point is defined by a combination of boat moorings, jetties, sea wall, commercial buildings, car parks and road side parking along McCarrs Creek Road.

Furthermore, the Bayview to Church Point scenic walkway, encompasses kilometres of foreshore and contains large sections with limited separation and no landscaping between the road edge and the path / seawall. This highlights the great appeal of this foreshore route, by being able to take in the spectacular views of the waterway, unobstructed by landscaping, not only as a pedestrian but also as a cyclist, public transport passenger or motorist. The site has a strong maritime character with views from the foreshore being focused on the adjoining water surface and floating pontoon, with moored boats in the foreground and views across open water beyond to the forest covered slopes and skylined ridges of Ku-ring-gai National Park in the distance.

7.3.2 METHODS

A detailed site analysis was undertaken to identify key view points from which the Proposal will be visible. The view locations, which are shown in Figure 7-3, include:

1. McCarrs Creek Road near Church Point shops at the northeast end of the site;
2. Church Point public jetty
3. Boats off shore from the site
4. The floating pontoon adjoining site
5. McCarrs Creek Road at southeast end of the site
6. Public foreshore reserve
7. Local access drive to residences above the site.

Views from these locations have been assessed to determine the extent to which the Proposal will be visible and therefore the visual impact on surrounding sensitive receivers

Figure 7-3: Key view points of the Proposal

The Visual Impact Assessment applied the RMS *Visual Assessment Guideline EIA-04*. The assessment process involved combining the sensitivity of the viewer with the magnitude of the visible change resulting from the proposed works to determine the predicted level of visual impact at each of the key viewpoints identified above in accordance with the following matrix (Figure 7-4).

SENSITIVITY \ MAGNITUDE	High	Moderate	Low	Negligible
High	High	Mod / High	Moderate	Negligible
Moderate	Mod / High	Moderate	Mod / Low	Negligible
Low	Moderate	Mod / Low	Low Impact	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Figure 7-4: Visual impact assessment matrix (Source: RMS Guidelines EIA-N04)

Sensitivity refers to the type of viewers and how sensitive they are to the changes that will result from the proposed development. Magnitude refers to the scale, form and character of the proposed development.

The various levels of visual impact that are identified through the combination of sensitivity and magnitude visual impact assessment matrix are defined as:

- High - The proposed works would be seen as a significant and immediately apparent feature in the landscape and will significantly affect and change its overall character in either a positive or negative way;
- Moderate - The proposed works would be readily noticed as a new element in the landscape and recognisable within the overall scene;
- Low - The proposed works would constitute only a minor change to the existing view and might be missed by the casual observer; awareness of the development would not have a marked effect on the overall quality of the view; and
- Negligible - Only a small part of the proposed works would be discernible or would be at such a distance that a change to the current view would scarcely be perceived.

7.3.3 POTENTIAL IMPACTS

Construction

The Proposal would result in a change to the visual environment during construction. The construction phase would include vehicle movements, relocation of utilities and storage of construction materials, all of which have the potential to impact negatively on the visual amenity of the locality. However, these impacts would only be temporary and relatively short term in nature. Mitigation measures would be implemented during construction to reduce the impact on visual amenity (see Table 7-5 below).

Operation

The Proposal would result in a permanent alteration to the existing visual environment, through the construction of the car park, seawall and road realignment. The at-grade car park with single deck over is consistent with existing surrounding development such as the buildings associated with the ferry wharf and the Pasadena complex. It is below the 8.5 metre building height limit for the area, stipulated in the *Pittwater DCP 21*. The at-grade carpark with single deck over is generally less high than a single storey building with a pitched roof. In this context, it is well below the height of the cliff face at the rear and below the height of adjoining developments at the General Store and Pasadena complexes. The structure is not enclosed apart from the intended façade treatment and as such the cliff face can still be seen through the carpark.

The Proposal is unlikely to significantly impact residents along the access road above the escarpment, just south of the site, as determined in the visual assessment below (Table 7-5). The existing patch of remnant vegetation would provide significant screening and views would be focussed on water and boat activity. Furthermore, as the Proposal is located on the southern side of McCarrs Creek Road along the existing escarpment, it is unlikely it would hinder or compromise water views of Pittwater and McCarrs Creek, and therefore, visual impacts to these residents is considered to be negligible.

The potential visual impact of the Proposal at each of the key viewpoints identified in Figure 7-3 has been assessed by applying the criteria defined above. The results of the assessment are presented in Table 7-5 below.

Table 7-5: Potential impacts of the Proposal on key viewpoints

Key Viewpoints	Sensitivity	Magnitude	Visual Impact	Comment
1. McCarrs Creek Road near Church Point shops, northeast of the site	Moderate	Moderate	Moderate	Car park structure will be seen at very close distance but for short period
2. Church Point public jetty and outdoor dining deck	Low	Moderate	Moderate/Low	Attention focused on boarding/alighting boats or enjoying water views rather than the site
3. Boats off shore from the site	Low	Low	Low	Attention focused on boating activities and view partly blocked by moored boats along foreshore
4. Floating pontoon adjoining the site	Low	Moderate	Moderate/Low	Car park structure will be seen at very close distance from pontoon and boats
5. McCarrs Creek Road at southeast end of the site	Moderate	Moderate	Moderate	Car park structure will be seen at very close distance but for short period by passing motorists, cyclists and pedestrians
6. Public foreshore reserve	Moderate	Low	Moderate/Low	View substantially blocked by marine works depot
7. Driveway and residences above the site	Moderate	Negligible	Negligible	View partly blocked by vegetation and focused on water and boat activity

In summary, visual impacts from the key viewpoints assessed ranged from low-to-moderate, however, the built form of the Proposal is considered to be generally compatible with the visual character of the foreshore area in which it is to be developed. The existing visual character reflects a combination of built and natural elements that include McCarrs Creek Road, commercial buildings at Church Point, car parking areas, jetties, the stone sea wall, moored and moving boats, private marina, marine works depot and a tree covered slope with residential buildings above.

Currently, residents may experience light reflection off cars parked along McCarrs Creek Rd, boats moored at the commuter wharf and off the water. The car park will relocate the cars, but the boats and water (and chance of light reflection off these sources) will remain. The most likely times for reflectivity off cars at the proposed car park would be from noon to early afternoon when the sun is high and moving west. The angle of reflection is at its greatest during this time, when it would be possible for light to reflect above the existing escarpment. The existing patch of remnant vegetation would provide significant screening for residents above the escarpment. The location of the car park along the existing escarpment would also provide shielding from light reflection off cars during late afternoon. There would be no issue in the morning as the sun would be from the wrong direction. Visual impacts to residents from light reflection off cars is considered to be negligible and intermittent, given they are likely to currently experience reflection at times from other sources.

The Proposal may have an intermittent and minor impact on the visual amenity from traffic travelling along McCarrs Creek Road, pedestrians using the walkway and from residents and visitors using the waterway and commuter wharf adjacent to the Proposal. However, these effects would be accommodated by the proposed design including suitable landscaping and façade clad with a suitable treatment such as recycled timbers, cascading plants and public art between the road and the car park. An example is shown in Figure 7-5 and Figure 7-6 below. Existing native vegetation would be retained where possible, in order to maintain the existing character of the area. Any potential visual impacts would be reduced over time as the landscape planting matures and the timber screen facade weathers to a natural grey colour.

The provision of a single storey car park will in part be more visible than an at-grade car park. The single deck however has more opportunity to provide a façade treatment to screen parked cars. It is considered that the visual amelioration measures will reduce the visual impact to an acceptable level and the single storey car park compared to an at grade carpark that only provides 50 per cent of the carpark yield, would provide significant social and economic advantages over the ground floor option.

There is no existing landscape separation between the road and walkway, providing for uninterrupted views across Pittwater. Landscape screening of the car park from the path/waterway would be achieved by specific plantings as already proposed in the PoM. The Proposal landscape features would incorporate a blend of the natural environment and community feel to retain the village-like atmosphere without taking away from the visual landscape (refer to Figure 7-5 and Figure 7-6 below). The Proposal would create a transit boulevard character with planted medians and would complement the surrounding residential development.

The PoM was very mindful of visual amenity associated with the scenic foreshore. This is why the car park has been placed on the inner side of the realigned road against the existing rock cutting. The alternative less cost option was to place the car park on the foreshore side of the road however, this would cause significant visual impact with far less opportunity to mitigate that impact.

The proposed mitigation measures in Table 7-6 below are to be integrated into the detailed design and documentation of the structural and landscape components of the Proposal, where reasonable and feasible, and would facilitate a reduction in visual impacts from the Proposal.

Figure 7-5: Existing photograph and visual representation of the Proposal, looking south from viewpoint 3 on Pittwater

Figure 7-6: Existing photographs and visual representation of the Proposal

7.3.4 MITIGATION MEASURES

The Proposal would incorporate, where reasonable and feasible, the following mitigation measures to reduce the visual impact to any sensitive receivers (Table 7-6):

Table 7-6: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
Utilise native plants, as appropriate, from around the local area for landscaping	Pittwater Council/Construction manager	During Construction
Detailed design would ensure the front edge of the parking deck is not visible from off shore	Design consultant	Pre-construction
Vertical concrete surfaces should be treated to visually integrate them with the surrounding environment	Construction manager	During Construction
A detailed analysis would be carried out with cross sections to determine visibility of parking deck and mitigation options (planting and/or structural screen)	Design consultant	Pre-construction
Façade treatment would be compatible with the surrounding environment proposed to incorporate suggested recycled materials, maritime theme and public art elements	Design consultant	Pre-construction
The proposed vertical timber slats will visually screen parked cars at ground level and on the deck	Construction manager	During Construction
Screening vegetation and other planting selected in accordance with the urban design objectives and principles identified for the Proposal. This would include strategic placement of vegetation	Pittwater Council/Construction manager	During Construction
The perimeter construction fencing will incorporate shade cloth to help visually screen construction activities	Construction manager	During Construction
The site would be kept tidy and amenities would be confined to the site and located where they	Construction manager/workers	During Construction

Mitigation measure	Responsibility	Timing
are least visible to nearby sensitive receivers		
Removal of construction equipment, plant and materials from the site as timely as possible once construction is completed	Construction manager	During construction
Preparation of a suitable management plan that addresses construction phase vegetation and post construction rehabilitation and restoration	Pittwater Council	Pre-construction
Sympathetic car park and seawall design utilising appropriate colouring and materials	Pittwater Council/Construction manager	Pre-construction

7.4 SOCIAL ENVIRONMENT

7.4.1 EXISTING ENVIRONMENT

Various reserves and parks near the Proposal play an important role in the integrity of the Church Point community by providing a public space around which social and commercial activities take place. The reserves provide a public arena for a range of community gatherings, commemorative and local fundraising events and regular social gatherings. The area also offers a community space where locals and visitors alike can associate. The social values embedded within the area offer a unique cultural identity.

The commercial interests at Church Point are also an integral contributor to the character of the area, providing essential facilities, provisions, resources and services to local residents (onshore and offshore) and visitors. Facilities include the Church Point Post Office, General Store and Café. The Church Point Ferry Service and Scotland Island Co-Operative also operate out of buildings associated with the heritage wharf.

A major existing social issue identified is the chronic shortage of car parking at Church Point. This under supply is creating generally untenable situations on a persistent ongoing basis. The lack of car parking directly impacts on the ability of offshore Pittwater residents to reasonably access their homes and adds to the safety concerns, particularly for female off shore residents who work later at night struggling to find a park.

7.4.2 POTENTIAL IMPACTS

The Proposal would provide significant parking relief along McCarrs Creek Road and adjoining local streets. The interconnect ability associated with the new car park would offer greater social connectivity and would increase the area's social integrity and operability and therefore is expected to provide a positive impact.

The proposed car park would increase commuter safety as road dangers are decreased due to more efficient traffic flow, reduced congestion and direct access from the pedestrian walkway, adjacent to the commuter wharf, to the car park. Furthermore, a well-lit public space, in the immediate vicinity to the commuter wharf will ensure late night users are safe, due to reduced movement between current parking spaces and the commuter wharf.

The overall functionality of the Proposal would provide an integral facility to connect the Scotland Island and Western Foreshore residents and visitors alike, providing an increased sense of community connectedness and integrity.

Furthermore, the Proposal is unlikely to have long-term negative socio-economic impacts on the community due to the distance the Proposal is away from the surrounding reserves and commercial facilities. Notwithstanding, the Proposal may result in short-term positive impacts due to the generation of construction jobs and increased business from construction workers at the surrounding commercial facilities. Long-term positive impacts include improved safety and amenity in particular for the offshore and mainland communities and their daily commute as well as visitors to the area. Safer and more convenient car parking opportunities is also important for offshore residents late at night.

7.4.3 MITIGATION MEASURES

No mitigation measures are proposed for the social environment due to both short and long term beneficial impacts resulting from the Proposal.

7.5 TRAFFIC AND TRANSPORT

7.5.1 EXISTING ENVIRONMENT

McCarrs Creek Road along with the section of Pittwater Road west of Mona Vale were previously State Roads that were reclassified to Regional roads and transferred to Pittwater Council. These provide a connection to Ku-ring-gai Chase National Park and residents to the west of the site with the Church Point community. There are limited existing pedestrian and cyclist facilities, most of which are patchy and disconnected. However, McCarrs Creek Road is regularly used by recreational cyclists travelling to and from Ku-ring-gai National Park in the west and towards Mona Vale in the east. Church Point Reserve (approximately 150 metres to the east of the site) is currently the only practical location to meet the parking needs of visitors to Church Point and the majority off-shore residents. Church Point Reserve currently provides the majority of the parking for the locality with further parking along the road edges in the vicinity.

The current chronic lack of car parking results in what is locally known as 'the Church Point Drive around', where motorists circulate the main car park and surrounding street trying to find an available car space. This adds to traffic movements at the locality. In addition, the local streets are generally narrow and pressure for on road parking can cause congestion and problems for emergency and service vehicle access as well as compete for visitor parking.

The provision of additional car parking at a convenient centralised location will reduce the 'drive around' and hence reduce traffic movements as well as help reduce parking pressure on local streets.

Public bus transport is limited at McCarrs Creek Road, with a State Transit Authority (STA) bus service operating daily and a ferry service operating from Church Point Ferry wharf to service offshore residents and visitors. However, the ferry service does not coordinate with bus times and can therefore extend journey times significantly. Alternate options include use of private taxi cabs or walking to Mona Vale (approximately four kilometres to the southeast of the site) and connection with STA services. The existing public transport system is not sufficient to encourage reduced dependency on private car use.

Water based transport services include the Church Point Ferry Service and water taxis. Due to the need for flexibility and cost implications, a large portion of off-shore residents own a boat and utilise a mooring space on the mainland, particularly around Church Point where moorings are concentrated adjacent to the Proposal at the commuter wharf.

An at-grade pedestrian walkway exists along McCarrs Creek Road at the site, between the roadway and Pittwater, above the dilapidated seawall. It is separated from vehicles by a number of timber bollards spaced at varying intervals between the General store and the Cargo wharf.

7.5.2 POTENTIAL IMPACTS

Construction

The Proposal may result in short term congestion during construction, potentially due to road closures and delivery of construction materials, equipment and machinery. However, the Proposal involves construction which is clear of the existing road allowing more of the works to be carried out whilst the existing road is still in use and therefore a traffic increase would likely be of only minor effect during construction. The seawall and road realignment would be constructed offline as the first stage of construction; traffic would then be switched to the realigned road, allowing construction of the car park. In summary, construction of the Proposal would allow traffic to flow throughout the entire construction process.

During construction, minor disruption to traffic and accessibility would be experienced. Delays in travel time may be experienced due to localised reduction in speed limits and use of detours where required. Additionally, a minor temporary increase in traffic may occur from construction and worker vehicles.

Movement of construction personnel, including contractors, site labour force and specialist supervisory personnel, particularly during work start and finish times, could pose a safety risk along McCarrs Creek Road. However, a Construction Transport Management Plan (CTMP) would provide appropriate mitigation measures to reduce any safety risks. Furthermore, the safety and access of the general public including pedestrians, workmen and cyclists, would be appropriately managed following the CTMP.

Operation

The Proposal incorporates a conventional carpark layout with efficient 90 degree parking on either side of a central access aisle – this also allows through movement and as such reduces potential congestion at entry / exit.

The provision of the foreshore shared boardwalk will improve safety and amenity for pedestrians and recreational cyclists. The road realignment will incorporate 3.7 metre wide lanes which can accommodate shared use with cyclists. The car park precinct will be traffic calmed to be consistent with the higher pedestrian activity and to reinforce the central pedestrian threshold, as well as, car park entrances / exits.

7.5.3 MITIGATION MEASURES

The following mitigation measures could be implemented to reduce the potential impacts on traffic and transport at the site (Table 7-7):

Table 7-7: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
It is recommended that a detailed CTMP, or equivalent, is developed as part of the detailed design stage	Pittwater Council	Pre-construction
The CTMP, or equivalent, should provide details on traffic access routes to, from, and within the construction site. Appropriate traffic measures to avoid conflict between construction vehicles and private vehicles should also be considered	Pittwater Council	Pre-construction

Mitigation measure	Responsibility	Timing
General signposting in the immediate vicinity of construction activities with appropriate heavy vehicle and construction warning signs and speed controls	Construction manager	During construction
Development of suitable vehicle detour routes (if required) during specific construction activities	Pittwater Council	Pre-construction and during construction
Installation of specific warning signs at entrances to the construction site to warn existing road users of entering and exiting construction traffic	Construction manager	During construction
Installation of appropriate traffic control and warning signs for areas identified to have potential safety risks	Construction manager	During construction
Management of the transportation of construction materials to maximise operational efficiencies and minimise heavy vehicle movements	Construction manager	During construction
Traffic control may need to be provided to manage and regulate traffic movements during construction	Construction manager	During construction
Construction and delivery vehicles entering or leaving the site compound and/or stockpile sites would be restricted to non-peak traffic periods	Construction manager	During construction
Disruption to all road users during the construction period would be kept to a minimum	Construction manager	During construction
Nearby residents would have their property access maintained during construction	Pittwater Council and construction manager	During construction
Pedestrian through fare access would be maintained throughout construction (including to the commuter wharf). This may include temporary structures / walkways around construction works	Construction manager	During construction

7.6 HYDROLOGY AND WATER QUALITY

7.6.1 EXISTING ENVIRONMENT

Pittwater is a drowned river valley with a surface area of approximately 17.5 square kilometres. The site is located at Church Point on the south western side of Pittwater, at the entrance to McCarrs Creek. McCarrs Creek has a total catchment area of 569 hectares and is the largest within the Pittwater Local Government Area.

The existing road reclamation is supported by a mixture of rock seawalls and rock rubble revetments in various states of repair. Much of the original rock revetment rubble have migrated down-slope and now forms an elongated intertidal mix of rock rubble and mud/sand substratum at the site.

7.6.2 POTENTIAL IMPACTS

Foreshore areas within the Pittwater estuary are subject to periodic inundation by coastal and estuarine processes (tides, high rainfall events, wave and barometric set-up). Pittwater Council's approach to managing this risk is set out in the *Estuarine Risk Management Policy for Development in Pittwater* (within the Pittwater Development Control Plan (DCP) 2009).

Estuarine Planning Levels (EPLs) are applied as a method for managing inundation risk along the foreshore of Pittwater by applying minimum floor levels to future developments. EPLs are calculated to reflect the likely extreme water levels along the Pittwater foreshore that may occur during an intense storm, on average, once in a lifetime or longer. These estimates are based on the current understanding of coastal processes and water levels within Pittwater, which are influenced by local variations as a result of both wind strength and direction and waves.

EPLs have also been developed for future dates, including predicted sea level rise. They also take into account the current foreshore treatments within Pittwater, such as sea walls. At the proposed car park and sea wall area, the EPL under the current mapping (2015) (based on an existing sea wall height of approximately 1.5 metres) is 2.68 metres AHD for the 2050 planning horizon (with a projected sea level rise of 0.4 metres) and an EPL of 3.18 metres AHD for the 2100 planning horizon (with a projected sea level rise of 0.9 metres). Under current conditions, this section of McCarrs Creek Road and existing car spaces alongside the road would be subject to inundation up to 0.8 metres in depth during an extreme storm event as the existing road level is approximately RL 1.7 metres where the EPL is RL 2.5 metres.

The proposed design life of the car park is 50 years. To be in accordance with the EPL the minimum floor level required would be RL 2.68 metres. However, the Clause 21 B3.9 of the *Pittwater Council DCP* states:

'Open carpark areas (including covered carpark areas) and carports: Are permissible at the existing ground level. Vehicle barriers or restraints are to be provided to prevent floating vehicles leaving the site where finished surface levels are more than 300 mm below the Estuarine Planning Level.'

This allows the car park to be built at the existing ground level provided the provisions are incorporated into the design.

It is proposed to raise the level of the road and proposed car park from the existing RL of 1.7 metres to the 2050 EPL of 2.68 metres. This design level has been selected to align with the 50 year design life of the structure. The car park is expected to meet the 2050 EPL of RL 2.68 metres across most of the site, with only the eastern tie-in with McCarrs Creek Road below this level at approximately RL 2.2 metres at the lowest point. This means the entrance to the car park may be inundated during an extreme storm event, however the alternate access at the western end of the proposed car park is proposed to be at or above the 2050 EPL, which would provide safe access/egress under 2050 conditions if inundation of the eastern access were to occur.

Detailed design of the car park and sea wall will incorporate vehicle barriers or similar to protect from inundation beyond 2050. Design will also give consideration to the predicted sea level rise of 0.9 metres by 2100 as a precautionary measure to allow for further adaptation as required.

Reclamation of land may cause a short-term negative impact on localised water around the site due to deposition of sediment/ballast, which would increase turbidity. Furthermore, excavation of soil, vehicle movements and stockpiling have the potential to cause erosion, sedimentation and degradation of water quality of surrounding land, urban areas and drainage lines.

Spills and leaks during construction such as oil and greases or spills of fuels/chemicals stored on site could also impact on water quality if there is flow at the site or rain during the construction period. This could affect the health of biota in nearby waterways and native vegetation and cause contamination. The potential impacts to water quality would be minimised with implementation of the mitigation measures identified below.

Works within the Pittwater waterway (seawall construction) also have the potential to disturb Acid Sulphate Soils (discussed in Section 7.7). Impacts to hydrology and water quality would be appropriately managed through the mitigation measures identified below.

7.6.3 MITIGATION MEASURES

The following mitigation measures would be implemented to minimise impacts to water quality and hydrology (Table 7-8):

Table 7-8: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
Detailed design of the car park and sea wall will incorporate vehicle barriers and give consideration to the predicted sea level rise of 0.90m by 2100	Design Manager	Detailed design
When reclamation of land is being undertaken for the road realignment and sea wall, placement of ballast would be controlled in a fashion that limits the turbidity of surrounding water	Construction manager	During construction
Reclamation of land would be undertaken in an organised and efficient method to reduce the amount of disturbance on the surrounding waterway	Construction manager	During construction

Mitigation measure	Responsibility	Timing
Any spoil sites would be kept as far as feasible from any waterbody	Construction manager	During construction
Works would be undertaken in dry conditions, where feasible and reasonable	Construction manager	During construction
An erosion and sediment control plan would be prepared to mitigate erosion and sedimentation during construction. Control measures in the plan may include floating booms, silt fences and sheet piling	Pittwater Council	Pre-construction

7.7 GEOLOGY AND SOILS

7.7.1 EXISTING ENVIRONMENT

To identify areas of potential soil or land contamination risks within the site, a desktop review was undertaken including:

- Topographical and soil type information (OEH, 2014 and NSW EPA, 2014); and
- Acid sulphate mapping (Pittwater Council LGA, 2014 and OEH, 2014).

The site includes a mix of artificially landscaped terrain and naturally existing soils. A search of the NSW Environment and Heritage soil database identified Watagan soils at the site. The topography of the area is mapped as containing rolling to very steep hills on fine-grained Narrabeen Group sediments. Local relief of the area ranges between 50 - 220 metres and slopes are generally greater than 25 per cent. The area also contains narrow convex crests and ridges, steep colluvial sideslopes, and occasional sandstone boulders and benches. Watagan soils at the site comprised of Tenosols (Lithosols), Rudosols (Siliceous Sands, Kandosols and Kurosols (Yellow Earths, (Yellow and Red Podzolic Soils) and Stratic Rudosols (Alluvial Soils). The soils are very complex due to the range of soil parent materials present and also by the transportational processes operating on the steeper slopes found within the area.

A geotechnical site investigation was carried out by Crozier Taylor Geotechnical in February 2013. This geotechnical investigation identified sandy sediments overlying deeply weathered bedrock, which contains a submarine cliff line close to the alignment of the proposed new sea wall and approximately 10 - 13 metres west of the existing seawall. The bedrock below the site consists of generally highly weathered, low strength, sandstone and interbedded shale units. The bedrock is generally interpreted to be overlain by up to four metres of sandy sediments and a layer of soft mud has also been identified within the vicinity of the proposed seawall alignment. Furthermore, the bedrock surface is likely to contain an iron rich capping of medium-to-high strength.

A supplementary geotechnical investigation was carried out by Crozier Taylor Geotechnical in September 2015 to provide details regarding the existing excavation and slope stability at the site. The inspection identified numerous joint and fracture defects within the existing excavation at the site. There are some joint defects which result in cracks and an uneven excavation wall face. These joint defects have created potential larger scale (up to 5m³) blocks of rock within the excavation wall face.

A search of the NSW EPA contaminated land records was undertaken on 30 May 2014. No contaminated sites were located within two kilometres of the site.

An Acid Sulphate Soil (ASS) desktop search via the ASRIS was conducted in May 2014 (OEH, 2014). The site is located on previously disturbed land, which can be broken into three sections. The eastern section of the site currently has no available ASS data, however, the western section of the site is mapped as extremely low probability of ASS occurring, while directly offshore is indicated as having a low probability of ASS occurring. Pittwater LEP 2014 acid sulphate soils maps show class 2 ASS along the foreshore and class 1 ASS within the reclamation area in the Proposal area.

7.7.2 POTENTIAL IMPACTS

Construction

Earthworks required for the construction of the Proposal would disturb soils over a relatively minor area. As the site is relatively flat, the risk of erosion is likely to be minor and limited generally to temporary or permanent spoil stockpiles (if contained onsite). However, erosion risk may still be high during wet weather and therefore could pose a risk of entering Pittwater.

Disturbance of potential acid sulfate soils (PASS) is likely to occur due to reclamation of land over Pittwater and McCarrs Creek. Pittwater Council mapping identified Class 1 and 2 acid sulfate soils, however the OEH data indicates a low probability of disturbance. As per clause 7.1(4) of the Pittwater LEP, 2014, further investigation to confirm presence of PASS will be undertaken during the detailed design phase, prior to any ground disturbance, to determine actual presence and extent of any ASS. The assessment would also determine if an acid sulfate soils management plan is required for the works, in accordance with the Acid Sulfate Soils Manual. The mitigation measures outlined below would be implemented to minimise disturbance of ASS and ensure any ASS is contained and does not enter the waterway.

Potential unstable rock wedges and detached rock fragments have also been identified along the excavation along the existing road. These have created potential small scale (<1.0 m^3) and some larger (up to 5 m^3) rock slide and topple hazards. These hazards may pose potential risks to workers during construction.

The construction of the new seawall will provide foreshore protection and hence eliminate the current foreshore erosion and sedimentation associated with the existing failed seawall and foreshore erosion.

Operation

During operation of the Proposal the risk of soil erosion would be minimal as all areas impacted during construction would be asphalt or rehabilitated and landscaped to prevent soil erosion from occurring. The sealed road surface would reduce water infiltration and increase the amount and velocity of stormwater run-off. This run-off would be channelled into a formal road drainage system that includes kerb and guttering and a buried pipe network.

The potential unstable rock wedges and detached rock fragments that have been identified on the existing excavation of McCarrs Creek Road may also pose potential risks to vehicles and pedestrians once the car park is operational unless unstable rocks are treated prior to Proposal operation.

7.7.3 MITIGATION MEASURES

The following mitigation measures would be implemented to minimise impacts to geology and soils (Table 7-9):

Table 7-9: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
The CEMP, or equivalent, would address erosion, sediment control and water quality. This would include erosion and sedimentation controls which would be prepared in accordance with Soils and Construction: *Managing Urban Stormwater 2004- 'the Blue Book'* guidelines	Pittwater Council	Pre-construction
Controls (such as wind breaks and earth dikes) would be implemented to ensure contaminants such as sediment, litter, particulates and oils are not transported off site during construction	Construction manager	During construction
Fuels and chemicals would be stored onsite within adequately bunded areas, or potentially offsite	Construction manager	During construction
The CEMP, or equivalent, would include site specific details to respond to and address any on-site spills	Pittwater Council	Pre-construction
Spill kits would be strategically placed at the construction site	Construction manager	During construction
Disturbed areas would be stabilised as soon as feasible and reasonable following construction	Construction manager	Post-construction
Detailed offshore geotechnical investigations, in order to further assess the risks and impacts associated with the location of the proposed new seawall.	Pittwater Council	Pre-construction
Booms, or similar, would be used during construction to minimise disturbed soils, including PASS, from entering the waterway from the construction area.	Construction manager	During construction
Detailed design to provide details of rock wall stabilisation or treatment. This may be in the form of initial slope grooming (smoothing) and subsequent grooming once operational and when required or more permanent measures	Arcadis (formerly Hyder Consulting)	Pre-construction

Mitigation measure	Responsibility	Timing
such as rock bolting and engineered shotcrete retaining walls.		
During detailed design, and prior to any ground disturbance, undertake a preliminary acid sulfate soils investigation.	Pittwater Council	Pre-construction
If required, prepare an acid sulfate soils management plan, in accordance with the Acid Sulfate Soils Manual.	Pittwater Council	Pre-construction

7.8 NON-INDIGENOUS HERITAGE

7.8.1 EXISTING ENVIRONMENT

Church Point provided a good location for loading and unloading ships, which were the main means of communication during the nineteenth century. The original wharf at Church Point was built in 1885 (has been rebuilt many times since) and is still an important wharf for communication with the offshore communities around Pittwater. The wharf also retained its post office and general store, which are associated with the historical use of the area.

A desktop study involving the NSW OEH state heritage register was undertaken in May 2014. The search identified numerous non-indigenous heritage items located near the site, with reference to the wharf, post office and store (refer to Table 7-10 below).

Table 7-10: Summary of Heritage items located near the site

Location	Description	Database No.	Distance and direction from site
McCarrs Creek Road Lot 318 DP 824048	Church Point Post Office and Store	2270010	Less than 50 metres to the east
McCarrs Creek Road Lot 319 DP 824048	Church Point Wharf	2270336	50 metres to the east
McCarrs Creek Road No 1 Lot C DP 349212 Former Methodist Church site	Graveyard and site of former Methodist Church	2270125	30 metres to the east
McCarrs Creek Road No 19 Lot 9 DP 609346	House “Homesdale”	2270070	600 metres to the southwest
McCarrs Creek Road No 27 Lot 7 DP 573492	House “Rostrevor”	2270005	200 metres to the west
McCarrs Creek Road No 2A Lot 7055 DP 93800 Rostrevor Reserve	Memorial Obelisk	2270007	450 metres to the southwest

7.8.2 POTENTIAL IMPACTS

As a result of the nature of the works proposed, it is unlikely that the Proposal would result in impacts to any non-indigenous heritage items, including any of the above mentioned items.

7.8.3 MITIGATION MEASURES

Although no heritage items are located on the site, and the site is considered disturbed, it is recommended that the following be implemented during construction (Table 7-11):

Table 7-11: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
Should unexpected relics be exposed, which are identified as having non-indigenous heritage significance, work would be required to cease and the NSW Heritage Office (OEH) would be informed, to determine the appropriate management strategy. The duration of this would depend on the integrity and significance of the relic	Construction manager/workers	During construction
Should items need to be disturbed (exposed, moved, damaged or destroyed), these works would not be undertaken until an excavation permit is received under Section 139 of the Heritage Act 1977	Construction manager	During construction
On-site heritage location map, to aid workers of heritage items near the site (identifying the cemetery, wharf, post office and store)	Construction manager	During construction

7.9 INDIGENOUS HERITAGE

7.9.1 EXISTING ENVIRONMENT

Throughout Pittwater, particularly within Ku-ring-gai Chase National Park, there are Aboriginal sites, including middens, axe - grinding grooves, cave art sites and rock engravings. Several Aboriginal Middens have been identified within or near the Church Point study area.

An Aboriginal Heritage officer completed a site inspection on 21 January 2014, to assess any recorded or potential indigenous heritage sites located at the site. The site assessment identified one shell midden site in the immediate vicinity of the Proposal, located at the northern end of the historic cemetary, to the west of the pedestrian footpath which descends to the junction of McCarrs Creek Road, an access road for residential properties and Pittwater Road. However, this site is located outside of the Proposal area. There were no other recorded or identified indigenous heritage at, or near, the site.

7.9.2 POTENTIAL IMPACTS

The site assessment concluded that the Proposal would not impact the slope above the existing road cutting and therefore would not impact the existing shell midden. If the proposed works, including the location of construction compound and access track(s), are contained within the area of previous disturbance, it is unlikely that there would be impacts to any indigenous heritage sites.

Notwithstanding this, areas outside the disturbance footprint of the site are within a sensitive landform (within 200 metres of a watercourse).Therefore, should these areas be disturbed during the proposed works, mitigation measures, identified below; including a site survey would need to be undertaken.

7.9.3 MITIGATION MEASURES

The following mitigation measures would be implemented to minimise impacts to indigenous heritage (Table 7-12):

Table 7-12: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
The proposed works including compound sites and access tracks would be contained within the area of previous disturbance	Construction manager	During construction
If works are to be undertaken outside any area of existing disturbance then a Pittwater Environmental Representative would be consulted as to whether further approvals are required prior to the works proceeding	Construction manager/Pittwater Council	During construction
If unforeseen Aboriginal objects are uncovered during development, work must cease immediately and an archaeologist, the OEH, and the Local Aboriginal Land Council should be	Construction manager	During construction

Mitigation measure	Responsibility	Timing
informed. If human remains are found, work should cease, the site should be secured and the NSW Police and the OEH should be notified. It is an offence under the NPW Act (Section 86) to disturb or destroy an Aboriginal object.		

7.10 AIR QUALITY

7.10.1 EXISTING ENVIRONMENT

Airborne dust levels within the area would be representative of a suburban environment. Exhaust fumes from boats and vehicles on the local roads and Pittwater have a minor negative influence on air quality within the immediate vicinity of the site. Other minor or seasonal air pollution sources may include back burning and bush fires in Ku-Ring-Gai Chase, Garrigal, Bouddi and Brisbane Water National Parks.

A search of the National Pollution Inventory (NPI) data was undertaken to identify sources of air pollution in the Church Point area. Air emission sources identified Warriewood sewage treatment plant as the closest NPI source, which is located approximately 5.4 kilometres southeast of the site. A search of the Environmental Protection Agency (EPA) data was also undertaken to identify local air quality sources. Air emission sources identified residential wood heating, marine aerosols, windblown dust and recreational boating as the major contributors. The impacts of these commercial and industrial operations on the existing air quality at the site is likely to be negligible.

Locally it is noted that the chronic lack of car parking results in motorists circulating the car parks and local streets trying to find a car space, which adds to vehicle movements and associated emissions and a reduced air quality.

7.10.2 POTENTIAL IMPACTS

During construction, the main potential impacts on air quality will be dust generated during earthworks, exhaust emissions from diesel powered equipment and vehicles transporting materials to and from the site. However, the degree of the impact will depend on the level of activity being undertaken at any given time and the current weather conditions at that time.

Long term impacts to air quality are not anticipated as the works would not result in an increase in vehicle capacity along McCarrs Creek Road.

Following completion of the car park component of the project with its additional 120 car spaces in a convenient central location a positive benefit is a reduction in the need to ‘drive around’ the locality trying to find an elusive car space. This in turn will reduce vehicle movements and reduce vehicle emission leading to improved air quality.

7.10.3 MITIGATION MEASURES

Mitigation and management measures to minimise dust and engine exhaust emissions during the construction of the Proposal would include (Table 7-13):

Table 7-13: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
Water carts would be used periodically during construction to supress dust generated by use of the access road, parking and turnaround areas	Construction manager	During construction
Work would cease during periods of extreme wind speed or in the event that significant dust emissions are observed	Construction manager	During construction
Vehicles transporting bulk materials to and from the site such as soils and ballast would be covered to prevent loss of load and dust generation	Construction manager/workers	During construction
Construction vehicle speeds would be limited to reduce dust generation from unsealed road surfaces	Construction manager/workers	During construction
Engine maintenance of plant and equipment would occur on a regular basis, to prevent the emission of black smoke and any other unnecessary emissions	Construction manager	During construction
Any long-term (greater than 1-2 months) soil stockpiles would be vegetated or covered, inclusive of any wet weather	Construction manager	During construction
The perimeter construction fencing will incorporate shade cloth to help suppress dust generated within the site area and act as a wind break	Construction manager	During Construction

7.11 WASTE MANAGEMENT AND MINIMISATION

7.11.1 POLICY SETTING

In New South Wales (NSW), waste storage, handling, transport, recovery and disposal is regulated by the *Protection of the Environment Operations Act 1997* and the *Protection of the Environment Operations (Waste) Regulation 2005*. This Act and Regulation are administered by the NSW Environment Protection Authority (EPA) to prevent degradation of the environment, eliminate harmful wastes, reduce the amount of waste generated and establish priorities for waste re-use, recovery and recycling.

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) requires the consideration of resource management options against the following waste management hierarchy principles:

- Avoidance, including actions to reduce the amount of waste generated;
- Recovery, including reuse, recycling, reprocessing and energy recovery; and
- Disposal, in a way that is environmentally responsible.

7.11.2 EXISTING ENVIRONMENT

The site is located on a roadway and adjacent to Pittwater estuary, therefore existing waste at the site is considered as minor, with only the occasional piece of litter from passing motorists and pedestrians and the commercial facilities nearby.

7.11.3 POTENTIAL IMPACTS

Construction

The Proposal would generate and require earthwork, concrete, steel, asphalt, fill materials and landscaping supplies. During construction, the Proposal may generate the following waste:

- General solid waste (non-putrescible), including scrap metal from reconstruction and/or replacement of existing road infrastructure; construction waste from excess materials such as asphalt and concrete; and redundant pavement material;
- General waste (putrescible) including paper waste, food waste and general rubbish generated by the construction workforce;
- Liquid waste including stormwater runoff from construction areas; sewage; and small volumes of excess fuel, oils and other chemicals from vehicle maintenance; and
- Excess spoil from earthworks, where excavated material is not suitable for reuse within the Proposal.

Any waste generated from the works could enter Pittwater and in turn, affect flora and fauna surrounding the site. Waste could also decrease the visual amenity of the site from construction to post construction if not properly managed. However, mitigation measures outlined below in Table 7-14, would reduce any impact of waste at the site.

Operation

Minor quantities of waste would be generated during the operation of the Proposal. These may include oil spills and leaks from vehicles parked at the car park and car park users disposing of general rubbish inappropriately. However, these impacts would be easily managed through the mitigation measures outlined below.

7.11.4 MITIGATION MEASURES

The following mitigation measures would be implemented to manage and minimise waste during the construction of the Proposal (Table 7-14):

Table 7-14: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
Appropriate on site waste management measures during construction would be detailed within the CEMP, or equivalent. This would include the mobilisation of waste off site to minimise the potential for negative environmental impacts on drainage systems, downstream watercourses and neighbouring land	Pittwater Council	Pre-construction
The CEMP, or equivalent, would include specific measures for classifying waste as well as its storage, transportation and disposal, in accordance with legislative requirements	Pittwater Council	Pre-construction
A concrete washout could be established in accordance with Best Practice Guidelines (Department of Environment and Conservation's Environmental Best Practice Management Guideline for Concreting Contractors). Concrete washout should be located away from drainage lines and be contained using appropriate sediment control measures to prevent any runoff	Construction manager	During construction
Waste would be removed by a licensed contractor	Construction manager	During construction
Any excavated soil and existing pavement materials would be reused on site as fill, where feasible and reasonable	Construction manager	During construction
Waste would not be burnt or buried on site	Construction manager	During construction
Waste material is not to be left on site once the works have been completed	Construction manager	During construction
All waste exiting the site would be recorded on a waste register in accordance with the site specific CEMP, or equivalent	Construction manager	During construction

Mitigation measure	Responsibility	Timing
Waste containers would be made available on site to store domestic recyclable waste, general waste and oil contaminated waste prior to removal from site. Pick up and appropriate disposal would be arranged as and when required with appropriate waste management companies.	Construction manager	During construction
General rubbish bins implemented at the site and located appropriately, and accordingly managed (council rubbish service to collect and maintain on a regular basis)	Pittwater Council	Post-Construction
All soil to be transferred off site would be tested and deposited at a suitable collection facility based on its determined category	Construction manager	During construction
All wastes would be managed in accordance with the *Protection of the Environment Operations Act 1997*.	Construction manager	During construction

7.12 CLIMATE CHANGE

7.12.1 EXISTING ENVIRONMENT

Changes to climate conditions are predicted to have adverse impacts on sea levels and rainfall intensities. Sea level rise planning benchmarks for assessing potential flood risk impacts due to sea level rise in coastal areas, are listed in three documents:

- NSW Sea Level Rise Policy Document (DECCW, 2009);
- NSW Coastal Planning Guideline: Adapting to Sea Level Rise (August 2010, prepared by the NSW Department of Planning); and
- Flood Risk Management Guide - Incorporating sea level rise benchmarks in flood risk assessments (August 2010, prepared by the Department of Environment, Climate Change and Water NSW).

The sea level rise benchmarks are a projected rise in sea level, relative to the 1990 mean sea level, of 0.4 metres by 2050 and 0.9 metres by 2100.

Coastal water levels are influenced by a variety of astronomical, meteorological / oceanographical and tectonic factors, the most readily apparent being the astronomical tides. At times, these factors interact to elevate water levels significantly above normal tide level. Storms, which produce low atmospheric pressure (also known as barometric pressure), strong onshore winds and large waves, are the most common cause of elevated water levels on a short-term basis. Long term changes in water levels are the result of sea level rise. Combined, short and long term changes in water levels are those levels that require consideration in planning for new and re-development.

Elevated water levels are of concern because they can cause damage to the coastline and to coastal developments. Elevated water levels can inundate low lying areas of the coastline and around estuaries. The foreshore areas of the Pittwater estuary within the Pittwater Local Government Area are subject to periodic inundation by coastal and estuarine processes. It is noted that the Proposal is located to the south of Scotland Island which provides a natural sheltered location from wind generated waves and prevailing northeast winds.

7.12.2 POTENTIAL IMPACTS

Construction

The site is located directly along the foreshore of Pittwater and is therefore at risk to the impacts of climate change. Short term impacts include storm surge which could cause inundation to the road and car park during construction. Inundation could damage the road, seawall and structure of the car park and hinder the construction process, therefore lengthening construction time. These impacts also pose a safety risk to pedestrians, workmen and traffic.

Operation

Storm surge could again effect the car park and road once in operation. Storm surge may damage the road, seawall and car park structure, preventing traffic flow and causing a risk to pedestrian safety.

Long term impacts include a permanent sea level rise, which could also inundate the road and car park and increase the risk of storm surge. The preferred option would follow the design levels accordingly to the 2050 EPL and give consideration to the 2100 EPL (refer to section 7.6.2 for more detail).

7.12.3 MITIGATION MEASURES

Mitigation measures are outlined in Table 7-15 below.

Table 7-15: Mitigation measures, timing and person (s) responsible

Mitigation measure	Responsibility	Timing
Detailed design to consider climate change impacts (e.g. sea level rise)	Design consultant	Pre-Construction
Provision of a higher deck, to allow for potential retrofit of a higher ground floor, if necessary	Design consultant	Pre-Construction

8 LICENSING AND APPROVALS

The following is a list of licences and/or approvals required for the proposed works (Table 8-1):

Table 8-1: Summary of licensing and approvals required

Requirement	Timing
Fisheries license	Pre-construction

9 OBJECTS OF THE EP&A ACT

This section demonstrates how the Proposal is consistent with the objectives of the EP&A Act. Table 9-1 explains how the Proposal performs against the objects of the Act, and references earlier sections of this REF where greater detail is provided.

Table 9-1: Summary of how the Proposal is consistent with the objectives of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	This Proposal forms part of the adopted Plan of Management framework to progress improvements for the overall Church Point precinct. Both Pittwater Council (owner as well as Care, Control & Management) and the Department of Lands (owner of Crown Land) agreed to the Plan of Management (refer to Section 2.2). The upgrade would be designed and built to maintain the environmental values of the surrounding area.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The Proposal provides an optimum cost effective car park that provides tangible additional car parking to significantly reduce the current chronic shortage for the benefit of offshore, onshore and visitors.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	A strategic assessment of utilities has identified utility services within the Proposal area, including: Sydney Water, Telstra, Optus and Ausgrid. Potential impacts on these utilities have been identified, including relocations, adjustments and protection work (Section 4.3.4). These will be considered further during detailed design.
5(a)(iv) To encourage the provision of land for public purposes.	Not relevant to this Proposal.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The Proposal will allow for continued use of the area as both a commuter hub for off-shore residents and a social hub for locals and visitors. The provision of a dedicated pedestrian walkway will allow safer access by the public to community facilities such as Rosstrevor Reserve, the public wharf and Church Point General Store.

Object	Comment
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The Proposal has been assessed against relevant environmental legislation that protects and conserves native animals and plants, including threatened species, populations and ecological communities, and their habitats (refer to Section 7.1).
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 – 8.2.4.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the Proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the Proposal.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	To date, consultation has included the community with respect to the Plan of Management and development of the concept design. Ongoing consultation will involve obtaining community comments and feedback and suggestions on the Proposal

The principles of ecologically sustainable development (ESD) as defined under Section 6(2) of the *Protection of the Environment Administration Act 1991,* were incorporated in the concept design and considered as part of the environmental assessment of the Proposal. These principles are addressed below.

9.1.1 THE PRECAUTIONARY PRINCIPLE

The precautionary principle requires evaluation of the threat of serious or irreversible harm to biodiversity.

As part of the assessment process, options were considered and assessed with the purpose of reducing the risk of serious and permanent impacts on the environment. The studies undertaken as part of the REF did not identify any issues that may cause serious and irreversible environmental damage as a result of the Proposal. In addition, best available technical information, environmental standards and measures were used to minimise environmental risks.

9.1.2 INTERGENERATIONAL EQUITY

The intergenerational equity principle is concerned with ensuring that the current generation preserves natural and built assets so that wellbeing and productivity are not compromised for future generations.

As part of the assessment process, a preferred design was chosen that would:

- Minimise environmental impacts;
- Provide for future demand;
- Improve road safety;
- Improve pedestrian safety; and
- Improve car parking.

Should the Proposal not proceed, the principle of intergenerational equity may be compromised as future generations would inherit a road with a lower level of service, and a lower level of safety.

9.1.3 CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY

This principle reinforces the previous two principles in requiring that the diversity of genes, species and communities, as well as the ecosystems and habitats to which they belong, be maintained and improved to ensure their survival.

As part of the assessment process, an assessment of the existing local environment has been carried out to recognise and manage any potential impacts of the Proposal on local biodiversity. It was found that the Proposal would not significantly impact biological diversity or ecological integrity. An ecological assessment and appropriate site-specific safeguards are provided in Section 7.1 of this REF.

9.1.4 IMPROVED VALUATION, PRICING AND INCENTIVE MECHANISMS

This principle requires that costs to the environment are incorporated or internalised within the overall project costs.

This REF has examined the environmental consequences of the Proposal and identified mitigation measures for areas that may possibly experience adverse impacts. Implementation of these mitigation measures would increase both the capital and operating costs of the Proposal. This shows that environmental resources were valued in economic terms during concept design.

In addition, the concept design was developed with an objective of minimising potential impacts on the surrounding environment, thereby minimising costs to the environment.

In summary, the Proposal is generally in accord with the principles of ESD. The Proposal would improve traffic movement and would provide a sustainable balance between environmental and economic objectives. It would also provide better facilities for pedestrians, cyclists and buses.

10 CONCLUSION

The proposed construction of a car park, land reclamation and sea wall construction and realignment of McCarrs Creek Road is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

The Proposal was found to have potential for short term and minor impacts to soil, water quality, flora and fauna, local air quality, noise emissions, visual amenity and utilities. However, impacts would be readily manageable through the application of mitigation measures summarised in this REF. The works were not found to result in any impacts to threatened species, populations or ecological communities listed on the NSW *Threatened Species Conservation Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The Proposal would also have a range of benefits including improved road safety; additional provision for parking; and safer pedestrian facilities. On balance, the Proposal is considered justified. If no change is completed, the chronic lack of car parking will continue to cause adverse social impacts and tensions.

11 CERTIFICATION

This Proposal has been assessed taking into account its biophysical, social and economic impact, the suitability of the site and whether or not the Proposal is in the public interest. The Proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

The environmental impacts of the Proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the Proposal from the Minister for Planning under Part 5.1 of the EP&A Act. The Proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The Proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.

12 REFERENCES

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APPENDIX A

CLAUSE 228 CHECKLIST

CLAUSE 228(2) CHECKLIST

In addition to the requirements of the *Is an EIS required?* guideline as detailed in the REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the Proposal on the natural and built environment.

Clause 228 Factor	Comments	Impact
a) Any environmental impact on a community?	Construction of the Proposal would result in some short-term negative impacts associated with construction such as traffic disruptions, noise and air emission impacts and visual amenity impacts. These issues could impact on the local community as described in the respective sections of this REF. Potential traffic impacts during construction would include an increase in the volume of heavy vehicles, interruption of traffic flows and travel times, and temporary changes in speed limits and access. Construction noise would be generated from construction plant, machinery and vehicles. Air quality impacts during construction would result from dust, vehicle emissions, and odour production.	Short term negative
	The operation of the Proposal would likely increase road traffic noise impacts to sensitive receivers along the road. Mitigation measures would be put in place to minimise these impacts, as outlined in Section 7.5	Long term negative
	The Proposal would improve parking conditions by increasing the number of dedicated car parking spaces. The Proposal would also improve the safety of the road by improving sight lines, reconstruct the seawall which is currently in disrepair and provide safer pedestrian paths.	Long term positive

Clause 228 Factor	Comments	Impact
b) A transformation of a locality?	The Proposal would result in changes (amenity, visual aspects) to the locality through provision of a wider road. A number of mitigation measures have been provided to minimise any negative impacts. Some changes to the locality would be positive, such as additional and safer parking, safer pedestrian and cycling provisions and improved road sight lines.	Long term negative and positive impacts
c) Any environmental impact on the ecosystem of the locality?	The Proposal is unlikely to have an impact on the ecosystems of the locality. Measures, as outlined in this REF, would be implemented to minimise impacts on the ecosystems associated with the Proposal.	Nil
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	There would be a minor reduction in the aesthetic quality of the locality due to the introduction of a new built feature (car park). Mitigation measures would be implemented to reduce impacts and detailed design would be undertaken in line with urban design principles.	Long term negligible negative impacts
e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations?	There would be no impacts on any locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.	Nil
f) Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)?	The Proposal is unlikely to have a significant impact on any habitat of protected fauna within the meaning of the National Parks and Wildlife Act 1974.	Nil

Clause 228 Factor	Comments	Impact
	Measures recommended in this REF would minimise impacts.	
g) Any endangering of any species of animal or plant or other form of life, whether living on land, in water or in the air?	The Proposal is unlikely to have a significant impact on any threatened species, population or community listed under the TSC Act or EPBC Act. Measures recommended in this REF would minimise impacts on threatened species and communities.	Nil
h) Any long-term effects on the environment?	The Proposal would result in short-term environmental impacts, largely restricted to the construction period. These include traffic, noise and air. Long-term impacts include potential impacts to visual amenity. However, these would be minor and would be minimised through application of urban design principles.	Long term positive
i) Any degradation of the quality of the environment?	The Proposal has the potential to degrade the quality of the environment through noise, visual, water, air, erosion and sedimentation pollution and marine ecology, as well as accidental spills during construction. These potential impacts would be managed using a suite of safeguards and mitigation measures. The construction footprint would be reduced as far as practicable and the site would be rehabilitated as work progresses to minimise impacts. In the long-term, the project will provide a range of benefits including improved	Short term negative Long term positive

Clause 228 Factor	Comments	Impact
	parking conditions and pedestrian facilities.	
j) Any risk to the safety of the environment?	The Proposal is likely to reduce safety along the road during construction. This would be managed through appropriate signage and a traffic management plan. The Proposal would provide dedicated car parking for off-shore residents and pedestrian facilities. This would improve road user safety.	Short term negative Long term positive
k) Any reduction in the range of beneficial uses of the environment?	The Proposal would result in minor traffic impacts during construction which would include an increase in the volume of heavy vehicles, interruption of traffic flow and speeds, and temporary impacts to access. These traffic impacts would reduce the beneficial use of McCarrs Creek Road during the construction phase. In the long-term, the Proposal would be consistent with future uses and there would be no reduction in the range of beneficial uses of the environment.	Short term negative Long term positive
l) Any pollution of the environment?	There would be some potential noise, visual, air, water, marine ecology and erosion and sedimentation impacts associated with construction of the proposed upgrade. Construction activities would be carefully managed with numerous safeguard for protection of the environment from pollution (refer to Section 7).	Short term negative
m) Any environmental problems associated with the disposal of waste?	Waste would be generated across a number of waste streams during construction. These streams would be	Short term negative

Clause 228 Factor	Comments	Impact
	managed in accordance with RMS specification, the Waste Avoidance and Resource Recovery Act 2001 and recycled where possible. It is not anticipated that there would be any issues associated with the disposal of waste during the operation of the Proposal.	Nil
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?	None of the resources required to effect this Proposal are, or are likely to become, in short supply.	Nil
o) Any cumulative environmental effect with other existing or likely future activities?	The Plan of management details the future development and management of the Church Point area. It is unlikely other construction works proposed in the Plan of Management would be undertaken at the same time as the Proposal. The Proposal would result in a safer environment due to the provision of additional dedicated parking, a reconstructed seawall, a safer road alignment and safer pedestrian facilities.	Negligible Long term positive
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	The Proposal would have a minor and temporary impact on coastal processes due to the construction of a new sea wall. These impacts include disturbance of the sea floor bed, potential disturbance of ASS and general construction impacts (especially if pylon drivers are used to erect sheeting). These would be managed through the mitigation measure outlined in this REF. Climate change and coastal inundation during extreme storm events have	Minor, temporary negative

Clause 228 Factor	Comments	Impact
	been considered in the design of the car park.	

APPENDIX B

NOISE AND VIBRATION ASSESSMENT

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

MCCARRS CREEK ROAD CAR PARK

Noise and Vibration Assessment

29 October 2014

Hyder Consulting Pty Ltd

TG874-01F02 (r2) Acoustic Assessment

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Attention:	Kate Wiggins

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
26.09.2014	Draft issued for comment	0	1	RP	MG	MG
29.10.2014	Final		2	MG		MG

Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

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1 Introduction

Pittwater Council has identified the need for additional long term and commuter car parking and small vessel tie up facilities on McCarrs Creek Road to service residents of Scotland Island as well as freeing up existing parking for visitors to the area.

Hyder Consulting was engaged to identify and review three conceptual car park options, and the results of the review were presented in Hyder's Options Evaluation Report dated October 2013. The report identified that the Option 3 concept, which is a two-level car park incorporating 120 parking spaces, was the best solution to minimise long term parking issues.

Renzo Tonin & Associates was engaged to conduct a noise and vibration assessment of the preferred Option 3 concept to further inform the decision making process. The purpose of this assessment is to:

- Assess noise impacts from car park operation,
- Comment on potential change in traffic noise from McCarrs Creek Road,
- Assess potential noise and vibration impacts from construction works associated with the project.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project Description

The overall layout for the preferred Option 3 proposes realignment of the existing McCarrs Creek Road and adjacent sea wall to provide an area of reclaimed land. The reclamation provides space for a total of 120 parking spaces, comprising 60 ground floor spaces plus a first floor deck providing a further 60 parking spaces. Pedestrian walkways and landscaped areas between the sea wall and existing cliff face are all also provided.

Land reclamation will be a significant activity due to the additional area required to house both parking and the realigned McCarrs Creek Road. Despite maintaining approximate existing and proposed road levels, earthworks are significant to fill between the existing sea wall and its realignment. Sea wall realignment works are also considerable due to the complexities associated with constructing a contiguous piled wall below the water level. Construction of the first floor deck will involve considerable concrete works including deck slab, columns, access ramps and steps.

The nearest sensitive receivers to the project are those residences on McCarrs Creek Road (and beyond), set high up on the escarpment and overlooking the proposed car park location.

The proposal is shown in Figure 1 and Figure 2 below.

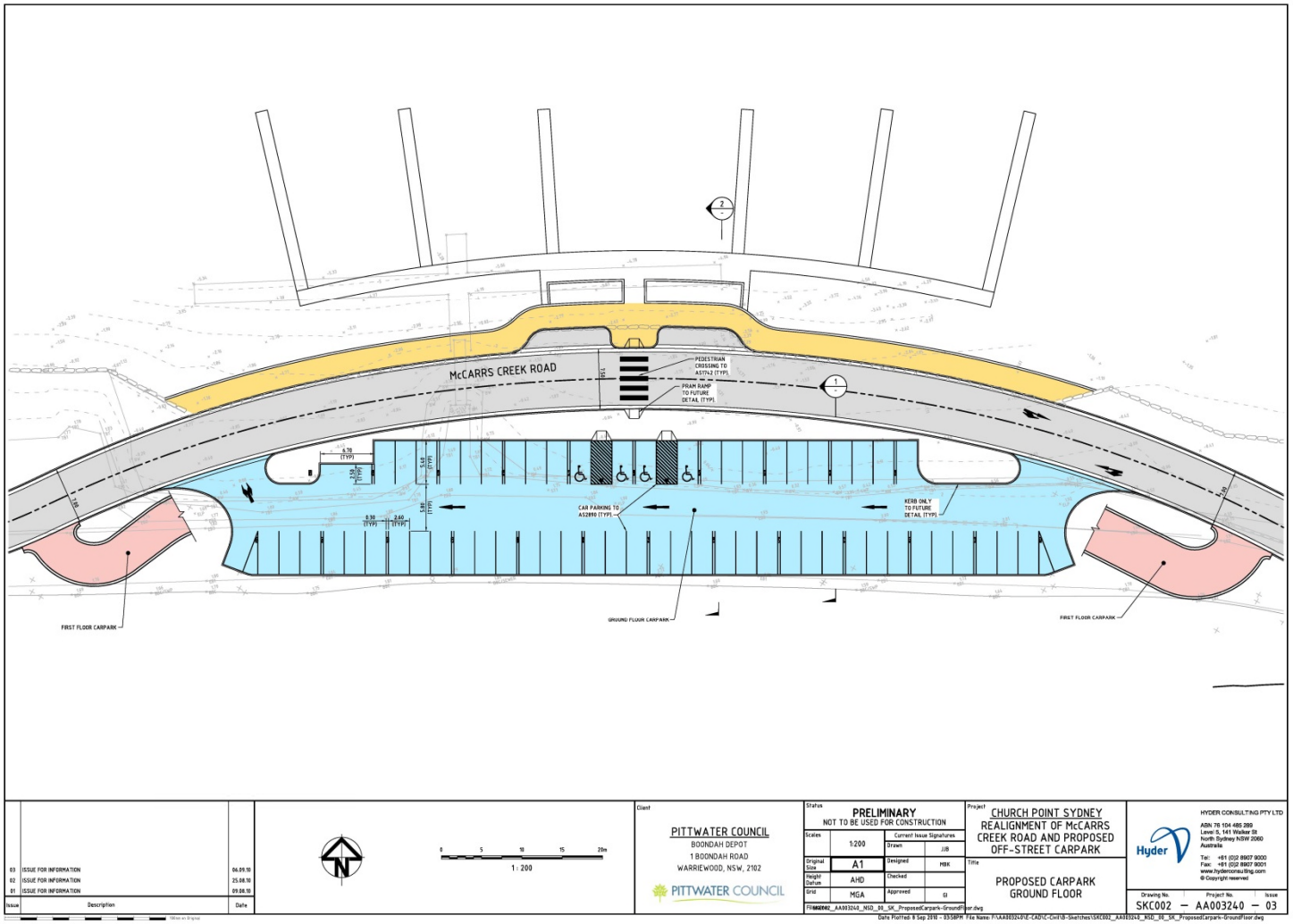

Figure 1: Project proposal (ground floor)

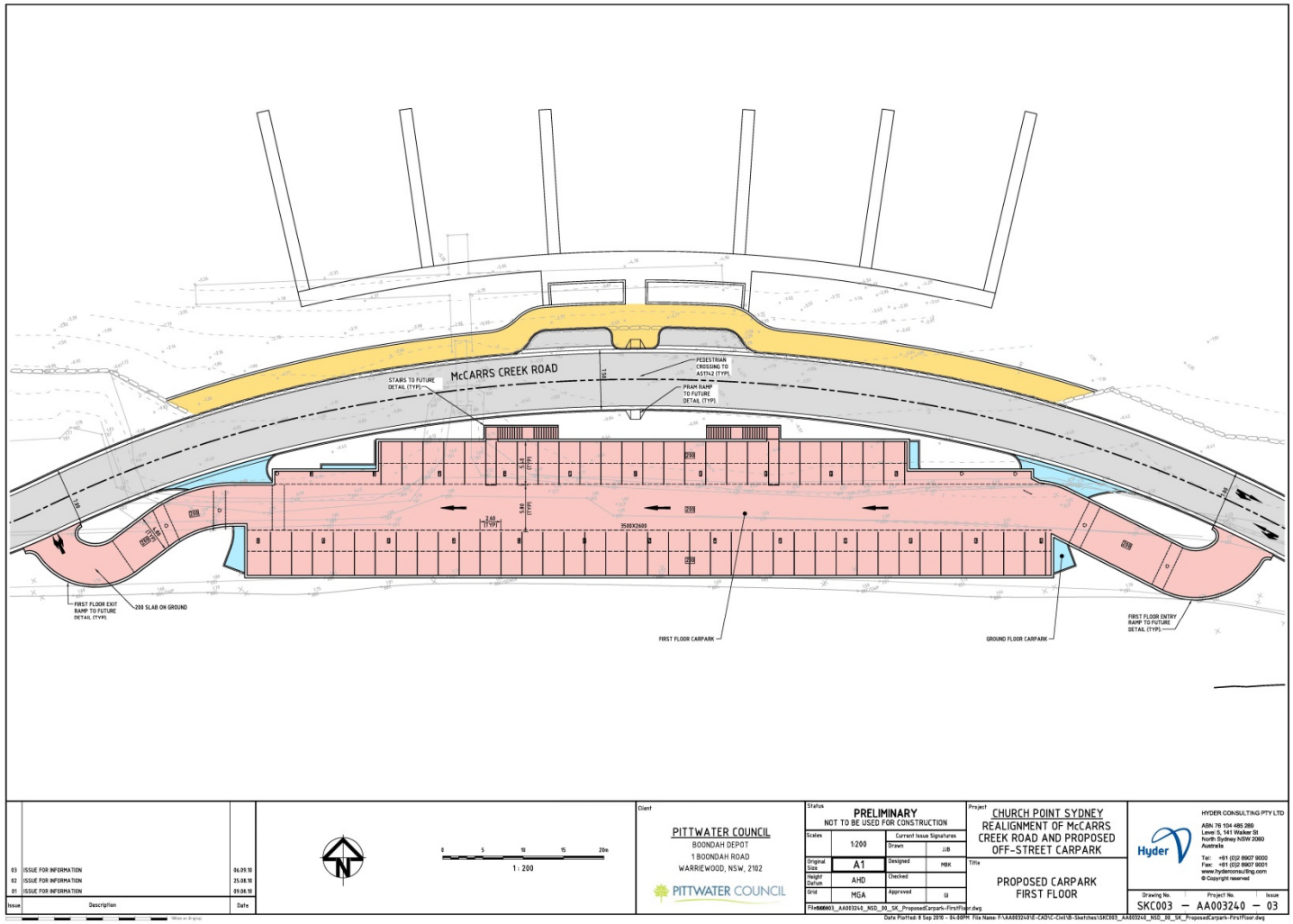

Figure 2: Project proposal (first floor)

3 Existing Noise Environment

The ambient noise environment in the study area is controlled by traffic noise from McCarrs Creek Road, activities from the nearby commuter wharf, water activities such as powered marine vessels and general nature. Long-term noise monitoring was conducted to establish the background noise levels for the setting of car park and construction noise goals.

3.1 Noise monitoring locations

Long-term noise monitoring was conducted on site from Monday 11th to Wednesday 20th August 2014. The noise monitor was installed adjacent to the residential access road on the escarpment, outside 3 McCarrs Creek Road, and the measured levels represent the existing acoustic environment of the nearest receivers.

3.2 Measured noise levels

A summary of the long-term noise monitoring results are presented in Table 1 below, in accordance with EPA monitoring guidelines. The noise monitoring methodology is described in Appendix B and the graphical outputs from the noise monitors are presented in Appendix C.

Table 1 Long-term noise monitoring results

Monitoring location	L_{A90} Rating Background Level (RBL) dB(A)			L_{Aeq} Ambient noise levels dB(A)		
	Day	Evening	Night	Day	Evening	Night
M1	44	35	30	61	50	46

Notes: Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays
Evening: 18:00-22:00 Monday to Sunday & Public Holidays
Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

3.3 Identified receivers

The following receivers have been identified as being the potentially most impacted receivers from both cark park and construction noise, and have been used as assessment points when conducting noise modelling.

Table 2 Identified receivers

Receiver ID	Receiver Address	Receiver Type
R01	3 McCarrs Creek Road	Residential
R02	5 McCarrs Creek Road	Residential
R03	9 McCarrs Creek Road	Residential
R04	7 McCarrs Creek Road	Residential
R05	11 McCarrs Creek Road	Residential
R06	15 McCarrs Creek Road	Residential

Receiver ID	Receiver Address	Receiver Type
R07	19 McCarrs Creek Road	Residential
R08	19a McCarrs Creek Road	Residential
R09	23 McCarrs Creek Road	Residential
R10	25 McCarrs Creek Road	Residential
R11	27 McCarrs Creek Road	Residential
R12	29 McCarrs Creek Road	Residential
R13	31 McCarrs Creek Road	Residential
R14	33 McCarrs Creek Road	Residential
R15	39 McCarrs Creek Road	Residential
R16	41 McCarrs Creek Road	Residential
R17	43 McCarrs Creek Road	Residential
R18	49 McCarrs Creek Road	Residential
R19	2185 Pittwater Road	Residential
R20	2187 Pittwater Road	Residential
R21	2189 Pittwater Road	Residential
R22	2191 Pittwater Road	Residential
R23	2193 Pittwater Road	Residential
R24	2195 Pittwater Road	Residential
R25	27 Eastview Road	Residential
R26	29 Eastview Road	Residential
R27	31 Eastview Road	Residential
R28	33 Eastview Road	Residential
R29	34 Eastview Road	Residential
R30	35 Eastview Road	Residential
R31	40 Eastview Road	Residential
R32	2 Quarter Sessions Road	Residential
R33	6 Quarter Sessions Road	Residential
R34	10 Quarter Sessions Road	Residential
R35	12 Quarter Sessions Road	Residential
R36	14 Quarter Sessions Road	Residential
R37	16 Quarter Sessions Road	Residential
S1	1860 Pittwater Road	Commercial

Figure 3 below displays the noise monitoring location and identified receivers.

Figure 3: Noise Monitoring Location & Identified Receivers

4 Operational Noise Criteria

Pittwater Council does not provide specific noise criteria for car park developments. We therefore refer to the EPA's intrusiveness criteria which is commonly used by Council's and other regulatory authorities to assess noise intrusiveness.

4.1 Intrusive noise criteria

The EPA's Industrial Noise Policy (INP) recommends that the L_{Aeq} noise level from a newly-introduced source not exceed the background (L90) noise level by more than 5dB(A). Regard must be given, however, to the extent of the existing background noise and whether such a level is appropriate for the specific development and land-use of the receiver area.

The intrusiveness of an industrial noise source may generally be considered acceptable if the L_{Aeq} (equivalent continuous A-weighted level of noise) from the source, measured over a 15 minute period, does not exceed the Rating Background Level (RBL) by more than 5dB(A). That is;

$$L_{Aeq,15min} \leq RBL + 5dB(A)$$

Based on the measured background noise levels, the intrusiveness noise criteria are:

Table 3 Intrusive noise criteria

Time of Day	Rating Background Level (RBL) L_{A90} dB(A)	Intrusiveness Criterion (RBL + 5) $L_{Aeq,15min}$ dB(A)
Day	44	49
Evening	35	40
Night	30	35
Shoulder Period (6am – 7am)	37	42

4.2 'Modifying factor' corrections

Where the character of the noise in question is assessed as particularly annoying (i.e. if it contains certain characteristics such as tonality, impulsiveness, or dominant low frequency content), then the EPA recommends a correction is to be added to the measured value to penalize the noise for its potential increase in annoyance. Car park noise does not contain these characteristics and therefore no corrections have been used for this assessment.

4.3 Sleep disturbance noise criteria

Use of the car park during the hours of 10pm and 7am has the potential to cause sleep disturbance from short term impact sounds such as car door slams and engine starts. The EPA has made the following policy statement with respect to sleep disturbance:

"Peak noise level events, such as reversing beepers, noise from heavy items being dropped or other high noise level events, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The INP does not specifically address sleep disturbance from high noise level events.

DEC reviewed research on sleep disturbance in the NSW Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999). This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, DEC recognised that current sleep disturbance criterion of an $L_{A1, (1\ minute)}$ not exceeding the $L_{A90, (15\ minute)}$ by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, DEC will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

The detailed analysis should cover the maximum noise level or $L_{A1, (1\ minute)}$, that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the appendices to the ECRTN. Other factors that may be important in assessing the extent of impacts on sleep include:

- *how often high noise events will occur;*
- *time of day (normally between 10pm and 7am); and*
- *whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).*

The $L_{A1, (1\ minute)}$ descriptor is meant to represent a maximum noise level measured under 'fast' time response. DEC will accept analysis based on either $L_{A1, (1\ minute)}$ or $L_{A, (Max)}$."

The NSW EPA confirm that a sleep disturbance criterion of $L_{A1(1min)} \leq L_{A90(15min)}$ + 15dB(A), should only be used as a first step guide and where the criteria is not met, more detailed analysis is required. The Application Notes of the NSW Industrial Noise Policy (2010) note the detailed analysis should include:

- the extent to which the maximum noise level exceeds the background level
- the number of times this happens during the night-time period, and
- the time of day (normally between 10pm and 7am).

In addition, reference is made to Appendix B of the NSW ECRTN, which summarises the findings of international research undertaken on sleep disturbance from noise (up until 2009) and concludes:

"Considering all of the foregoing information the following conclusions can be drawn:

- *Maximum internal noise levels below 50-55dB(A) are unlikely to cause awakening reactions.*
- *One or two noise events per night, with maximum internal noise levels of 65-70dB(A), are not likely to affect health and wellbeing significantly."*

In regard to external noise levels, the maximum internal noise level 55dB(A) referenced in the ECRTN is equivalent to 65dB(A) outside an open window. It is noted that a 10dB(A) reduction from outside to inside is common and typical noise reduction via an open window. The 65dB(A) external noise limit is consistent with the findings of Griefahn [*Acoustics Australia vol 20 No 2 August 1992 pp 43-47*].

In summary, the sleep disturbance criteria of $L_{A1(1min)} \leq L_{A90(15min)}$ + 15dB(A) is to be used for initial assessment, however consideration is also given to the 'upper' limit criteria of 65dB(A) in accordance with the ECRTN. It is noted that the background $L_{A90(15minute)}$ noise level used for establishing the sleep disturbance criteria does not need to exclude other noise from the subject premise.

The sleep disturbance criteria for the project are presented in Table 4.

Table 4 Sleep disturbance criteria

Sleep disturbance criteria, 10:00pm - 7:00am, $L_{A1,1minute}$	
$L_{A90(15min)}$ + 15	**Upper limit**
50	65

5 Operational Noise Assessment

5.1 Vehicle movements within car park

The RLS-90 noise calculation standard contains algorithms to predict noise from car parks. The RLS-90 algorithms, as applied in the Cadna-A noise modelling package, have been used to predict noise levels from vehicle movements within the car park for this assessment.

For the purpose of noise predictions, it has been assumed that both the ground floor and first floor car park will be filled from empty to full capacity over a one hour period in either the daytime or evening assessment periods. That is 60 movements on the ground floor, plus 60 movements on the first floor of the car park, in a one hour period. This allows for a conservatively high level of use during peak periods when commuters are most likely to use the car park.

During the night time period between 10pm and 7am, it is not known how many vehicles might access the car park. If car park usage can be estimated by the busyness of McCarrs Creek Road at a corresponding time, then traffic counts conducted on McCarrs Creek Road in March 2014 indicate there would be very little usage of the car park during the middle of the night, possibly only a few vehicles per hour. The peak movements prior to 7am would likely be on weekdays in the early morning shoulder period between 6am and 7am.

Weekday traffic movements on McCarrs Creek Road between 6am and 7am are roughly half of the peak hour movements. Therefore noise levels from the car park in this shoulder period would likely be lower than during the evening peak, yet the noise criteria is 2dB(A) higher than the evening criteria. Therefore the critical period of assessment is the evening period.

The results of the noise model predictions for both the day and evening periods are presented in Table 5 below. It is predicted that unmitigated noise from the operation of the car cark could potentially cause exceedances at the most affected residence of up to 8dB in the evening period. Daytime noise levels comply.

As a first step consideration to mitigate the predicted impact, a screen wall at the rear of the first floor car park was modelled with increasing heights to determine its potential effectiveness. The references heights are from the surface of the first floor and the results are included in the table below. Noise screens of up to 3m high have minimal benefits due to the elevated positions of the residences. A screen of 4m high achieves compliance for all but the nearest house, and 5m achieves full compliance.

A design review has determined provision of a noise screen is not feasible due to the design of the car park and the site constraints. Since the predicted noise exceedances are due to vehicles on the first floor of the car park and not the ground floor, restricting use of the first floor in the late evening by use of locked chains or gates would be an alternative management measure.

Post construction noise compliance measurements are recommended to confirm noise levels and would be useful in identifying how the car park is being used by the public, and what type of operational restrictions could be implemented to reduce any noise impacts.

Table 5 Car park operational noise results

Receiver		NML		No Wall					1m Screen		2m Screen		3m Screen		4m Screen		5m Screen	
				Car Park Noise $L_{Aeq,15min}$ dB(A)			Exceedance		Exceedance		Exceedance		Exceedance		Exceedance		Exceedance	
ID	Address	Day	Evening	Ground Floor	First Floor	Total	Day	Evening	Day	Evening	Day	Evening	Day	Evening	Day	Evening	Day	Evening
R01	3 McCarrs Creek Road	49	40	41	47	48	-	8	-	7	-	6	-	5	-	3	-	-
R02	5 McCarrs Creek Road	49	40	39	44	45	-	5	-	5	-	4	-	2	-	-	-	-
R03	9 McCarrs Creek Road	49	40	31	35	36	-	-	-	-	-	-	-	-	-	-	-	-
R04	7 McCarrs Creek Road	49	40	39	43	44	-	4	-	3	-	2	-	1	-	-	-	-
R05	11 McCarrs Creek Road	49	40	35	39	40	-	-	-	-	-	-	-	-	-	-	-	-
R06	15 McCarrs Creek Road	49	40	28	30	32	-	-	-	-	-	-	-	-	-	-	-	-
R07	19 McCarrs Creek Road	49	40	29	32	33	-	-	-	-	-	-	-	-	-	-	-	-
R08	19a McCarrs Creek Road	49	40	25	27	29	-	-	-	-	-	-	-	-	-	-	-	-
R09	23 McCarrs Creek Road	49	40	31	31	34	-	-	-	-	-	-	-	-	-	-	-	-
R10	25 McCarrs Creek Road	49	40	22	24	26	-	-	-	-	-	-	-	-	-	-	-	-
R11	27 McCarrs Creek Road	49	40	29	30	33	-	-	-	-	-	-	-	-	-	-	-	-
R12	29 McCarrs Creek Road	49	40	27	27	30	-	-	-	-	-	-	-	-	-	-	-	-
R13	31 McCarrs Creek Road	49	40	28	28	31	-	-	-	-	-	-	-	-	-	-	-	-
R14	33 McCarrs Creek Road	49	40	26	28	30	-	-	-	-	-	-	-	-	-	-	-	-
R15	39 McCarrs Creek Road	49	40	24	26	28	-	-	-	-	-	-	-	-	-	-	-	-
R16	41 McCarrs Creek Road	49	40	24	25	27	-	-	-	-	-	-	-	-	-	-	-	-
R17	43 McCarrs Creek Road	49	40	21	22	25	-	-	-	-	-	-	-	-	-	-	-	-
R18	49 McCarrs Creek Road	49	40	20	20	23	-	-	-	-	-	-	-	-	-	-	-	-
R19	2185 Pittwater Road	49	40	12	15	17	-	-	-	-	-	-	-	-	-	-	-	-
R20	2187 Pittwater Road	49	40	14	17	19	-	-	-	-	-	-	-	-	-	-	-	-
R21	2189 Pittwater Road	49	40	15	19	20	-	-	-	-	-	-	-	-	-	-	-	-
R22	2191 Pittwater Road	49	40	17	21	23	-	-	-	-	-	-	-	-	-	-	-	-

Receiver		NML		No Wall					1m Screen		2m Screen		3m Screen		4m Screen		5m Screen	
				Car Park Noise $L_{Aeq,15min}$ dB(A)			Exceedance		Exceedance		Exceedance		Exceedance		Exceedance		Exceedance	
ID	Address	Day	Evening	Ground Floor	First Floor	Total	Day	Evening	Day	Evening	Day	Evening	Day	Evening	Day	Evening	Day	Evening
R23	2193 Pittwater Road	49	40	20	24	25	-	-	-	-	-	-	-	-	-	-	-	-
R24	2195 Pittwater Road	49	40	22	27	28	-	-	-	-	-	-	-	-	-	-	-	-
R25	27 Eastview Road	49	40	12	14	16	-	-	-	-	-	-	-	-	-	-	-	-
R26	29 Eastview Road	49	40	14	16	18	-	-	-	-	-	-	-	-	-	-	-	-
R27	31 Eastview Road	49	40	15	18	20	-	-	-	-	-	-	-	-	-	-	-	-
R28	33 Eastview Road	49	40	18	21	22	-	-	-	-	-	-	-	-	-	-	-	-
R29	34 Eastview Road	49	40	14	16	18	-	-	-	-	-	-	-	-	-	-	-	-
R30	35 Eastview Road	49	40	25	30	31	-	-	-	-	-	-	-	-	-	-	-	-
R31	40 Eastview Road	49	40	17	19	21	-	-	-	-	-	-	-	-	-	-	-	-
R32	2 Quarter Sessions Road	49	40	29	33	34	-	-	-	-	-	-	-	-	-	-	-	-
R33	6 Quarter Sessions Road	49	40	35	41	42	-	2	-	1	-	1	-	-	-	-	-	-
R34	10 Quarter Sessions Road	49	40	30	34	35	-	-	-	-	-	-	-	-	-	-	-	-
R35	12 Quarter Sessions Road	49	40	32	37	38	-	-	-	-	-	-	-	-	-	-	-	-
R36	14 Quarter Sessions Road	49	40	21	23	25	-	-	-	-	-	-	-	-	-	-	-	-
R37	16 Quarter Sessions Road	49	40	21	24	26	-	-	-	-	-	-	-	-	-	-	-	-
S1	1860 Pittwater Road	65	65	38	39	41	-	-	-	-	-	-	-	-	-	-	-	-

5.2 Night time maximum noise level events

Although vehicle movements in the car park at night may be very low, there is potential for sleep disturbance due to maximum noise level events such as car door slams or engine starts. Noise modelling of these peak sounds has been conducted assuming at the first floor of the car park. Noise data from our library files indicates a sound power level of 100dB(A) is typical for a door slam.

L_{Amax} noise levels at the nearest residences as are predicted to be up to approximately 60dB(A). This is above the EPA's initial assessment level of 'background +15dB', however is below the recommended 65dB(A) maximum assessment level. We therefore conclude that sleep disturbance from car park activities is unlikely. Similar to the discussion for L_{Aeq} noise above, restricting use of the first floor at night would significantly lower the likelihood of sleep disturbance.

5.3 McCarrs Creek Road realignment

As the car park is being proposed to cater for existing traffic in the area, the development is unlikely to cause an increase in the total traffic using McCarrs Creek Road. However, the realignment of McCarrs Creek Road may alter the road traffic noise level at residences after the realignment works are complete. This is due a number of factors;

- The road is shifting in alignment up to approximately 25m from the original location, further away from the residences,
- The road alignment is being shifted away from the existing rock cutting and into view of residences previously shielded by the cutting,
- The car park is providing some shielding of the road.

Cursory noise modelling of road traffic noise of the existing and proposed road alignments has been undertaken and the general outcomes are as follow;

- For residences nearest to the road realignment section (numbers 3 to 11 McCarrs Creek Road), noise levels are predicted to decrease slightly, with a reduction of up to 3dB. The reduction is mainly due to the road alignment moving further away from the residences.
- For residences further back from the road (residences on and near Quarter Sessions Road), noise levels are predicted to increase slightly, with an increase of up to 3dB. The increase is mainly due to the realigned road being more visible and less shielded from the existing rock cutting.

The applicable noise criterion for traffic local roads is contained in the EPA's NSW Road Noise Policy which recommends a level of 55 LAeq(1hr) during the day (7am to 10pm). In circumstances where the existing noise level from local traffic exceeds 55dB(A), then any increase in traffic noise associated with redevelopment of a local road should not increase that level by more than 2dB(A).

For this realignment, any property which is predicted to experience an increase in traffic noise of more than 2dB(A) is set back from the road and receives an absolute level of traffic noise that is below 55dB(A). All other properties either receive a reduction in noise, or remain the same. Therefore traffic noise from the road realignment is compliant.

6 Construction Noise and Vibration Assessment

The NSW *Interim Construction Noise Guideline* (ICNG, 2009) provides guidelines for assessing noise generated during the construction phase of developments. The ICNG provides two methods for assessment of construction noise, being either a quantitative or a qualitative assessment. A quantitative assessment method has been used for this assessment.

6.1 Construction noise objectives

Construction noise management levels are determined by the NSW 'Interim Construction Noise Guideline'. Table 6 below (reproduced from Table 2 of the ICNG) sets out the noise management levels (NMLs) for residences and how they are to be applied.

The guideline intends to provide respite for residents exposed to excessive construction noise outside the recommended standard hours whilst allowing construction during the recommended standard hours without undue constraints.

The rating background level (RBL) is used when determining the NML. The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours).

Table 6 Noise management levels at residential receivers

Time of day	Management level $L_{Aeq\ (15\ min)}$	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Time of day	Management level $L_{Aeq\ (15\ min)}$	How to apply
Outside recommended standard hours	Noise affected RBL + 5dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

The NML represents the point above which there may be some community reaction to noise. Residential receivers are considered 'noise affected' where construction noise levels are greater than the NML. Where predicted and/or measured construction noise levels exceed the NML, all feasible and reasonable work practices will be applied to meet the management levels. During standard construction hours a highly affected noise objective of LAeq(15min) 75 dB(A) also applies at all receivers.

It is expected that the project construction will occur during standard daytime hours only. Table 7 identifies the adopted NMLs for residential receivers.

Table 7 Construction noise management levels at residential receivers

L_{A90} Rating Background Level (RBL)			Noise Management Level $L_{Aeq(15min)}$[1]		
Day	Evening	Night	Day	Evening	Night
44	35	30	54	n/a	n/a

Notes:

1. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

The NML for the commercial receiver at 1860 Pittwater Road is 70dB(A).

6.2 Construction activities

The following table lists the sound power levels of the plant and equipment likely to be used by the contractor to carry out the necessary construction work for this project. The sound power levels are based on maximum levels given in Table A1 of Australian Standard 2436 - 2010 "Guide to Noise Control on Construction, Demolition and Maintenance Sites", ICNG, information from past projects and information held in the Renzo Tonin & Associates library files.

Table 8 Construction activity & equipment list

Activity	Plant/ Equipment	Sound Power Level, Lw dB L_{Aeq}
Site clearance	Chain Saw[1]	114+5 (119)
	Dump Truck	106
	Tracked Excavator	107

Activity	Plant/ Equipment	Sound Power Level, Lw dB L_{Aeq}
Utility, property, service adjustment	Dump Truck	106
	Mobile Crane	98
	Tracked Excavator	107
Pavement and kerb demolition	Backhoe	100
	Dump Truck	106
	Front end loader	103
	Road Milling Machine[1]	110+5 (115)
	Tracked Excavator	107
Excavation	Dump Truck	106
	Front End Loader	103
	Mobile Crane	98
	Pneumatic jack hammers[1]	111+5 (116)
	Power Generator	94
	Tracked Excavator	107
Seawall Piling & Construction	Concrete pump	99
	Concrete Truck	105
	Dump Truck	106
	Power Generator	94
	Mobile Crane	98
	Piling Rig	111
	Tracked Excavator	107
Road & Car park Construction	Concrete pump	99
	Concrete Truck	105
	Dump Truck	106
	Power Generator	94
	Grader	113
	Mobile Crane	98
	Pavement Laying Machine	105
	Vibrating Roller[1]	109+5 (114)
	Tracked Excavator	107
Traffic signals, signposting and line marking	Mobile Crane	98
	Truck	106

Notes:
In accordance with the ICNG, a +5dB penalty has been applied for annoyance

6.3 Predicted noise levels

Noise emissions were determined by modelling the noise sources, receiver locations, and operating activities as outlined above. Predicted noise levels assume all listed equipment for individual tasks are operating concurrently. This approach is conservative and has been adopted to ensure the full extent of possible noise impacts are assessed (what might occur in the worst-case). Therefore, the noise generated during construction works will generally be below the predicted levels.

Table 9 presents a summary of the predicted L_{Aeq} noise levels for each activity associated with the construction phase. The assessment point is at the boundary for residential receivers.

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Table 9 Predicted construction noise levels

Receiver		NML	Construction Activity / Predicted Noise Level, dB(A)						
ID	Address	Day	Site Clearance	Utilities	Pavement demolition	Excavation	Seawall Construction	Road & Car park Construction	Signposting and line marking
R01	3 McCarrs Creek Road	54	**79**	**69**	**75**	**76**	**74**	**77**	**66**
R02	5 McCarrs Creek Road	54	**74**	**65**	**71**	**72**	**69**	**73**	61
R03	9 McCarrs Creek Road	54	**66**	57	63	63	62	**65**	54
R04	7 McCarrs Creek Road	54	**75**	**65**	**71**	**72**	**70**	**73**	62
R05	11 McCarrs Creek Road	54	**73**	63	**69**	**70**	**68**	**71**	60
R06	15 McCarrs Creek Road	54	60	51	58	57	56	60	48
R07	19 McCarrs Creek Road	54	**67**	58	64	**65**	62	**66**	54
R08	19a McCarrs Creek Road	54	56	47	53	53	52	55	44
R09	23 McCarrs Creek Road	54	**66**	56	63	63	61	64	53
R10	25 McCarrs Creek Road	54	53	45	51	50	49	53	41
R11	27 McCarrs Creek Road	54	64	55	61	61	60	63	52
R12	29 McCarrs Creek Road	54	60	51	57	58	56	59	48
R13	31 McCarrs Creek Road	54	62	53	59	59	57	61	50
R14	33 McCarrs Creek Road	54	61	52	58	58	57	60	49
R15	39 McCarrs Creek Road	54	58	49	55	55	53	57	46
R16	41 McCarrs Creek Road	54	53	44	51	50	49	52	41
R17	43 McCarrs Creek Road	54	49	40	46	45	45	48	37
R18	49 McCarrs Creek Road	54	48	39	46	45	44	48	36
R19	2185 Pittwater Road	54	46	38	44	43	43	46	35
R20	2187 Pittwater Road	54	48	40	46	45	45	48	37
R21	2189 Pittwater Road	54	50	41	48	47	47	49	38

Receiver		NML	Construction Activity / Predicted Noise Level, dB(A)						
ID	Address	Day	Site Clearance	Utilities	Pavement demolition	Excavation	Seawall Construction	Road & Car park Construction	Signposting and line marking
R22	2191 Pittwater Road	54	52	44	50	49	49	52	41
R23	2193 Pittwater Road	54	55	46	53	52	51	54	43
R24	2195 Pittwater Road	54	59	50	56	56	55	58	47
R25	27 Eastview Road	54	47	38	45	44	44	46	35
R26	29 Eastview Road	54	50	41	48	47	47	49	38
R27	31 Eastview Road	54	51	42	49	48	48	50	39
R28	33 Eastview Road	54	53	45	51	50	50	53	41
R29	34 Eastview Road	54	46	38	44	43	43	46	35
R30	35 Eastview Road	54	63	54	60	60	59	62	51
R31	40 Eastview Road	54	53	44	51	50	50	52	41
R32	2 Quarter Sessions Road	54	**66**	56	63	64	61	64	53
R33	6 Quarter Sessions Road	54	**72**	62	**68**	**69**	**67**	**70**	59
R34	10 Quarter Sessions Road	54	**65**	56	62	63	61	64	53
R35	12 Quarter Sessions Road	54	**68**	58	**65**	**65**	63	**66**	55
R36	14 Quarter Sessions Road	54	56	47	53	53	52	55	44
R37	16 Quarter Sessions Road	54	56	47	54	53	52	55	44
S1	1860 Pittwater Road	70	**78**	69	75	**76**	73	**77**	65

Construction phase noise levels at nearby residences are expected to exceed the NMLs for most activities, and for some activities, one residence is "highly noise affected". The commercial receiver near to the works are also expected to be impacted and "highly noise affected" during some activities where works are occurring at the north-eastern end of the site.

6.4 Construction noise mitigation options

As construction noise is predicted to exceed the daytime NML at a number of receivers, in accordance with the ICNG, the proponent or contractor should:

- Apply all feasible and reasonable work practices to meet the noise affected level.
- Inform all potentially impacted residences of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Table 10 outlines a number of techniques and options for controlling construction noise and vibration, where considered reasonable and feasible. Where actual construction activities differ from those assessed in this report, more detailed design of noise control measures may be required once specific items of plant and construction methods have been chosen and assessed on site.

Table 10 Construction noise and vibration management options

Construction Noise and Vibration Management Options	
Source controls	
Time constraints	Limit work to daylight hours. Consider implementing respite periods with low noise/vibration-producing construction activities.
Scheduling	Perform noisy work during less sensitive time periods.
Equipment restrictions	Select low-noise plant and equipment. Ensure equipment has quality mufflers installed.
Emission restrictions	Establish stringent noise emission limits for specified plant and equipment. Implement noise monitoring audit program to ensure equipment remains within specified limits.
Substitute methods	Use quieter and less vibration emitting construction methods where possible. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts.
Limit equipment on site	Only have necessary equipment on site.
Limit activity duration	Where possible, concentrate noisy activities at one location and move to another as quickly as possible. Any equipment not in use for extended periods during construction work should be switched off.
Equipment Location	Noisy plant and equipment should be located as far as possible from noise sensitive areas, optimising attenuation effects from topography, natural and purpose built barriers and materials stockpiles.
Site access	Vehicle movements outside construction hours, including loading and unloading operations, should be minimised and avoided where possible.
Equipment maintenance	Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the design specifications.

Construction Noise and Vibration Management Options	
Reduced equipment power	Use only necessary size and power.
Quieter work practices	For example, implement worksite induction training, educating staff on noise sensitive issues and the need to make as little noise as possible.
Reversing alarms	Consider alternatives, such as manually adjustable or ambient noise sensitive types ("smart" reversing alarms) and closed circuit TV systems.
Path controls	
Noise barriers	Consider installing temporary construction noise barriers. Locate equipment to take advantage of the noise barriers provided by existing site features and structures, such as embankments and storage sheds.
Project Planning	Construction should be programmed so that noise barriers or mounding required to control noise are built as soon as possible.
Enclosures	Install noise-control kits for noisy mobile equipment and shrouds around stationary plant, as necessary.
Increased distance	Locate noisy plant as far away from noise-sensitive receptors as possible.
Site access	Select and locate site access roads as far away as possible from noise-sensitive areas.
Receptor controls	
Consultation	Community consultation, information, participation and complaint responses are essential aspects of all construction noise management programs. They typically involve: • A community information program before construction and/or high risk activities are commenced. This usually involves a leaflet distribution and direct discussions and negotiations with affected residents, explaining the type, time and duration of expected noise emissions. • The involvement of affected residents in the development of acceptable noise management strategies. • A nominated community liaison officer with a contact telephone number. • A complaints hotline. • Timely responses to complaints, providing information on planned actions and progress towards the resolution of concerns.
Noise / Vibration Monitoring	Noise and vibration monitoring at sensitive receiver or to address complaints.

There is one residence, 3 McCarrs Creek Road, that is predicted to experience noise levels above 75dB(A) and be "highly noise affected". Where a property is highly noise affected, the ICNG recommends that respite periods be offered, taking into account:

- times identified by the affected community when they are less sensitive to noise,
- if the community is prepared to accept a longer overall period of construction in exchange for restrictions on construction times.

6.5 Construction vibration

The nearest residential building is approximately 25m from the proposed construction works. The equipment with the ability to generate the greatest vibration is a vibratory roller. Cosmetic damage with a vibratory roller is very unlikely at 25m. Human comfort vibration levels (felt vibration) can sometimes be exceeded at 25m if a large vibratory roller is used, however large rollers are usually reserved for large scale road projects, which this is not. We therefore do not expect felt vibration to be an issue.

All other construction plant and equipment are not predicted to have any adverse reactions with respect to vibration.

7 Conclusion

Renzo Tonin & Associates have completed a noise and vibration assessment of the proposed McCarrs Creek Road car park and road realignment at Church Point. Operational noise has been assessed, along with noise and vibration associated with the project construction activities.

The findings of this study are:

Car park operational noise

- Based upon the assumed usage of the car park, unmitigated noise from general usage of the car park is predicted to comply with the daytime noise goal for all residential receivers.
- Unmitigated noise from general usage of the car park is predicted to exceed the evening noise goal by up to 8dB(A) at the nearest residence.
- Mitigation in the form of an acoustic screen at the rear of the car park was investigated but found to be not feasible. Post construction noise monitoring and operational management the first floor of the car park have been discussed as an alternative.
- Sleep disturbance is unlikely during any night time use of the car park.

McCarrs Creek Road realignment

- While some residences may experience a small increase in road traffic noise due to the road realignment, traffic noise is predicted to comply with the NSW Road Noise Policy at all properties.

Construction noise and vibration

- Construction noise is likely to exceed the construction noise management levels. All reasonable and feasible noise mitigation shall be applied during the construction phase. Noise mitigation options have been discussed.
- Vibration from the construction works is not expected to cause any structural damage or generate any adverse comment from residents.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.

L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Noise Monitoring Methodology

B.1 Noise Monitoring Equipment

A noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Type	Octave Band Data
RTA05 (NTi Audio XL2)	Type 1	1/1 octaves

Notes: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table, and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Bruel & Kjaer Type 4230 or 4231 calibrator. No significant drift in calibration was observed.

B.2 Meteorology during Monitoring

Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the INP. The Bureau of Meteorology (BOM) provided meteorological data, which is considered representative of the site, for the duration of the noise monitoring period. The data was modified to allow for the height difference between the BOM weather station, where wind speed and direction is recorded at a height of 10m above ground level, and the microphone location, which is typically 1.5m above ground level (and less than 3m). The correction factor applied to the data was taken from *Australian Standard AS1170.2 1989 Section 4.2.5.1*.

B.3 Noise vs Time Graphs

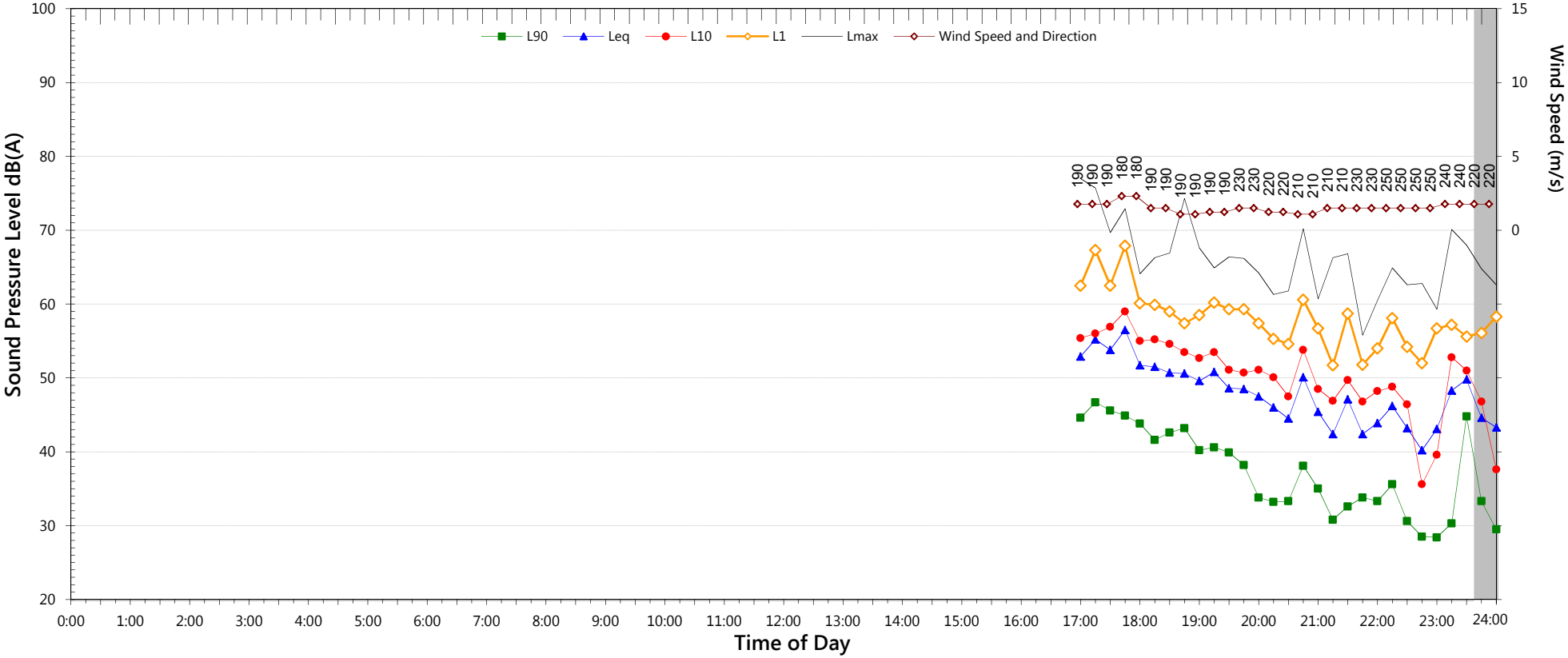
Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the $\mathbf{L_{10}}$, $\mathbf{L_{90}}$, and $\mathbf{L_{eq}}$ levels. The statistical descriptors $\mathbf{L_{10}}$ and $\mathbf{L_{90}}$ measure the noise level exceeded for 10% and 90% of the sample measurement time. The $\mathbf{L_{eq}}$ level is the equivalent continuous noise level or the level averaged on an equal energy basis. The measurement sample periods are were fifteen minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband results.

APPENDIX C Measured Noise Data

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Monday, 11 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	43.8	32.6	28.4
Leq	54.3	48.4	45.1

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

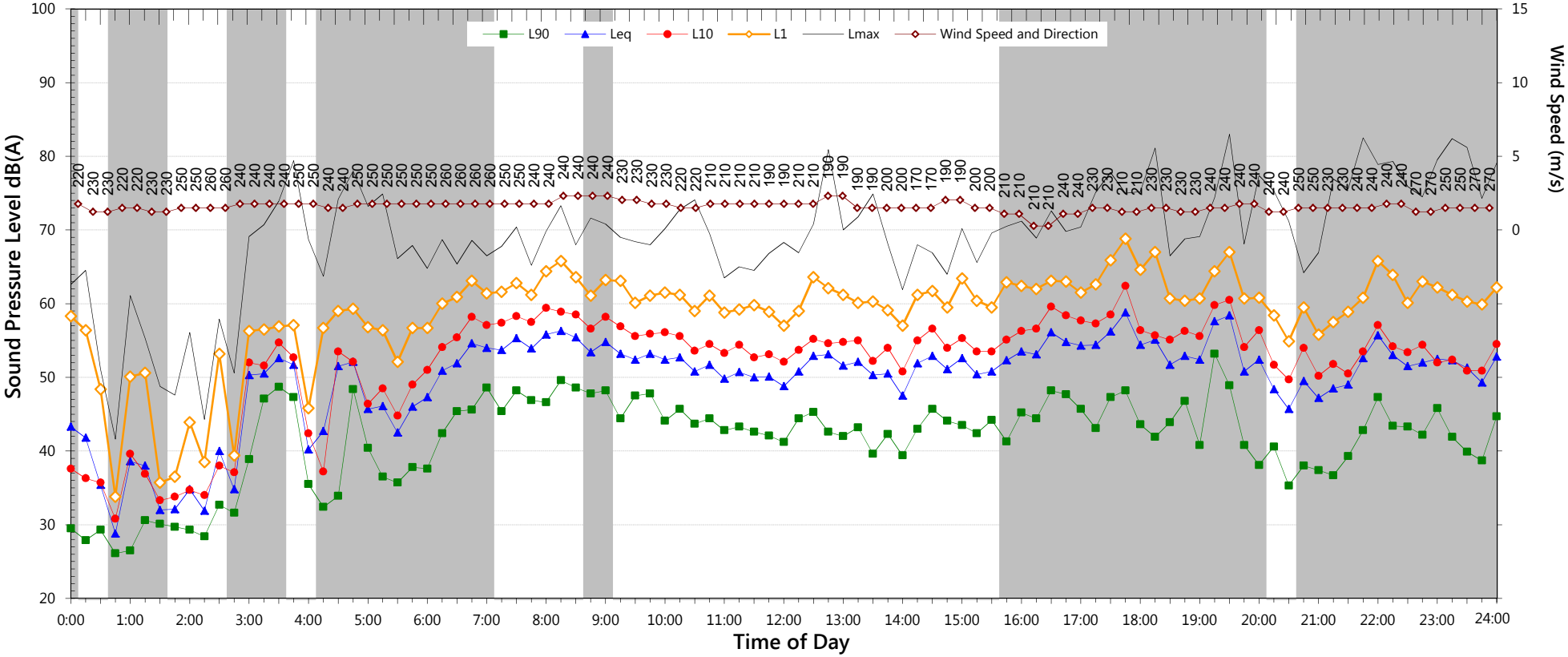
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	53.2	47.6
$L_{eq\ 1hr}$ upper 10 percentile	57.1	51.6
$L_{eq\ 1hr}$ lower 10 percentile	46.9	36.2

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	70.1	to	79.4
Lmax - Leq (Range)	20.3	to	30.4

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Tuesday, 12 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	42.0	35.3	29.5
Leq	52.5	47.3	47.4

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

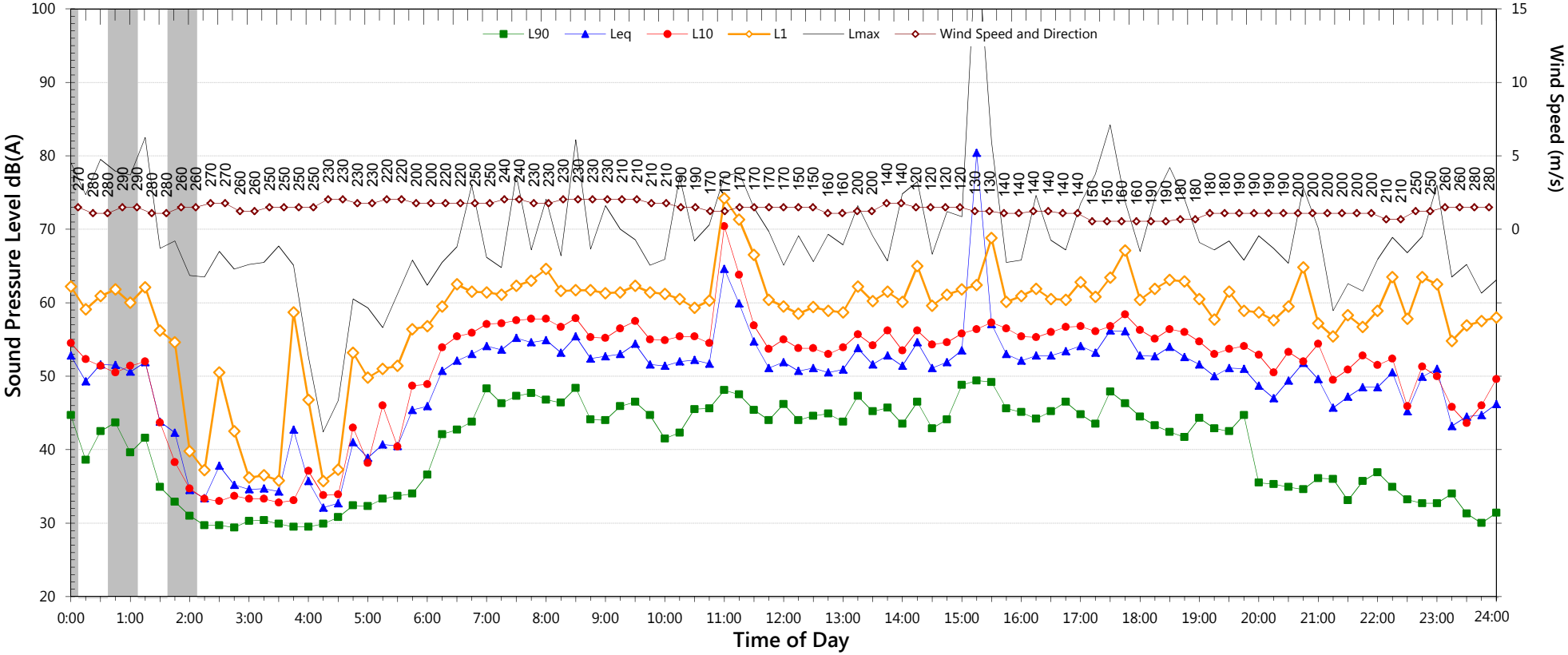
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	54.8	49.9
$L_{eq\ 1hr}$ upper 10 percentile	58.4	55.1
$L_{eq\ 1hr}$ lower 10 percentile	49.8	38.1

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	65.8	to	82.5
Lmax - Leq (Range)	22.0	to	33.0

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Wednesday, 13 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	43.5	34.6	29.9
Leq	64.4	50.5	46.2

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

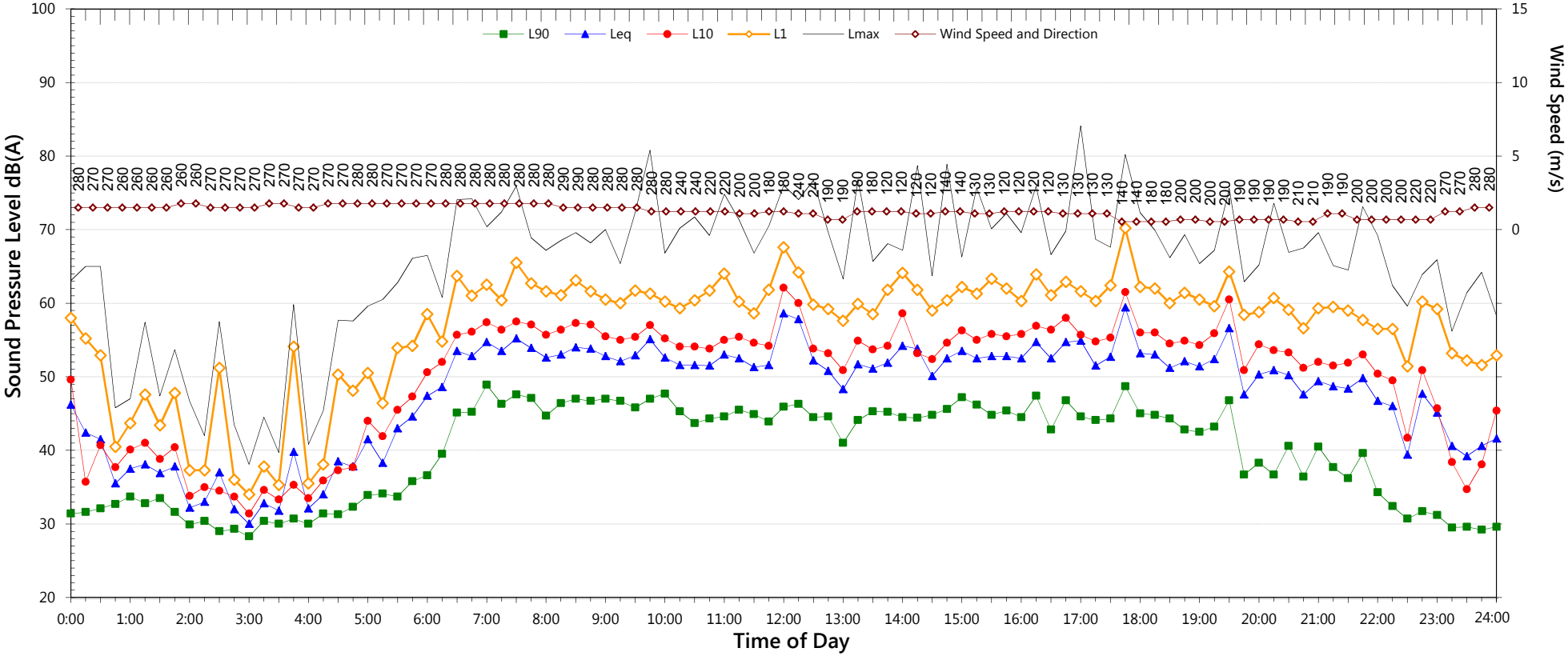
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	65.7	48.7
$L_{eq\ 1hr}$ upper 10 percentile	74.0	55.4
$L_{eq\ 1hr}$ lower 10 percentile	51.3	36.3

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	65.0	to	76.0
Lmax - Leq (Range)	20.4	to	26.4

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Thursday, 14 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	44.1	36.2	29.5
Leq	53.6	51.2	45.2

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

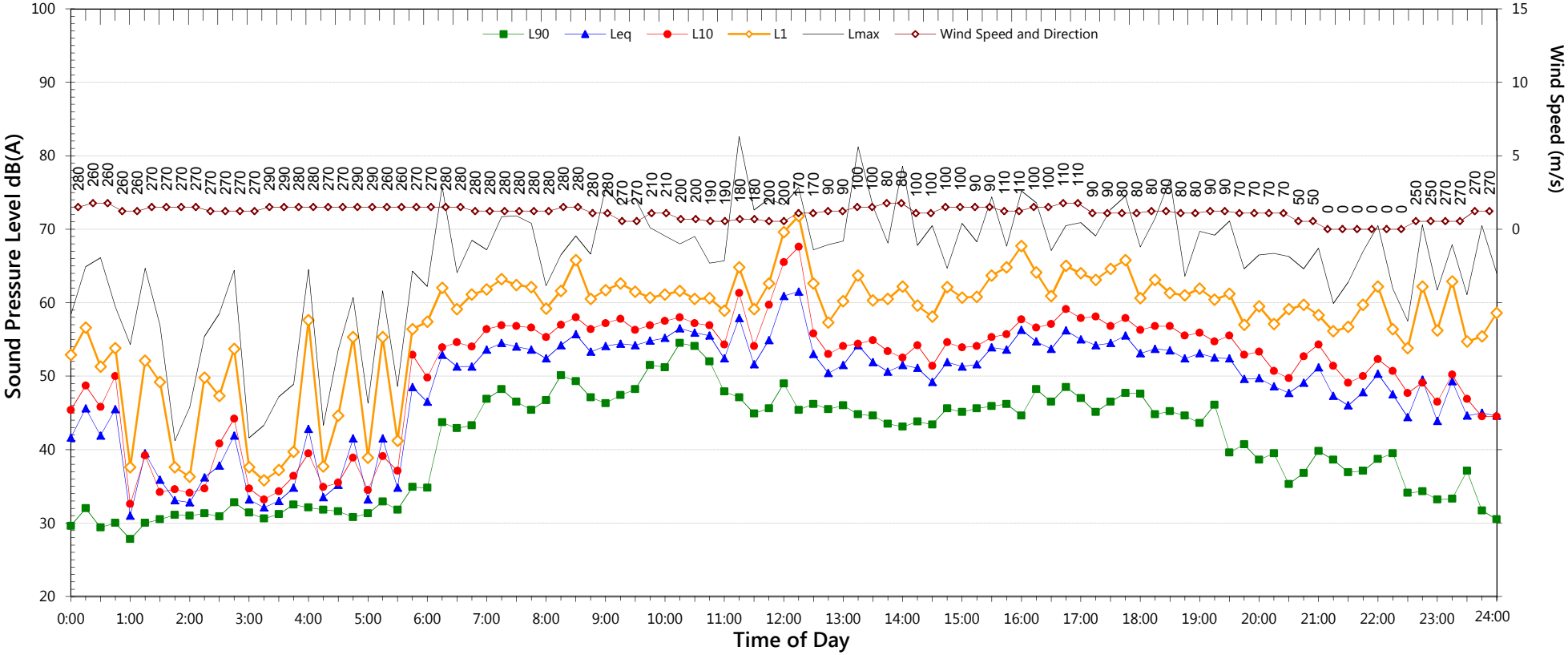
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	55.6	47.7
$L_{eq\ 1hr}$ upper 10 percentile	57.6	54.9
$L_{eq\ 1hr}$ lower 10 percentile	51.7	38.7

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	65.9	to	75.8
Lmax - Leq (Range)	19.1	to	28.5

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Friday, 15 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	44.6	36.8	31.1
Leq	54.8	50.9	44.5

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

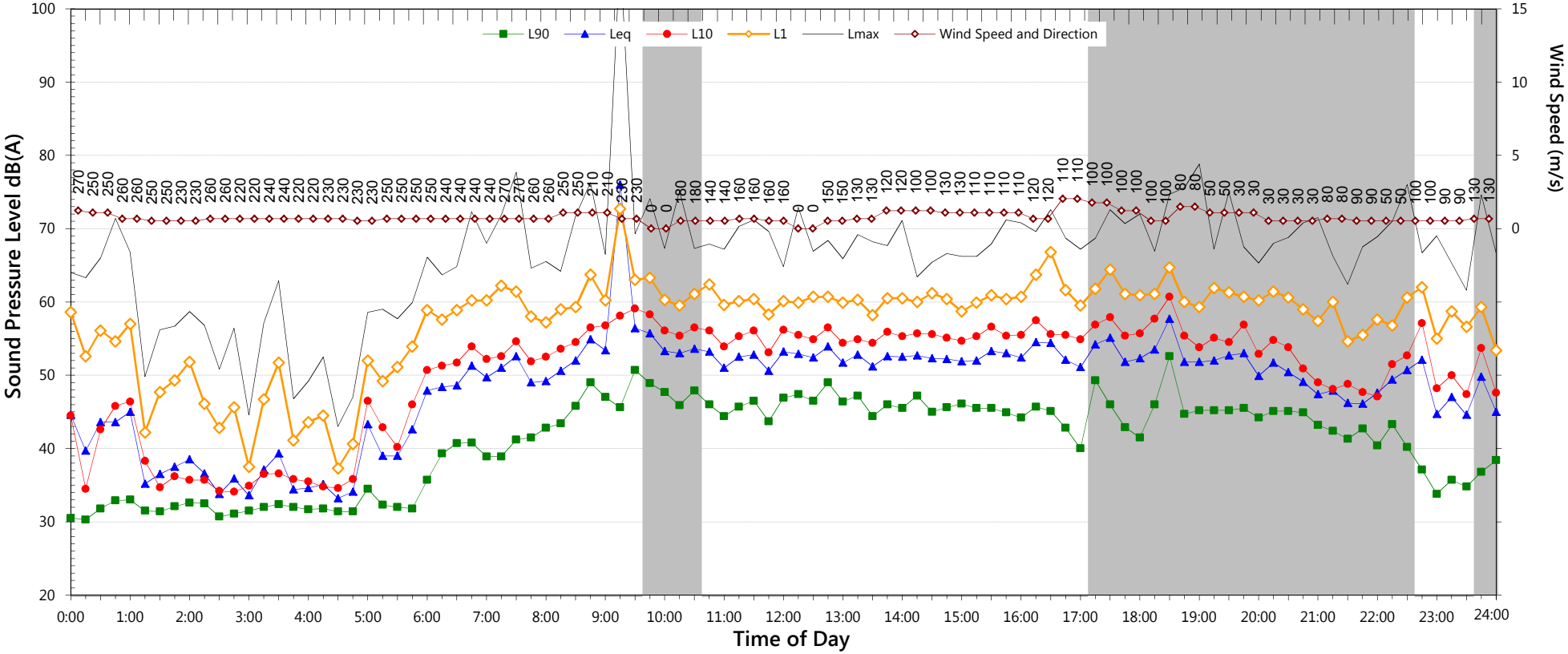
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	56.6	47.0
$L_{eq\ 1hr}$ upper 10 percentile	59.7	52.2
$L_{eq\ 1hr}$ lower 10 percentile	51.3	37.7

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	66.1	to	72.3
Lmax - Leq (Range)	20.0	to	28.0

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Saturday, 16 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	41.5	-	33.8
Leq	61.1	-	48.0

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

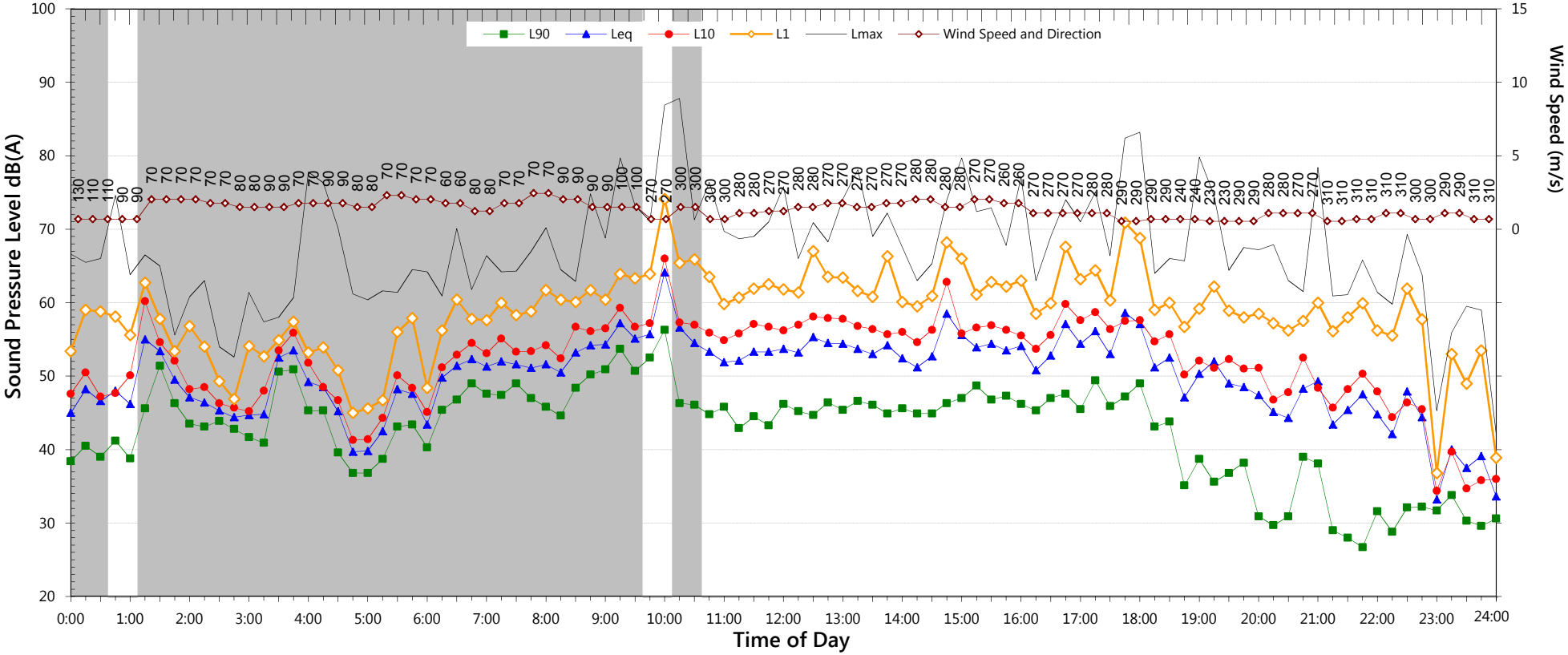
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	63.6	50.5
$L_{eq\ 1hr}$ upper 10 percentile	75.5	52.3
$L_{eq\ 1hr}$ lower 10 percentile	53.2	48.5

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	65.3	to	74.6
Lmax - Leq (Range)	19.2	to	27.4

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Sunday, 17 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	44.7	28.0	25.8
Leq	55.5	48.7	46.8

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

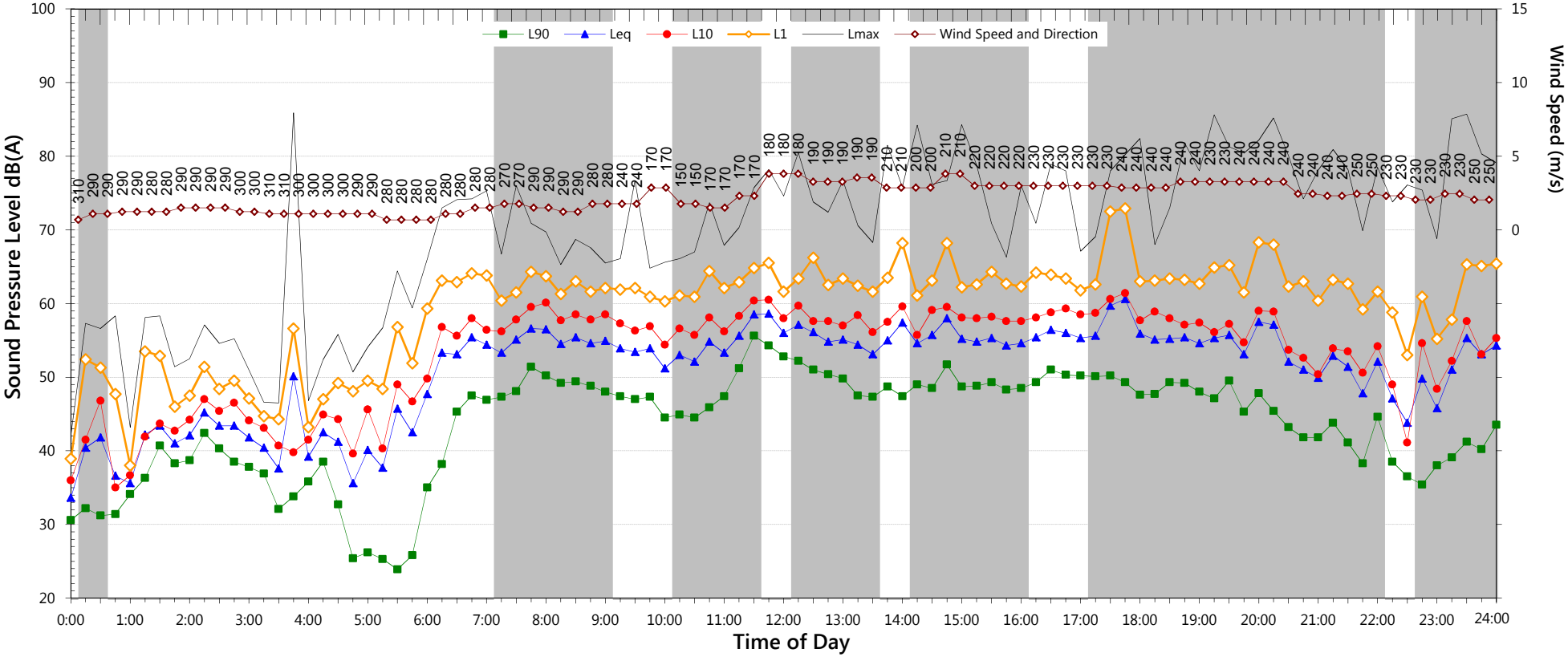
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	56.7	49.3
$L_{eq\ 1hr}$ upper 10 percentile	63.2	56.7
$L_{eq\ 1hr}$ lower 10 percentile	48.6	38.6

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	66.0	to	85.9
Lmax - Leq (Range)	15.3	to	40.9

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Monday, 18 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	47.0	-	36.5
Leq	55.6	-	51.0

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

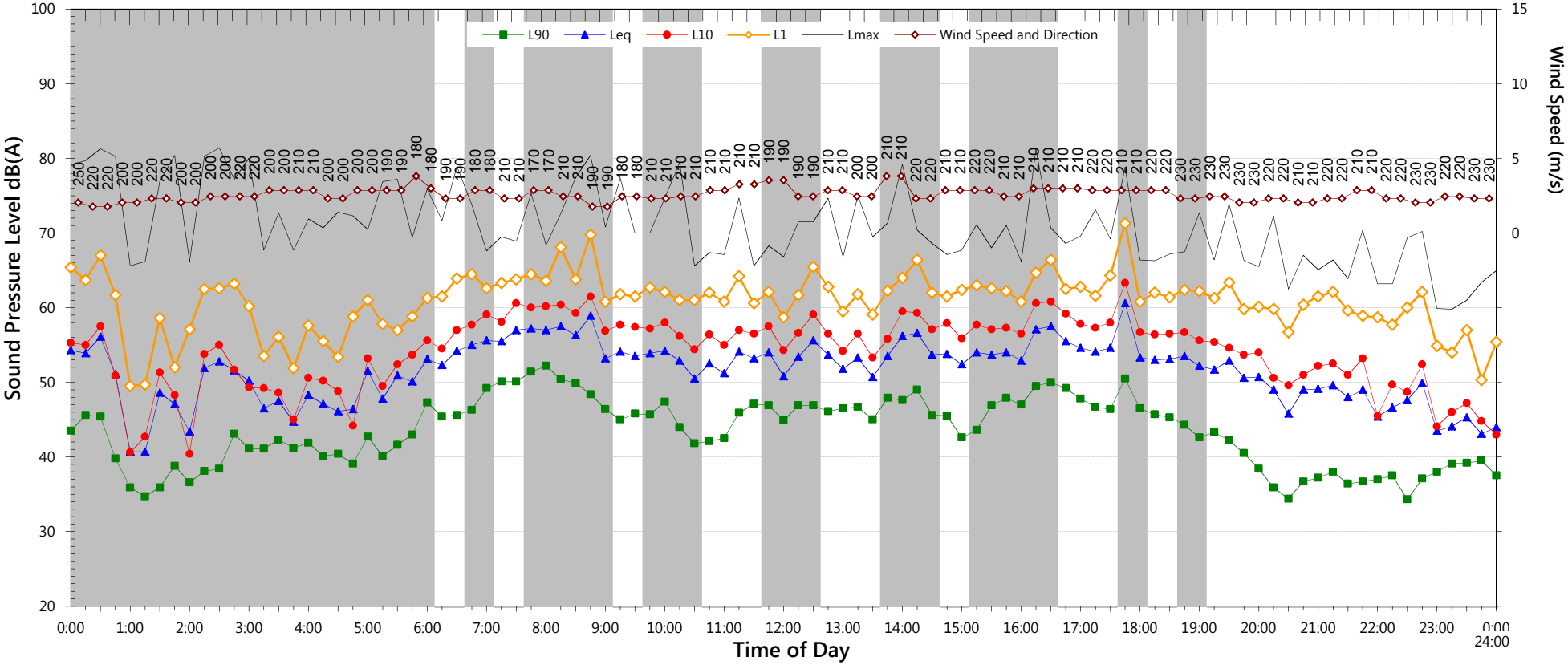
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	58.1	53.5
$L_{eq\ 1hr}$ upper 10 percentile	60.0	55.9
$L_{eq\ 1hr}$ lower 10 percentile	55.7	48.3

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	76.1	to	78.9
Lmax - Leq (Range)	25.5	to	30.3

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Tuesday, 19 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	42.5	35.9	37.5
Leq	53.9	50.4	46.7

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

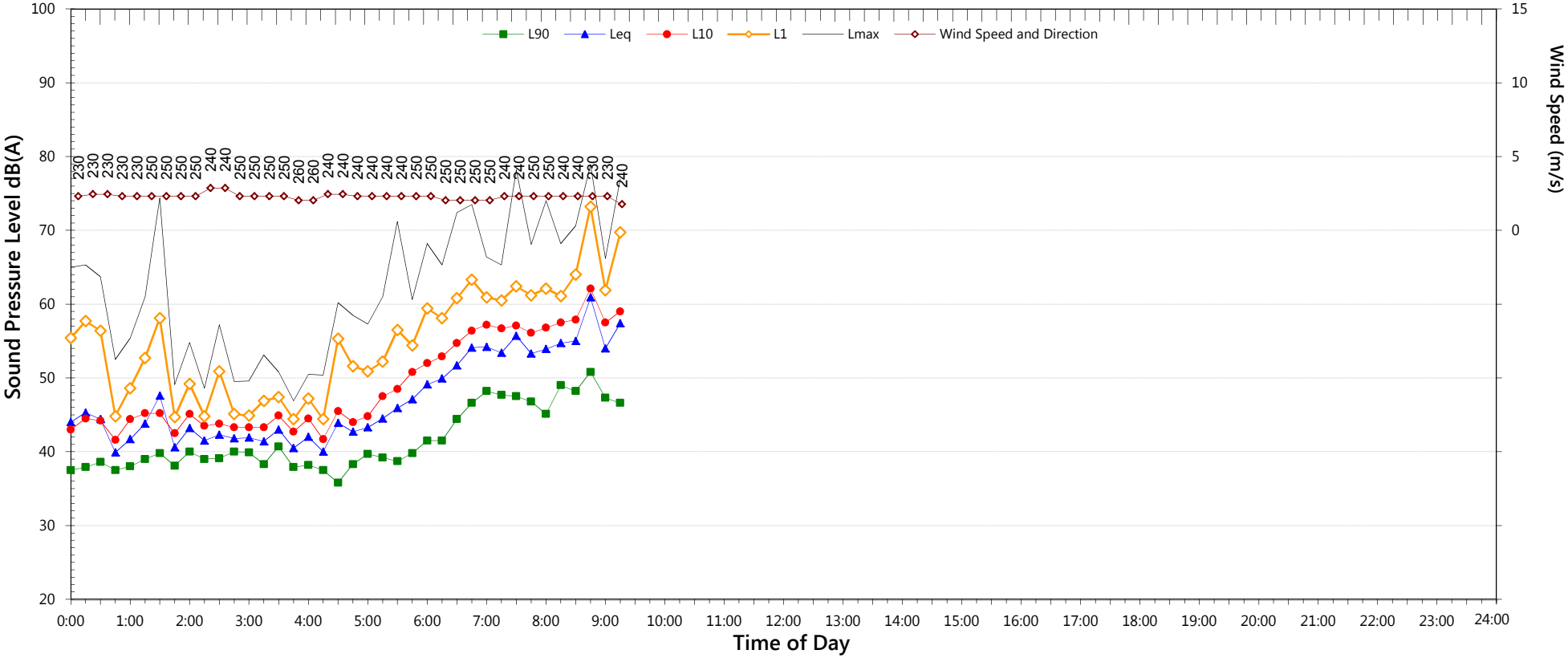
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	55.2	49.2
$L_{eq\ 1hr}$ upper 10 percentile	58.5	55.3
$L_{eq\ 1hr}$ lower 10 percentile	50.8	44.3

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	65.0	to	74.4
Lmax - Leq (Range)	15.3	to	29.9

Unattended Noise Monitoring Results

McCarrs Creek Road, Church Point

Wednesday, 20 August 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	45.1	-	-
Leq	56.1	-	-

NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured in free-field; tabulated results facade corrected

4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	58.6	-
$L_{eq\ 1hr}$ upper 10 percentile	59.9	-
$L_{eq\ 1hr}$ lower 10 percentile	56.7	-

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	-	to	-
Lmax - Leq (Range)	-	to	-

APPENDIX C

TRAFFIC ASSESSMENT

MCCARRS CREEK ROAD TRAFFIC IMPACT ASSESSMENT

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PITTWATER COUNCIL

MCCARRS CREEK ROAD CAR PARK

Traffic Impact Assessment

Author	S Manahan	
Checker	Kate Wiggins	
Approver	Kate Wiggins	

Report No

Date 24 October 2014

This report has been prepared for Pittwater Council in accordance with the terms and conditions of appointment for McCarrs Creek Road Car Park dated 2014. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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1 INTRODUCTION

1.1 BACKGROUND

Pittwater Council (Council) is seeking approval under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) to undertake an activity including the realignment of McCarrs Creek Road and construction of car park and sea wall (the Proposal) at Church Point.

Church Point is a local and regional transport node and tourist destination. It essentially provides services to residents who live on Scotland Island and the western foreshores. The offshore communities use Church Point as a vital connection to the mainland and facility for vehicle parking, local services and a social meeting place.

Church Point provides community access to Pittwater and the Ku-ring-gai Chase National Park and supports a number of local businesses. The area functions as an interchange for boats and vehicles for the offshore residents as well as local residents and visitors. On-shore communities generally value the recreational resource of the area and its connectivity with the established foreshore walkway to Mona Vale.

The divergent interests of the off-shore and on-shore communities has triggered management issues at Church Point. Hence, the Plan of Management has been prepared to establish a vision and development strategy for the natural and built environment and infrastructure requirements that considers the needs of all stakeholders and the role of Church Point as a transport interchange. The Plan of Management is expected to facilitate the effective management and resolution of conflicts over the use of the area.

A Master Plan has been finalised for Church Point to form the basis for the Plan of Management. The master plan has been formulated through a community based design forum and establishes the need to accommodate both carparking and water access needs with the provision of high quality recreational space.

Figure 1 Church Point Masterplan

At Church Point there are currently three groupings of facilities that are defined by precincts:

- Precinct One – incorporating McCarrs Creek Road. McCarrs Creek Road extends west from Rosstrevor Reserve to Ku-ring-gai Chase National Park, rising up behind HolmePort Marina;
- Precinct Two – Thomas Stevens Reserve and associated public wharves; and
- Precinct Three – Church Point Reserve and the historic Cementery site.

Pittwater Council has been developing a concept design for Precinct One to provide additional long term and commuter parking and wharfing facilities to service the residents of Scotland Island and to free up existing parking for visitors to the area.

The limited available vehicle parking has increased the number of adhoc vehicle parking spaces which in turn creates unsafe conditions for both traffic and pedestrians.

The Proposal contained in this report is associated with the concept development of Precinct One.

1.2 THE PROPOSAL

The construction of the new carpark on McCarrs Creek Road will provide additional long term and commuter parking to service residents of Scotland Island as well as freeing up existing parking for visitors to the area.

The proposal involves the following:

- Construction of new seawall and reclamation of land;
- Realignment of McCarrs Creek Road over reclaimed ground between the Church Point Ferry Wharf and Rosstrevor Reserve;
- Provision of street level parking along with an additional structural level constructed over the top. This would provide a total of 120 additional car spaces established next to the base of cliff line, with entry and exit off McCarrs Creek Road; and
- Provision of a new boardwalk to cater for pedestrians. The new boardwalk would form part of the recently upgraded commuter wharf.

1.3 PURPOSE OF THIS REPORT

This Traffic Impact Assessment has been prepared to support a Review of Environmental Factors in association with the above proposal.

This report outlines a summary of current traffic management context and potential traffic impacts associated with the construction and operation of the Proposal.

2 EXISTING CONDITIONS

2.1 TRAFFIC VOLUMES ALONG MCCARRS CREEK ROAD

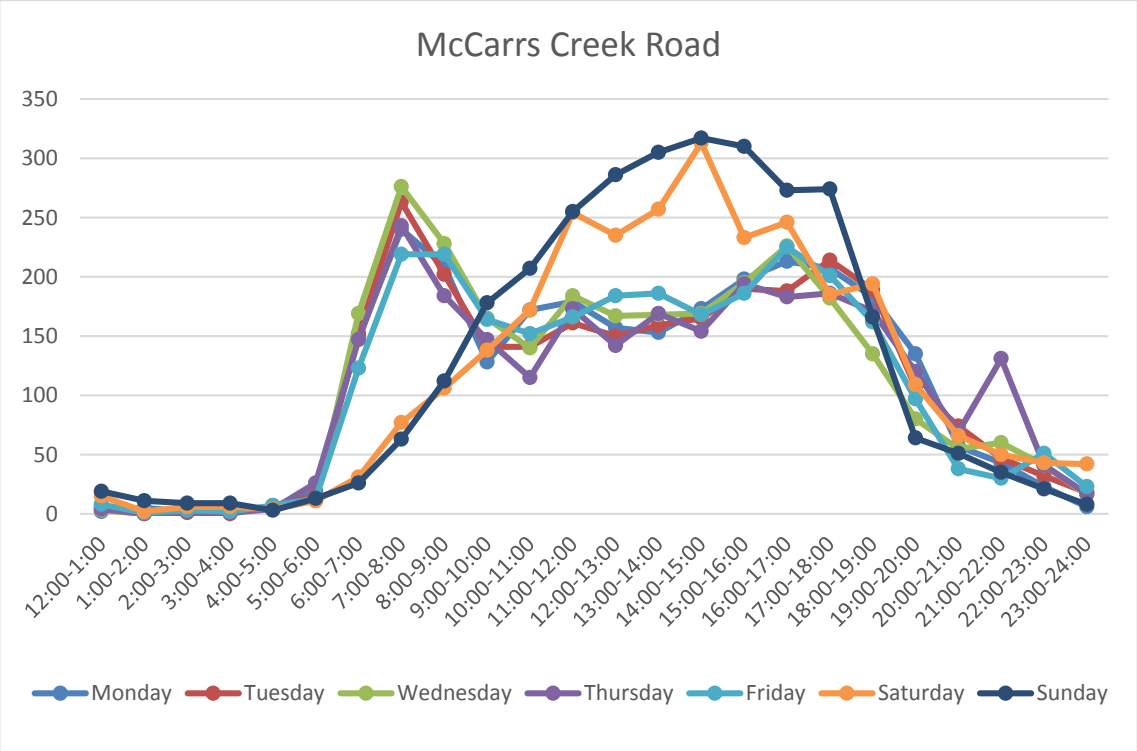
McCarrs Creek Road, is a local road under the care and control of Pittwater Council. It is connected to Pittwater Road at its eastern end and Mona Vale Road at its western end. McCarrs Creek Road performs the function of a collector road, providing access to Church Point and the adjoining local road network. McCarrs Creek Road has one traffic lane in either

direction and has a sign-posted speed limit of 60km/h. McCarrs Creek Road is estimated to be currently carrrying an average annual daily traffic volume of approximately 2,719 vehicles per day.

Traffic data obtained from Pittwater Council provide an indication of the traffic volumes along McCarrs Creek Road. The observed traffic volumes (March 2014) is shown in Figure 2.

The bidirectional peak traffic volume was observed to occur at 7:00-8:00 a.m. averaging 179 vehicles per hour on a weekday. The afternoon peak was slightly higher, averaging 222 vehicles per hour on a weekday and occurring 4:00-5:00 p.m. From the traffic counts, it was observed that the morning peak is attributable to vehicles travelling southwest in the direction towards the CBD while the afternoon peak is due mainly to traffic flow in the northeast direction. Weekend peak traffic, averaging 315 vehicles per hour, was observed to be higher than weekday traffic and occurring at 2:00-3:00 p.m.

Figure 2 Hourly Traffic Volumes, McCarrs Creek Road



2.2 ROAD SEGMENT (MID-BLOCK) OPERATION

Although the capacity of the urban roads is generally determined by the capacity of the intersection, the assessment of mid-block lane capacity is essential to provide indication of the ability of the approach roads to carry additional traffic for strategic planning purposes. Table 1 provides the typical roadway capacities for urban streets with interrupted flows. Peak period mid-block capacities may increase to 1,200 -1,400 vehicles per lane per hour when certain conditions exists such as when there are adequate flaring at major intersections, control and absence of parking, control or absence of right turns at difficult intersections, etc.

Table 1 Typical Mid-block Capacities for Urban Streets

Type of Lane	One-way mid-block capacity (vph*)
Median or inner lane	

Type of Lane	One-way mid-block capacity (vph*)
- Divided road	1,000
- Undivided Road	900
Middle lane (of a 3-lane carriageway)	
- Divided road	900
- Undivided Road	1,000
Kerb lane	
- Adjacent to parking lane	900
- Occasional parked vehicles	600
Clearway conditions	900

Source: AUSTROADS Guide to Traffic Management – Part 3: Traffic Studies and Analysis
**vph = vehicle per hour*

Level of Service is used as a performance standard to assess effect of a development proposal on the traffic efficiency of the road network. The AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity* defines level of service as a qualitative measure describing operational conditions within a traffic stream. The term Level of Service (LOS) and its characteristics is defined in Table 2.

Table 2 Roads Levels of Service (LOS) Descriptions

LOS	Description	VCR Ratio
A	Primarily free flow operations at average travel speeds, usually about 90% of the FFS (free flow speed) for the given street class. Vehicles are completely unimpeded in their ability to manoeuvre within the traffic stream. Control delay at signalised intersections is minimal.	0.00 to 0.34
B	Reasonably unimpeded operations at average travel speeds, usually about 70% of the FFS for the street class.	0.35 to 0.50
C	Stable operations; however, ability to manoeuvre and change lanes in mid-block locations may be more restricted than at LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50% of the FFS for the street class.	0.51 to 0.74
D	A range in which small increases in flow may cause substantial increases in delay and decreases in travel speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or a combination of these factors. Average travel speeds are about 40% of FFS.	0.75 to 0.89
E	Characterised by significant delays and average travel speeds of 33% of the FFS or less. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.	0.90 to 0.99

LOS	Description	VCR Ratio
F	Characterised by urban street flow at extremely low speeds, typically 25% to 33% of the FFS. Intersection congestion is likely at critical signalised locations, with high delays, high volumes, and extensive queuing.	1.0 or greater

Source: Austroads Guide to Traffic Engineering Practice, Part 2

McCarrs Creek Road is estimated to have a mid-block capacity of 1,800 vehicles per hour. With an average peak of up to 315 vehicles per hour (weekend average peak traffic volume), the volume to capacity ratio is calculated to be 0.175. As such, McCarrs Creek Road is operating at the level of service “A”.

2.3 PARKING

There is an existing small off-road car park with provision for 10 spaces with approximately 23 spaces along McCarrs Creek Road, either parallel or angled parked. Car parking spaces are generally utilized by off-shore residents supplementing parking at the Church Point Reserve car park.

Church Point Reserve (approximately 150 metres to the east of the site) is currently the only practical location to meet the parking needs of visitors to Church Point and the majority off-shore residents. Church Point Reserve currently provides the majority of the parking for the locality with further parking along the road edges in the vicinity.

Daily carparking demands generally exceed available spaces and car spaces 'have been lost' over the years to address safety and parking standards requirements.

2.4 PUBLIC TRANSPORT

There is limited public transport services at McCarrs Creek Road. A State Transit Authority (STA) bus service operates daily with limited services. A ferry service operating from Church Point Ferry wharf services offshore residents and visitors. However, the ferry and bus service timetables do not coincide and hence resulting significant transfer time. Alternate options include use of private taxi cabs or walking to Mona Vale (approximately 4 kilometres to the southeast of the site) and connection with STA services. The existing public transport system is not sufficient to encourage reduced dependency on private car use.

2.5 PEDESTRIAN AND CYCLIST FACILITIES

There are limited existing pedestrian and cyclist facilities, most of which are patchy and disconnected. McCarrs Creek Road is regularly used by recreational cyclists travelling to and from Ku-ring-gai National Park in the west and towards Mona Vale in the east.

3 IMPACT OF THE PROPOSED ENHANCEMENT WORKS

This section summarises the traffic generation expected from the proposed development, and examines the traffic implications with respect to the road network in terms of traffic efficiency.

3.1 CONSTRUCTION STAGING

Traffic volumes expected to be generated by construction employees and by materials delivery would vary depending on the construction phasing and methodology. The traffic movements assumed in this analysis is based on the assumption that substantial volumes of aggregate and other materials will need to be imported. Hence, the calculated traffic volumes will represent the worst-case scenario.

The sequencing of construction activities is as follows:

- Site Clearance and Establishment
- Land reclamation and sea wall construction

Land reclamation is a significant activity due to the additional area required to house both parking and the realigned McCarrs Creek Road. Despite maintaining approximate existing and proposed road levels, earthworks are significant to fill between the existing sea wall and its realignment.

- Sea Wall realignment

Sea wall realignment works are also considerable and carry the major cost, due to the complexities associated with constructing a contiguous piled wall below the water level.

- Installation of relocated and new services
- New road pavement construction and associated road works
- Car park pavement and ancillary works
- Landscaping

3.2 CONSTRUCTION HOURS

Standard hours of construction for the duration of the construction program are anticipated to be between 7:00 am and 6:00 pm, Monday to Friday and 7:00 am to 4:00 on Saturday, excluding public holidays.

3.3 CONSTRUCTION ACCESS

The main access to the site would be via McCarrs Creek Road. The new alignment would be built off line, then traffic switched to the new alignment whilst the car park is constructed on the present alignment next to the escarpment.

Temporary use of traffic lanes and/or road occupancy may be required along McCarrs Creek Road. Should this be required, traffic control measures specified in “AS1742.3: 2002 Traffic Control Devices for Works on Roads” and the RMS’s “*Traffic Control at Work Sites*” will be provided to ensure impacts on road safety are minimised and to warn road users in advance of the change in traffic conditions.

3.4 CONSTRUCTION TRAFFIC GENERATION

The main traffic generated through the construction phase would be from equipment and material deliveries, such as:

- Delivery of Construction materials;

- Spoil Removal;
- Delivery and removal of construction equipment and machinery;
- Movement of construction personnel, including contractors, site labour force and specialist supervisory personnel.

3.4.1 LIGHT VEHICLE

Light vehicle traffic generation would be associated with:

- Workforce attendance of approximately 15-10 personnel on an ordinary hour shift;
- Trades vehicles attending to the site for light fabrication and equipment servicing
- Emergency services, if required.

It is assumed the majority of the workforce would arrive between 6:30 am and 7:00 am and depart generally between 5:00 pm and 5:30 pm. The workforce arrival and departure periods represent the peak construction traffic generation periods. It is likely that the construction traffic generation peak periods would occur outside the existing road network AM and PM peak hours.

Over the full construction period, the peak construction workforce is estimated to be approximately 20 persons. Based on the characteristics of the project route, it is assumed there would be a typical car driver ratio of 100%. Application of this car driver rate to an assumed worst case scenario workforce yields a traffic generation in the order of 40 light vehicles a day, 20 0f these are anticipated during each of the morning and afternoon peak hours.

During the construction traffic peak periods, the workforce traffic movements are likely to be distributed based on a 100/0 split between arrivals and departures during the morning peak period, and the reverse during the afternoon peak period.

3.4.2 HEAVY VEHICLE TRAFFIC

Heavy vehicle traffic is not expected to be high and will generally consist of:

- Earthmoving equipment such as bulldozers, off-highway haul trucks, front-end loaders, graders, rollers, excavators and backhoes;
- Ready mixed concrete deliveries;
- Large quarrying equipment, including crushers, conveyors and screening plant plus generators to power the crusher;
- Clay and sand deliveries;
- Cement deliveries; and,
- Progressive removal of equipment and construction equipment.

The average number of heavy vehicles per day is approximately 1-2 trucks per day with a maximum number of truck loads of 6 trucks per day.

3.4.3 ESTIMATED TOTAL VEHICLE MOVEMENTS

In summary, it is estimated that approximately 20 light vehicle movements and 2 heavy movements may occur during the peak hour

3.5 CONSTRUCTION TRAFFIC IMPACT

During construction, minor disruption to traffic and accessibility would be experienced. In addition, a minor temporary increase in traffic may occur from construction and worker vehicles

The volume to capacity ratios have been used to represent the degree to which the existing road network is meeting its design capacity within the adopted road hierarchy. The additional traffic flows on the road network as a consequence of the proposed construction works has been added to existing peak hour traffic flows and the results indicate that the increase in traffic is minor in terms of road congestion and design capacity and that the additional traffic demand on the external road network is not at a level normally associated with unacceptable traffic implications in terms of road network capacity.

When the realignment works on McCarrs Creek Road will be carried out, the existing road will continue to operate. Delays in travel time may be experienced due to localised reduction in speed limits and use of detours where required. Traffic management measures will be put in place to ensure there is minor impact on the operations of the existing road.

3.6 OPERATIONAL TRAFFIC IMPACT

The new carpark will provide an additional 120 parking spaces. The carpark will accommodate existing users of the current facilities and additional users. Traffic generated by the new carpark is not expected to result in significant increase in traffic on McCarrs Street nor is it anticipated to result in congestion or deterioration of traffic conditions.

4 MITIGATION

A construction traffic management plan would be prepared in consultation with RMS and Pittwater Council as part of the CEMP and would include the following measures to manage potential impacts on the traffic and transport network:

- In consultation with RMS and Council, general signposting of McCarrs Creek Road in the immediate vicinity of the site with appropriate heavy vehicle and construction warning signs;
- If temporary road closures are required, traffic control measures specified in AS1742.3: 2002 Traffic Control Devices for Works on Roads and the RMS's *Traffic Control at Work Sites* would be detailed in a traffic control plan and subsequently implemented;
- Development of a suitable vehicle detour route, if required for use during specific construction activities;
- Installation of specific warning and safety signs at entrances to the construction site to warn existing road users of entering and exiting construction traffic;
- Preparation of a pedestrian management plan that details measures to be implemented to minimise impacts on pedestrian movement and maintain pedestrian safety;
- Management of the transportation of construction materials to maximise vehicle loads to therefore minimise vehicle movements; and
- Inducting truck and vehicle operators on the requirements of the traffic management plan.

Implementation of a community information and awareness program would be an important measure to ensure the surrounding stakeholders are informed of changes to traffic conditions. This awareness program would be initiated prior to construction commencing and during the construction period to ensure that the local community are fully aware of the construction

activities with particular regard to construction traffic accessing the site. The awareness program shall identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction related matters.

5 SUMMARY AND CONCLUSIONS

The following conclusions are made based on the above investigations:

- The existing road conditions along McCarrs Creek Road is generally considered satisfactory to accommodate the additional number and type of vehicles likely to be generated by the construction works.
- The assessment of the additional traffic demand as a consequence of the construction works indicate that it would be minor when distributed on the surrounding road network and would not result in any adverse effects on the operational performance of the road and have minimal impact on the current network operations.
- Additional traffic demand on McCarrs Creek Road, as a consequence of the proposed development is not likely to have a significant impact on pedestrians and cyclists or public transport services.

Although it is anticipated that the impact may be insignificant in terms of road capacity, measures should be implemented to minimise the impact of truck movements on the existing road users.

APPENDIX D

QUANTITY SURVEY

McCarrs Creek Road

TOTAL SUMMARY

SECTION	AMOUNT
Option 1 (Friends of Church Point)	$5,455,000.00
Option 2 (Hyder Ground Floor)	$5,430,000.00
Option 3 (Hyder First Floor)	$7,276,000.00

Figures above include:-
OVERHEADS AND MARGIN
LONG SERVICE LEVY
PROFESSIONAL FEES
CONTINGENCY

Construction of Civil Works **DATE: 22nd April 2013**
For: Church Point Sydney **Contract No. Option 1 (Friends of Church Point)**
At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
1	**GENERAL**					
1.1	Site Establishment, incl portaloos within the work area, compound, maintenance of site facilities (site office, lunch room, change room), construction and maintenance of access tracks and roads, barriers, signage, storage, plant on site, etc	1	item	$70,000.00	$70,000.00	
1.2	Geotechnical inspection, Level 1 supervision, testing	1	item	$40,000.00	$40,000.00	
1.3	Survey and setout for all construction requirements	1	item	$30,000.00	$30,000.00	
1.4	Preparation of "As Built" Drawings	1	item	$10,000.00	$10,000.00	
1.5	Insurances	1	item	$40,000.00	$40,000.00	
1.6	Site de-establishment	1	item	$7,500.00	$7,500.00	
1.7	Provision for traffic management to McCarrs Creek Road					
1.7.1	Nightly close down works and make safe	1	item	$40,000.00	$40,000.00	
1.7.2	Daytime traffic & pedestrian management	1	item	$202,000.00	$202,000.00	
1.7.3	Equipment hire	1	item	$10,000.00	$10,000.00	
1.8	Site supervision	1	item	$198,000.00	$198,000.00	
1.9	QA Plan, OH&S management & SWMS, Programming	1	item	$15,000.00	$15,000.00	
1.10	Temporary Services	1	item	$5,000.00	$5,000.00	
	Subtotal General				**$667,500.00**	
2	**CLEARING AND DEMOLITION**					
2.1	Demolish and remove existing bollards	94	m	$75.00	$7,050.00	
2.2	Sawcut existing pavement	14	m	$25.00	$350.00	
2.3	Demolish and remove existing roadpavement from site	1540	sq.m	$15.00	$23,100.00	Assume removed road to be 220m long and 7m wide
2.4	Remove Street Lights	4	item	$1,500.00	$6,000.00	
2.5	Remove Road Signage	16	item	$150.00	$2,400.00	
	Subtotal Clearing and Demolition				**$38,900.00**	
3	**EROSION & SEDIMENT CONTROL**					
3.1	Sediment Fence	25	m	$18.00	$450.00	
3.2	Geotextile Filter Pit Surround	4	each	$150.00	$600.00	
3.3	Stabilised Site Access and Washdown Area	1	item	$3,500.00	$3,500.00	
3.4	Barrier Fence 1.8m high chainwire driven post ***(including Blue Shade Cloth)***	10	m	$80.00	$800.00	
	Subtotal Erosion & Sediment Control				**$5,350.00**	
4	**EARTHWORKS**					
4.1	Compacted backfill material to make up levels to road and carpark formation level. Class II to AS 4678	6938	cu.m	$93.00	$645,234.00	Material to be suitable engineered fill imported from off-site
	Subtotal Earthworks				**$645,234.00**	
5	**PAVEMENT**					
5.1	**McCarrs Creek Road**					
5.1.1	Construct Pavement Type 2 consisting of:					
5.1.1.1	50mm AC10 Class 320	1430	sq.m	$36.00	$51,480.00	
5.1.1.2	2 coat seal with 10mm aggregate ***Poly Modified***	1430	sq.m	$8.50	$12,155.00	
5.1.1.3	150mm Base Course (DGB 20)	1430	sq.m	$22.00	$31,460.00	
5.1.1.4	260mm Recycled Concrete (DGS 40)	1782	sq.m	$30.00	$53,460.00	
					$0.00	
5.2	**Ground Floor Carpark**					
5.2.1	Construct Pavement Type 2 consisting of:					
5.2.1.1	50mm AC10 Class 320	1460	sq.m	$36.00	$52,560.00	
5.2.1.2	2 coat seal with 10mm aggregate ***Poly Modified***	1460	sq.m	$8.50	$12,410.00	
5.2.1.3	150mm Base Course (DGB 20)	1460	sq.m	$22.00	$32,120.00	
5.2.1.4	260mm Recycled Concrete (DGS 40)	1563	sq.m	$30.00	$46,890.00	
	Subtotal Pavement				**$292,535.00**	

Construction of Civil Works **DATE: 22nd April 2013**
For: Church Point Sydney **Contract No. Option 1 (Friends of Church Point)**
At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
6	**ROADWORKS and ANCILLARIES**					
6.1	**McCarrs Creek Road**					
6.1.1	Construct following concrete roadworks and ancillaries:					
6.1.1.1	Kerb and gutter	379	m	$65.00	$24,635.00	
6.1.1.2	Provide 900mm concrete dish drain	61	m	$130.00	$7,930.00	
6.1.1.3	Provide standard RMS pedestrian crossing to AS.1742.13 (including sign posts, marking)	1	item	$3,000.00	$3,000.00	
6.2	**Ground Floor Carpark**					
6.2.1	Construct following concrete roadworks and ancillaries:					
6.2.1.1	Kerb only	295	m	$65.00	$19,175.00	
6.2.1.2	Pram ramps to AS1428.1 (1.2m wide)	0	no.	$750.00	$0.00	
6.2.1.3	Wheel Stops to AS/NZS 2890.1:2004	56	no.	$150.00	$8,400.00	
	Subtotal Roadworks and Ancillaries				**$63,140.00**	
7	**SIGNAGE AND LINEMARKING**					
	Supply and Install Line Marking: ***Note: We have allowed that line marking will be "Waterborne Roadmarking Paint"***					
7.1	**McCarrs Creek Road**					
7.1.1	S1 line	220	m	$5.50	$1,210.00	
7.1.2	Traffic Arrow UA	2	no.	$125.00	$250.00	
7.1.3	Speed Limit	2	no.	$125.00	$250.00	
7.1.4	Pedestrian Crossing Ahead	2	no.	$220.00	$440.00	
7.2	**Ground Floor Carpark**					
7.2.1	100mm wide white marking (yellow for disable parking) AS/NZS 2890.1:2004	287	m	$3.50	$1,004.50	
7.2.3	Chevron to pedestrians	0	no.		$0.00	
7.2.4	Traffic Arrow UA	4	no.	$125.00	$500.00	
	Subtotal Signage and Linemarking				**$3,654.50**	
8	**CONTIGUOUS PILED SEA WALL**					
8.1	Pile rig mobilisation and setting up, dismantling removal		item		Included	
8.2	Temporary sheet steel piling to create coffer to install pile wall (includes hire and removal)	840	sq.m	$270.00	$226,800.00	Assume 70% of area of final wall size. Surplus material from between steel and concrete wall will be left on sea floor.
8.3	Secant pile wall (hard/soft) in 600mm dia. 50MPa concrete + reinforcement 100kg/m^3	1200	sq.m	$750.00	$900,000.00	
8.4	32mm Macalloy 1030 bar, taped and sleeved 10m each including connections	52	no.	$750.00	$39,000.00	This will need to be installed from a barge. Used SAS Threadbar prices.
8.5	Precast concrete anchor block	60	cu.m	$320.00	$19,200.00	
8.6	Capping beam concrete including cast in joist supports (40MPa)	265	cu.m	$1,130.00	$299,450.00	Includes formwork
8.7	Capping beam reinforcement	53	t	$2,200.00	$116,600.00	Assume 200kg/m3
8.8	Allowing for staging the works due to tidal restictions		item		Included	
	Subtotal Contiguous Piled Sea Wall				**$1,601,050.00**	
9	**BALLAST SANDSTONE SEA WALL**					
9.1	Reuse of ballast sandstone	408	cu.m	$360.00	$146,880.00	Rate includes for removing wall and storage
	Subtotal Ballast Sandstone Sea Wall				**$146,880.00**	
10	**BOARDWALK**					
10.1	Pile rig mobilisation and setting up, dismantling removal	1	item	$3,500.00	$3,500.00	
10.2	Driven Timber Piles, treated hardwood	513	m	$210.00	$107,730.00	57 pile bents @ 3.0m spacing
10.3	Timber joists	700	m	$240.00	$168,000.00	300mm x 150mm
10.4	Timber connections (10%)	1	item		Included	
10.5	Boardwalk Deck (fixed)	430	sq.m	$280.00	$120,400.00	
10.6	Heavyweight bench seating	9	No	$3,500.00	$31,500.00	**Landscape Designer to confirm**
10.7	Bollard Lighting	18	No	$1,800.00	$32,400.00	**Landscape Designer to confirm**
	Subtotal Boardwalk				**$463,530.00**	

Construction of Civil Works **DATE: 22nd April 2013**
For: Church Point Sydney **Contract No. Option 1 (Friends of Church Point)**
At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
11	**EXTERNAL STORMWATER DRAINAGE**					
11.1	**McCarrs Creek Road**					
11.1.1	Make Good existing stromwater pits including installation of grate and surround	0	no.	$2,000.00	$0.00	
11.1.2	New on grade grated pits	4	no.	$2,750.00	$11,000.00	
11.1.3	375 dia RCP Stormwater pipes	15	m	$235.00	$3,525.00	
11.1.4	Extend culverts under road	10	m	$750.00	$7,500.00	
11.2	**Ground Floor Carpark**					
11.2.1	New surface inlet grated pits	2	no.	$2,750.00	$5,500.00	
11.2.2	375 dia RCP Stormwater pipes	6	m	$235.00	$1,410.00	
11.2.3	Extend culverts under carpark	14	m	$750.00	$10,500.00	
	Subtotal External Stromwater Drainage				**$39,435.00**	
12	**EXTERNAL ELECTRIC LIGHT & POWER**					
12.1	**McCarrs Creek Road**					
12.1.1	Pole Mounted lighting	3	no.	$8,000.00	$24,000.00	Includes an allowance for conduit and cable
12.1.2	BWIC		item		Included	
12.2	**Ground Floor Carpark**					
12.2.1	Pole Mounted lighting	6	no.	$8,000.00	$48,000.00	Includes an allowance for conduit and cable
12.2.2	Allowance for LV feed and metering for carpark lights	1	Item	$15,000.00	$15,000.00	
12.2.3	BWIC		item		Included	
	Subtotal External Stromwater Drainage				**$87,000.00**	
13	**SERVICES RELOCATION/PROTECTION**					
13.1	Optus underground duct and cable to be protected during construction	1	item	$100,000.00	$100,000.00	
13.2	Sydney Water 375mm diam. VCP Sewer Main Protection	232	m	$150.00	$34,800.00	
13.3	Ausgrid 2 x 125mm PVC electricity duct and cable to be protected during construction	200	m	$200.00	$40,000.00	
13.4	Telstra Aerial cable to be relocated	1	item	$100,000.00	$100,000.00	
13.5	Jemena 32mm PE gas line to be protected during construction	20	m	$100.00	$2,000.00	
	Subtotal Services Relocation				**$276,800.00**	
14	LANDSCAPE	1	item	$25,000.00	$25,000.00	Landscape Designer to confirm
	Subtotal Landscape				**$25,000.00**	
	TOTAL SUMMARY				**$4,356,008.50**	

1	**GENERAL**	**$667,500.00**
2	**CLEARING AND DEMOLITION**	**$38,900.00**
3	**EROSION AND SEDIMENT CONTROL**	**$5,350.00**
4	**EARTHWORKS**	**$645,234.00**
5	**PAVEMENT**	**$292,535.00**
6	**ROADWORKS AND ANCILLARIES**	**$63,140.00**
7	**SIGNAGE AND LINEMARKING**	**$3,654.50**
8	**CONTIGUOUS PILED SEA WALL**	**$1,601,050.00**
9	**BALLAST SANDSTONE SEA WALL**	**$146,880.00**
10	**BOARDWALK**	**$463,530.00**
11	**EXTERNAL STORMWATER DRAINAGE**	**$39,435.00**
12	**EXTERNAL ELECTRIC LIGHT & POWER**	**$87,000.00**
13	**SERVICES RELOCATION/PROTECTION**	**$276,800.00**
14	**LANDSCAPE**	**$25,000.00**
15	**OVERHEADS AND MARGIN (6%)**	**$262,000.00**
16	**LONG SERVICE LEVY (0.35%)**	**$16,164.00**
17	**PROFESSIONAL FEES (7%)**	**$324,000.00**
18	**CONTINGENCY (10%)**	**$496,000.00**
	TOTAL (ROUNDED)	**$5,455,000.00**

EXCLUSIONS
Carpark management system and access control
Telecom and data connections
Diversion or protection of unidentified existing underground services
Out of hours working
Landscape irrigation and maintenance
Excavation of rock on south side of road
Legal costs
Council officers costs
Archaeological surveys
Issues associated with permissive occupancies
Outbuildings and covered ways
Wharf areas

Construction of Civil Works **DATE: 22nd April 2013**

For: Church Point Sydney **Contract No. Option 2 (Hyder Ground Floor)**

At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
1	**GENERAL**					
1.1	Site Establishment, incl portaloos within the work area, compound, maintenance of site facilities (site office, lunch room, change room), construction and maintenance of access tracks and roads, barriers, signage, storage, plant on site, etc	1	item	$70,000.00	$70,000.00	
1.2	Geotechnical inspection, Level 1 supervision, testing	1	item	$40,000.00	$40,000.00	
1.3	Survey and setout for all construction requirements	1	item	$30,000.00	$30,000.00	
1.4	Preparation of "As Built" Drawings	1	item	$10,000.00	$10,000.00	
1.5	Insurances	1	item	$40,000.00	$40,000.00	
1.6	Site de-establishment	1	item	$7,500.00	$7,500.00	
1.7	Provision for traffic management to McCarrs Creek Road					
1.7.1	Nightly close down works and make safe	1	item	$40,000.00	$40,000.00	
1.7.2	Daytime traffic & pedestrian management	1	item	$202,000.00	$202,000.00	
1.7.3	Equipment hire	1	item	$10,000.00	$10,000.00	
1.8	Site supervision	1	item	$198,000.00	$198,000.00	
1.9	QA Plan, OH&S management & SWMS, Programming	1	item	$15,000.00	$15,000.00	
1.10	Temporary Services	1	item	$5,000.00	$5,000.00	
	Subtotal General				**$667,500.00**	
2	**CLEARING AND DEMOLITION**					
2.1	Demolish and remove existing bollards	94	m	$75.00	$7,050.00	
2.2	Sawcut existing pavement	14	m	$25.00	$350.00	
2.3	Demolish and remove existing roadpavement from site	1540	sq.m	$15.00	$23,100.00	Assume removed road to be 220m long and 7m wide
2.4	Remove street lights	4	item	$1,500.00	$6,000.00	
2.5	Remove road signage	16	item	$150.00	$2,400.00	
	Subtotal Clearing and Demolition				**$38,900.00**	
3	**EROSION & SEDIMENT CONTROL**					
3.1	Sediment Fence	25	m	$18.00	$450.00	
3.2	Geotextile Filter Pit Surround	4	each	$150.00	$600.00	
3.3	Stabilised Site Access and Washdown Area	1	item	$3,500.00	$3,500.00	
3.4	Barrier Fence 1.8m high chainwire driven post ***(including Blue Shade Cloth)***	10	m	$80.00	$800.00	
	Subtotal Erosion & Sediment Control				**$5,350.00**	
4	**EARTHWORKS**					
4.1	Compacted backfill material to make up levels to road and carpark formation level.Class II to AS 4678	6700	cu.m	$93.00	$623,100.00	Material to be suitable engineered fill imported from off-site
	Subtotal Earthworks				**$623,100.00**	
5	**PAVEMENT**					
5.1	**McCarrs Creek Road**					
5.1.1	Construct Pavement Type 2 consisting of:					
5.1.1.1	50mm AC10 Class 320	1442	sq.m	$36.00	$51,912.00	
5.1.1.2	2 coat seal with 10mm aggregate ***Poly Modified***	1442	sq.m	$8.50	$12,257.00	
5.1.1.3	150mm Base Course (DGB 20)	1442	sq.m	$22.00	$31,724.00	
5.1.1.4	260mm Recycled Concrete (DGS 40)	1794	sq.m	$30.00	$53,820.00	
5.2	**Ground Floor Carpark**					
5.2.1	Construct Pavement Type 2 consisting of:					
5.2.1.1	50mm AC10 Class 320	1598	sq.m	$36.00	$57,528.00	
5.2.1.2	2 coat seal with 10mm aggregate ***Poly Modified***	1598	sq.m	$8.50	$13,583.00	
5.2.1.3	150mm Base Course (DGB 20)	1598	sq.m	$22.00	$35,156.00	
5.2.1.4	260mm Recycled Concrete (DGS 40)	1683	sq.m	$30.00	$50,490.00	
	Subtotal Pavement				**$306,470.00**	

Construction of Civil Works **DATE: 22nd April 2013**
For: Church Point Sydney **Contract No. Option 2 (Hyder Ground Floor)**
At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
6	**ROADWORKS and ANCILLARIES**					
6.1	**McCarrs Creek Road**					
6.1.1	Construct following concrete roadworks and ancillaries:					
6.1.1.1	Kerb and gutter	380	m	$65.00	$24,700.00	
6.1.1.2	Provide 900mm concrete dish drain	62	m	$130.00	$8,060.00	
6.1.1.3	Provide standard RMS pedestrian crossing to AS.1742.13 (including sign posts, marking)	1	item	$3,000.00	$3,000.00	
6.2	**Ground Floor Carpark**					
6.2.1	Construct following concrete roadworks and ancillaries:					
6.2.1.1	Kerb only	242	m	$65.00	$15,730.00	
6.2.1.2	Pram ramps to AS1428.1 (1.2m wide)	2	no.	$750.00	$1,500.00	
6.2.1.3	Wheel Stops to AS/NZS 2890.1:2004	62	no.	$150.00	$9,300.00	
	Subtotal Roadworks and Ancillaries				**$62,290.00**	
7	**SIGNAGE AND LINEMARKING**					
	Supply and Install Line Marking: ***Note: We have allowed that line marking will be "Waterborne Roadmarking Paint"***					
7.1	**McCarrs Creek Road**					
7.1.1	S1 line	220	m	$5.50	$1,210.00	
7.1.2	Traffic Arrow UA	2	no.	$125.00	$250.00	
7.1.3	Speed Limit	2	no.	$125.00	$250.00	
7.1.4	Pedestrian Crossing Ahead	2	no.	$220.00	$440.00	
7.2	**Ground Floor Carpark**					
7.2.1	100mm wide white marking (yellow for disable parking) AS/NZS 2890.1:2004	454	m	$3.50	$1,589.00	
7.2.2	Chevron to pedestrians	2	no.	$400.00	$800.00	
7.2.3	Traffic Arrow UA	4	no.	$125.00	$500.00	
	Subtotal Signage and Linemarking				**$5,039.00**	
8	**CONTIGUOUS PILE WALL**					
8.1	Pile rig mobilisation and setting up, dismantling removal		item		Included	
8.2	Temporary sheet steel piling to create coffer to install pile wall (includes hire and removal)	840	sq.m	$270.00	$226,800.00	Assume 70% of area of final wall size. Surplus material from between steel and concrete wall will be left on sea floor.
8.3	Secant pile wall (hard/soft) in 600mm dia. 50MPa concrete + reinforcement 100kg/m^3	1200	sq.m	$750.00	$900,000.00	
8.4	32mm Macalloy 1030 bar, taped and sleeved 10m each including connections	52	no.	$750.00	$39,000.00	This will need to be installed from a barge. Used SAS Threadbar prices.
8.5	Precast concrete anchor block	60	cu.m	$320.00	$19,200.00	
8.6	Capping beam concrete including cast in joist supports (40MPa)	265	cu.m	$1,130.00	$299,450.00	Includes formwork
8.7	Capping beam reinforcement	53	t	$2,200.00	$116,600.00	Assume 200kg/m3
8.8	Allowing for staging the works due to tidal restrictions		item		Included	
	Subtotal Contiguous Piled Sea Wall				**$1,601,050.00**	
9	**BALLAST SANDSTONE SEA WALL**					
9.1	Reuse of ballast sandstone	370	cu.m	$360.00	$133,200.00	
	Subtotal Ballast Sandstone Sea Wall				**$133,200.00**	
10	**BOARDWALK**					
10.1	Pile rig mobilisation and setting up, dismantling removal	1	item	$3,500.00	$3,500.00	
10.2	Driven Timber Piles, treated hardwood	360	m	$210.00	$75,600.00	49 pile bents @ 3.0m spacing
10.3	Timber joists	638	m	$240.00	$153,120.00	300mm x 150mm
10.4	Timber connections (10%)	1	item		Included	
10.5	Boardwalk Deck (fixed)	492	sq.m	$280.00	$137,760.00	
10.6	Heavyweight bench seating	10	No	$3,500.00	$35,000.00	**Landscape Designer to confirm**
10.7	Bollard Lighting	20	No	$1,800.00	$36,000.00	**Landscape Designer to confirm**
	Subtotal Boardwalk				**$440,980.00**	
11	**EXTERNAL STORMWATER DRAINAGE**					
11.1	**McCarrs Creek Road**					
11.1.1	Make Good existing stromwater pits including installation of grate and surround	0	no.	$2,000.00	$0.00	
11.1.2	New on grade grated pits	4	no.	$2,750.00	$11,000.00	
11.1.3	375 dia RCP Stormwater pipes	15	m	$235.00	$3,525.00	

Construction of Civil Works **DATE: 22nd April 2013**

For: Church Point Sydney **Contract No. Option 2 (Hyder Ground Floor)**

At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
11.1.4	Extend culverts under road	10	m	$750.00	$7,500.00	
11.2	**Ground Floor Carpark**					
11.2.1	New surface inlet grated pits	3	no.	$2,750.00	$8,250.00	
11.2.2	375 dia RCP Stormwater pipes	18	m	$235.00	$4,230.00	
11.2.3	Extend culverts under carpark	20	m	$750.00	$15,000.00	
	Subtotal External Stromwater Drainage				**$49,505.00**	
12	**EXTERNAL ELECTRIC LIGHT & POWER**					
12.1	**McCarrs Creek Road**					
12.1.1	Pole Mounted lighting	3	no.	$8,000.00	$24,000.00	
12.1.2	BWIC		item		Included	
12.2	**Ground Floor Carpark**					
12.2.1	Pole mounted lighting	8	no.	$8,000.00	$64,000.00	
12.2.2	Allowance for LV feed and metering for carpark lights	1	Item	$15,000.00	$15,000.00	
12.2.3	BWIC		item		Included	
	Subtotal External Electric Light & Power				**$103,000.00**	
13	**SERVICES RELOCATION/PROTECTION**					
13.1	Optus underground duct and cable to be protected during construction	1	item	$100,000.00	$100,000.00	
13.2	Sydney Water 375mm diam. VCP Sewer Main Protection	232	m	$150.00	$34,800.00	
13.3	Ausgrid 2 x 125mm PVC electricity duct and cable to be protected during construction	200	m	$200.00	$40,000.00	
13.4	Telstra Aerial cable to be relocated	1	item	$100,000.00	$100,000.00	
	Subtotal Services Relocation				**$274,800.00**	
14	LANDSCAPE	1	item	$25,000.00	$25,000.00	Landscape Designer to confirm
	Subtotal Landscape				**$25,000.00**	
	TOTAL SUMMARY				**$4,336,184.00**	

1	**GENERAL**	**$667,500.00**
2	**CLEARING AND DEMOLITION**	**$38,900.00**
3	**EROSION AND SEDIMENT CONTROL**	**$5,350.00**
4	**EARTHWORKS**	**$623,100.00**
5	**PAVEMENT**	**$306,470.00**
6	**ROADWORKS AND ANCILLARIES**	**$62,290.00**
7	**SIGNAGE AND LINEMARKING**	**$5,039.00**
8	**CONTIGUOUS PILED SEA WALL**	**$1,601,050.00**
9	**BALLAST SANDSTONE SEA WALL**	**$133,200.00**
10	**BOARDWALK**	**$440,980.00**
11	**EXTERNAL STORMWATER DRAINAGE**	**$49,505.00**
12	**EXTERNAL ELECTRIC LIGHT & POWER**	**$103,000.00**
13	**SERVICES RELOCATION/PROTECTION**	**$274,800.00**
14	**LANDSCAPE**	**$25,000.00**
15	**OVERHEADS AND MARGIN (6%)**	**$261,000.00**
16	**LONG SERVICE LEVY (0.35%)**	**$16,091.00**
17	**PROFESSIONAL FEES (7%)**	**$322,000.00**
18	**CONTINGENCY (10%)**	**$494,000.00**
	TOTAL (ROUNDED)	**$5,430,000.00**

EXCLUSIONS

Carpark management system and access control
Telecom and data connections
Diversion or protection of unidentified existing underground services
Out of hours working
Landscape irrigation and maintenance
Excavation of rock on south side of road
Legal costs
Council officers costs
Archaeological surveys
Issues associated with permissive occupancies
Outbuildings and covered ways
Wharf areas

Construction of Civil Works | **DATE: 22nd April 2013**

For: Church Point Sydney | **Contract No. Option 3 (Hyder Ground Floor +1)**

At: McCarrs Creek Road | **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
1	**GENERAL**					
1.1	Site Establishment, incl portaloos within the work area, compound, maintenance of site facilities (site office, lunch room, change room), construction and maintenance of access tracks and roads, barriers, signage, storage, plant on site, etc	1	item	$85,000.00	$85,000.00	
1.2	Geotechnical inspection, Level 1 supervision, testing	1	item	$50,000.00	$50,000.00	
1.3	Survey and setout for all construction requirements	1	item	$40,000.00	$40,000.00	
1.4	Preparation of "As Built" Drawings	1	item	$12,500.00	$12,500.00	
1.5	Insurances	1	item	$45,000.00	$45,000.00	
1.6	Site de-establishment	1	item	$7,500.00	$7,500.00	
1.7	Provision for traffic management to McCarrs Creek Road					
1.7.1	Nightly close down works and make safe	1	item	$44,000.00	$44,000.00	
1.7.2	Daytime traffic & pedestrian management	1	item	$220,000.00	$220,000.00	
1.7.3	Equipment hire including cranage for the carpark	1	item	$100,000.00	$100,000.00	
1.8	Site supervision	1	item	$237,600.00	$237,600.00	
1.9	QA Plan, OH&S management & SWMS, Programming	1	item	$15,000.00	$15,000.00	
1.10	Temporary Services	1	item	$5,000.00	$5,000.00	
	Subtotal General				**$861,600.00**	
2	**CLEARING AND DEMOLITION**					
2.1	Demolish and remove existing bollards	94	m	$75.00	$7,050.00	
2.2	Sawcut existing pavement	14	m	$25.00	$350.00	
2.3	Demolish and remove existing road pavement from site	1540	sq.m	$15.00	$23,100.00	Assume removed road to be 220m long and 7m wide
2.4	Remove street lights	4	no.	$1,500.00	$6,000.00	
2.5	Remove road signage	16	no.	$150.00	$2,400.00	
2.6	Demolish and remove kerb for first floor access	16	m	$25.00	$400.00	
	Subtotal Clearing and Demolition				**$38,900.00**	
3	**EROSION & SEDIMENT CONTROL**					
3.1	Sediment Fence	25	m	$18.00	$450.00	
3.2	Geotextile Filter Pit Surround	4	each	$150.00	$600.00	
3.3	Stabilised Site Access and Washdown Area	1	item	$3,500.00	$3,500.00	
3.4	Barrier Fence 1.8m high chainwire driven post ***(including Blue Shade Cloth)***	10	m	$80.00	$800.00	
	Subtotal Erosion & Sediment Control				**$5,350.00**	
4	**EARTHWORKS**					
4.1	Compacted backfill material to make up levels to road and carpark formation level. Class II to AS 4678	6700	cu.m	$93.00	$623,100.00	Material to be suitable engineered fill imported from off-site
	Subtotal Earthworks				**$623,100.00**	
5	**PAVEMENT**					
5.1	**McCarrs Creek Road**					
5.1.1	Construct Pavement Type 2 consisting of:					
5.1.1.1	50mm AC10 Class 320	1442	sq.m	$36.00	$51,912.00	
5.1.1.2	2 coat seal with 10mm aggregate ***Poly Modified***	1442	sq.m	$8.50	$12,257.00	
5.1.1.3	150mm Base Course (DGB 20)	1442	sq.m	$22.00	$31,724.00	
5.1.1.4	260mm Recycled Concrete (DGS 40)	1794	sq.m	$30.00	$53,820.00	
5.2	**Ground Floor Carpark**					
5.2.1	Construct Pavement Type 2 consisting of:					
5.2.1.1	50mm AC10 Class 320	1598	sq.m	$36.00	$57,528.00	
5.2.1.2	2 coat seal with 10mm aggregate ***Poly Modified***	1598	sq.m	$8.50	$13,583.00	
5.2.1.3	150mm Base Course (DGB 20)	1598	sq.m	$22.00	$35,156.00	
5.2.1.4	260mm Recycled Concrete (DGS 40)	1683	sq.m	$30.00	$50,490.00	
	Subtotal Pavement				**$306,470.00**	

Construction of Civil Works **DATE: 22nd April 2013**

For: Church Point Sydney **Contract No. Option 3 (Hyder Ground Floor +1)**

At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
6	**ROADWORKS and ANCILLARIES**					
6.1	**McCarrs Creek Road**					
6.1.1	Construct following concrete roadworks and ancillaries:				$0.00	
6.1.1.1	Kerb and gutter	380	m	$65.00	$24,700.00	
6.1.1.2	Provide 900mm concrete dish drain	62	m	$130.00	$8,060.00	
6.1.1.3	Provide standard RMS pedestrian crossing to AS.1742.13 (including sign posts, marking)	1	item	$3,000.00	$3,000.00	
6.2	**Ground Floor Carpark**					
6.2.1	Construct following concrete roadworks and ancillaries:					
6.2.1.1	Kerb only	242	m	$65.00	$15,730.00	
6.2.1.2	Pram ramps to AS1428.1 (1.2m wide)	2	no.	$750.00	$1,500.00	
6.2.1.3	Wheel Stops to AS/NZS 2890.1:2004	62	no.	$150.00	$9,300.00	
6.3	**First Floor Carpark**					
6.3.1	Construct following concrete roadworks and ancillaries:					
6.3.1.1	Kerb only	331	m	$65.00	$21,515.00	
6.3.1.2	Concrete Laybacks at driveways including kerb transitions	16	m	$140.00	$2,240.00	
6.3.1.3	Wheel Stops to AS/NZS 2890.1:2004	62	no.	$150.00	$9,300.00	
	Subtotal Roadworks and Ancillaries				**$95,345.00**	
7	**SIGNAGE AND LINEMARKING**					
	Supply and Install Line Marking: ***Note: We have allowed that line marking will be "Waterborne Roadmarking Paint"***					
7.1	**McCarrs Creek Road**					
7.1.1	S1 line	220	m	$5.50	$1,210.00	
7.1.2	Traffic Arrow UA	2	no.	$125.00	$250.00	
7.1.3	Speed Limit	2	no.	$125.00	$250.00	
7.1.4	Pedestrian Crossing Ahead	2	no.	$220.00	$440.00	
7.2	**Ground Floor Carpark**					
7.2.1	100mm wide white marking (yellow for disable parking) AS/NZS 2890.1:2004	454	m	$3.50	$1,589.00	
7.2.3	Chevron to pedestrians	2	no.	$400.00	$800.00	
7.2.4	Traffic Arrow UA	4	no.	$125.00	$500.00	
7.3	**First Floor Carpark**					
7.3.1	100mm wide white marking (yellow for disable parking) AS/NZS 2890.1:2004	346	m	$3.50	$1,211.00	
7.3.4	Traffic Arrow UA	4	no.	$125.00	$500.00	
	Subtotal Signage and Linemarking				**$6,750.00**	
8	**CONTIGUOUS PILE WALL**					
8.1	Pile rig mobilisation and setting up, dismantling removal		item		Included	
8.2	Temporary sheet steel piling to create coffer to install pile wall (includes hire and removal)	840	sq.m	$270.00	$226,800.00	Assume 70% of area of final wall size. Surplus material from between steel and concrete wall will be left on sea floor.
8.3	Secant pile wall (hard/soft) in 600mm dia. 50MPa concrete + reinforcement 100kg/m^3	1200	sq.m	$750.00	$900,000.00	
8.4	32mm Macalloy 1030 bar, taped and sleeved 10m each including connections	52	no.	$750.00	$39,000.00	This will need to be installed from a barge. Used SAS Threadbar prices.
8.5	Precast concrete anchor block	60	cu.m	$320.00	$19,200.00	
8.6	Capping beam concrete including cast in joist supports (40MPa)	265	cu.m	$1,130.00	$299,450.00	Includes formwork
8.7	Capping beam reinforcement	53	t	$2,200.00	$116,600.00	Assume 200kg/m3
8.8	Allowing for staging the works due to tidal restrictions		item		Included	
	Subtotal Contiguous Piled Sea Wall				**$1,601,050.00**	

Construction of Civil Works **DATE: 22nd April 2013**

For: Church Point Sydney **Contract No. Option 3 (Hyder Ground Floor +1)**

At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
9	**BALLAST SANDSTONE SEA WALL**					
9.1	Reuse of ballast sandstone	370	cu.m	$360.00	$133,200.00	
	Subtotal Ballast Sandstone Sea Wall				**$133,200.00**	
10	**BOARDWALK**					
10.1	Pile rig mobilisation and setting up, dismantling removal	1	item	$3,500.00	$3,500.00	
10.2	Driven Timber Piles, treated hardwood	360	m	$210.00	$75,600.00	49 pile bents @ 3.0m spacing
10.3	Timber joists	638	m	$240.00	$153,120.00	300mm x 150mm
10.4	Timber connections (10%)	1	item		Included	
10.5	Boardwalk Deck (fixed)	492	sq.m	$280.00	$137,760.00	
10.6	Heavyweight bench seating	10	No	$3,500.00	$35,000.00	**Landscape Designer to confirm**
10.7	Bollard Lighting	20	No	$1,800.00	$36,000.00	**Landscape Designer to confirm**
	Subtotal Boardwalk				**$440,980.00**	
11	**EXTERNAL STORMWATER DRAINAGE**					
11.1	**McCarrs Creek Road**					
11.1.1	Make Good existing stromwater pits including installation of grate and surround	0	no.	$2,000.00	$0.00	
11.1.2	New on grade grated pits	4	no.	$2,750.00	$11,000.00	
11.1.3	375 dia RCP Stormwater pipes	15	m	$235.00	$3,525.00	
11.1.4	Extend culverts under road	10	m	$750.00	$7,500.00	
11.2	**Ground Floor Carpark**					
11.2.1	New surface inlet grated pits	3	no.	$2,750.00	$8,250.00	
11.2.2	375 dia RCP Stormwater pipes	18	m	$235.00	$4,230.00	
11.2.3	Extend culverts under carpark	20	m	$750.00	$15,000.00	
					$0.00	
11.3	**First Floor Carpark**					
11.3.1	N/A		item		$0.00	Weep holes included in upstand concrete
	Subtotal External Stormwater Drainage				**$49,505.00**	
12	**EXTERNAL ELECTRIC LIGHT & POWER**					
12.1	**McCarrs Creek Road**					
12.1.1	Pole Mounted lighting	3	no.	$8,000.00	$24,000.00	
12.1.2	BWIC		item		Included	
12.2	**Ground Floor Carpark**					
12.2.1	Ceiling mounted lighting	60	no.	$350.00	$21,000.00	
12.2.2	Allowance for LV feed and metering for carpark lights	1	Item	$15,000.00	$15,000.00	
12.2.3	Switchboard to carpark	1	Item	$10,000.00	$10,000.00	
12.2.4	BWIC		item		Included	
12.3	**First Floor Carpark**					
12.2.1	Pole Mounted lighting	8	no.	$8,000.00	$64,000.00	
12.2.2	BWIC		item		Included	
	Subtotal External Electric Light & Power				**$134,000.00**	
13	**FIRST FLOOR STRUCTURE**					NB: Including steel reo and formwork
13.1	Deck	495.0	cu.m	$1,070.00	$529,650.00	
13.2	Columns	42.0	cu.m	$990.00	$41,580.00	30 No.
13.3	Concrete Upstand	75.0	cu.m	$1,770.00	$132,750.00	Inlcuding allowance for drainage weepholes
13.4	Foundations	75.0	cu.m	$1,820.00	$136,500.00	30 No.
13.5	Ramps	180.0	cu.m	$1,070.00	$192,600.00	
13.6	Concrete staircase	12.0	cu.m	$2,150.00	$25,800.00	2 No at 6m3 each
	Subtotal First Floor Structure				**$1,058,880.00**	
14	**FIRST FLOOR ANCILLARIES**					
14.1	Stair handrail	37	m	$120.00	$4,440.00	
14.2	First floor handrail	220	m	$80.00	$17,600.00	
14.3	Armco barriers at ramps	113	m	$240.00	$27,120.00	
	Subtotal First Floor Ancillaries				**$49,160.00**	

Construction of Civil Works **DATE: 22nd April 2013**

For: Church Point Sydney **Contract No. Option 3 (Hyder Ground Floor +1)**

At: McCarrs Creek Road **Prepared by: MAK/QD**

Bill of Quantities

ITEM No	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	Remarks/Comments
15	**SERVICES RELOCATION/PROTECTION**					
15.1	Optus underground duct and cable to be protected during construction	1	item	$100,000.00	$100,000.00	
15.2	Sydney Water 375mm diam. VCP Sewer Main Protection	232	m	$150.00	$34,800.00	
15.3	Ausgrid 2 x 125mm PVC electricity duct and cable to be protected during construction	200	m	$200.00	$40,000.00	
15.4	Telstra Aerial cable to be relocated	1	item	$100,000.00	$100,000.00	
	Subtotal Services Relocation				**$274,800.00**	
16	LANDSCAPE	1	item	$25,000.00	$25,000.00	Landscape Designer to confirm
	Subtotal Landscape				**$25,000.00**	
	TOTAL SUMMARY				**$5,704,090.00**	

1	**GENERAL**	**$861,600.00**
2	**CLEARING AND DEMOLITION**	**$38,900.00**
3	**EROSION AND SEDIMENT CONTROL**	**$5,350.00**
4	**EARTHWORKS**	**$623,100.00**
5	**PAVEMENT**	**$306,470.00**
6	**ROADWORKS AND ANCILLARIES**	**$95,345.00**
7	**SIGNAGE AND LINEMARKING**	**$6,750.00**
8	**CONTIGUOUS PILED SEA WALL**	**$1,601,050.00**
9	**BALLAST SANDSTONE SEA WALL**	**$133,200.00**
10	**BOARDWALK**	**$440,980.00**
11	**EXTERNAL STORMWATER DRAINAGE**	**$49,505.00**
12	**EXTERNAL ELECTRIC LIGHT & POWER**	**$134,000.00**
13	**FIRST FLOOR STRUCTURE**	**$1,058,880.00**
14	**FIRST FLOOR ANCILLARIES**	**$49,160.00**
15	**SERVICES RELOCATION/PROTECTION**	**$274,800.00**
16	**LANDSCAPE**	**$25,000.00**
17	**OVERHEADS AND MARGIN (6%)**	**$343,000.00**
18	**LONG SERVICE LEVY (0.35%)**	**$21,165.00**
19	**PROFESSIONAL FEES (9%)**	**$545,000.00**
20	**CONTINGENCY (10%)**	**$662,000.00**
	TOTAL (ROUNDED)	**$7,276,000.00**

EXCLUSIONS

Carpark management system and access control
Telecom and data connections
Diversion or protection of unidentified existing underground services
Out of hours working
Landscape irrigation and maintenance
Excavation of rock on south side of road
Legal costs
Council officers costs
Archaeological surveys
Issues associated with permissive occupancies
Outbuildings and covered ways
Wharf areas

APPENDIX E

SERVICES INFRASTRUCTURE REPORT

PITTWATER COUNCIL – MCCARRS CREEK ROAD REALIGNMENT AND NEW CARPARK

SERVICES INFRASTRUCTURE REPORT

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PITTWATER COUNCIL

MCCARRS CREEK ROAD REALIGNMENT AND NEW CARPARK

Services Infrastructure Report

Author	K McMullen	
Checker	M Kurtz	
Approver	K McMullen	

Report No 1

Date 10 August 2015

This report has been prepared for Pittwater Council in accordance with the terms and conditions of appointment for McCarrs Creek Road Realignment and New Carpark dated . Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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1 INTRODUCTION

1.1 THE PROPOSAL

Pittwater Council (Council) proposes to undertake works at McCarrs Creek Road, Church Point as identified in the adopted *Church Point Plan of Management (2009)* (Plan of Management).

The Plan of Management includes a series of Precinct Master Plans that visually portray the proposed outcomes for the Church Point area. The works proposed in this REF are identified within the Master Plan for 'Precinct One' of the Plan of Management. A key issue is the need for additional parking as well as safety and amenity improvements for pedestrians and road users as part of the overarching wharf, boating facilities and associated car parking at this node. The following works are to be undertaken as part of the Proposal:

- Construction of new seawall and reclamation of land;
- Realignment of McCarrs Creek Road between the Church Point Ferry Wharf and Rosstrevor Reserve;
- Provision of street level parking, along with an additional structural level constructed over the top. This would provide a total of 120 additional car spaces established next to the base of cliff line, with entry and exit off McCarrs Creek Road; and
- Pedestrians catered for by a new boardwalk which would form part of the recently upgraded commuter wharf.

The car park component of the Proposal will provide additional parking for the locality.

Council has consulted relevant stakeholders and the community in their consideration of options for the car park and identified a preferred option. A concept design of the preferred car park option, along with the realignment of McCarrs Point Road and construction of a new sea wall, has been developed and subsequently adopted by Pittwater Council as the preferred option and is the subject of assessment in this report (Figure 1-1).

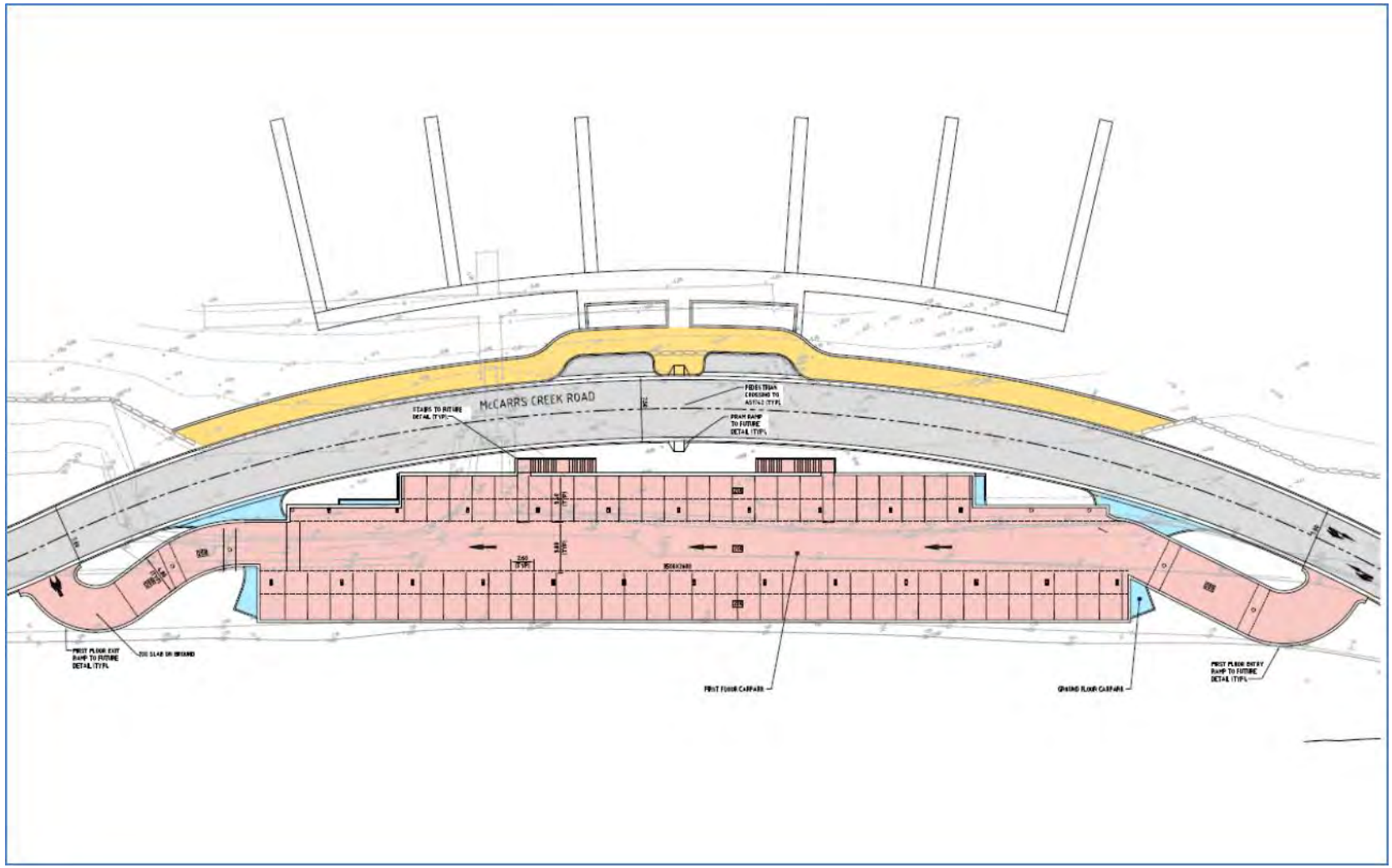

Figure 1-1 The adopted design for the proposal

1.2 BACKGROUND TO THE PROPOSAL

Church Point is a local and regional transport node and tourist destination. The area functions as an interchange for boats and vehicles for the approximately 560 households that reside offshore as well as local residents and visitors. Church Point provides community access to Pittwater and the Ku-ring-gai Chase National Park and supports a number of local businesses.

For many decades, issues at Church Point, in particular car parking pressures and recreational space had continually been raised by the community but with no successful outcomes. Due to safety issues, an estimated 125 former 'spaces' have been removed and/or reconfigured the past 3 decades, with no replacement. This in turn has significantly added to the pressure on remaining spaces. The need for a master plan was established to provide a consolidated approach for the management of issues across the whole of Church Point.

Pittwater Council, in conjunction with local community associations and the NSW Government including agency feedback, prepared the *Church Point Plan of Management* (Plan of Management) to 'ensure that Church Point retains its environmental, recreational, scenic, cultural and social values, while key issues relating to the management of the study areas are addressed'. The Plan of Management was adopted by Council under the *Local Government Act* and by the State Government Minister under the *Crown Lands Act*.

Having completed the upgrade to the commuter wharf, Council's next priority project is that proposed in this REF, McCarrs Creek Road realignment and car park facility, in order to progress improvements for the overall Church Point precinct.

1.3 PURPOSE OF THIS DOCUMENT

This report has been prepared to accompany the Review of Environmental Factors (REF) prepared by Hyder Consulting on behalf of Pittwater Council. This report details the likely impact of the proposed modifications to the Concept Proposal will have on the existing and proposed utility services in the vicinity of the development.

The basis for the investigation of the existing utilities in the vicinity of the site was a 'Dial Before You Dig' (DBYD) enquiry that was undertaken on 8 March, 2013 and reviewed on 30 July, 2015. Figure 2 depicts the area subject to the DBYD enquiry. This report does not consider any utility infrastructure outside the enquiry boundary and its' potential relationship to, or impact on the supply of utility services to the site.

Figure 1-2 The DBYD search area.

The following entities were identified as having an interest in the DBYD enquiry area:

- Optus underground duct and cable;
- Sydney Water sewer main;
- Ausgrid overhead electricity cable;
- Telstra aerial cable; and
- Existing stormwater drainage.

2 SITE DESCRIPTION

2.1 SITE LOCATION

Church Point is located in northern Sydney, approximately 32 kilometres north of the Sydney central business district and at the southern end of the Pittwater Estuary. McCarrs Creek Road connects to Pittwater Road near the Church Point Ferry Wharf and extends west past Rosstrevor Reserve to Ku-ring-gai Chase National Park. The Proposal encompasses an area within Precinct One under the Council's Church Point Plan of Management (2009) (refer to Figure and Figure).

Figure 2-1 Church Point Masterplan (from Church Point Plan of Management, 2009)

Figure 2-2 McCarrs Creek (Precinct 1) Masterplan (from Church Point Plan of Management, 2009)

2.2 LANDFORM AND ENVIRONMENTAL FEATURES

A mix of managed landscapes associated with the Reserves and 'naturally occurring' vegetation provide important habitat connections along the shores of Pittwater, connecting with Ku-ring-gai Chase National Park.

The existing road is relatively narrow and runs between a dilapidated sea wall and a rock (escarpment) cutting. Above this rock cutting, the steep hillside has vegetated slopes characterised by Spotted Gum Forest with dominant canopy species of Spotted Gum (*Corymbia maculata*) and Grey Ironbark (*Eucalyptus paniculata*). At the top of the escarpment, there are a number of residential properties with views overlooking Pittwater. A network of public roads provides access to these properties from Pittwater Road and McCarrs Creek Rd.

A (low) sandstone boulder seawall separates the (built environment) current edge of the road formation and the Pittwater estuarine waterway. The Pittwater Waterway is a slowly infilling drowned river valley with a surface area of 17.5 square kilometres. The partially closed body of water, open to the sea, forms a transitional ecosystem with a rich diversity of estuarine habitats including mangroves; seagrasses; intertidal mud flats; rocky shores and sandy beaches. Seagrass beds have been previously identified in areas around the Commuter 'dinghy' Wharf, extending from the General Store to the Cargo Wharf. Portions of exposed rock rubble in the intertidal zone provide habitat for a variety of molluscs and oysters. There are no mangroves and no substantial algae growth

3 UTILITIES INFRASTRUCTURE

3.1 SEWER

There is an existing 375mm diameter Sydney Water vitrified clay sewer line traversing the site. This line is located at depths between 2.1 and 2.3 metres within the extent of works.

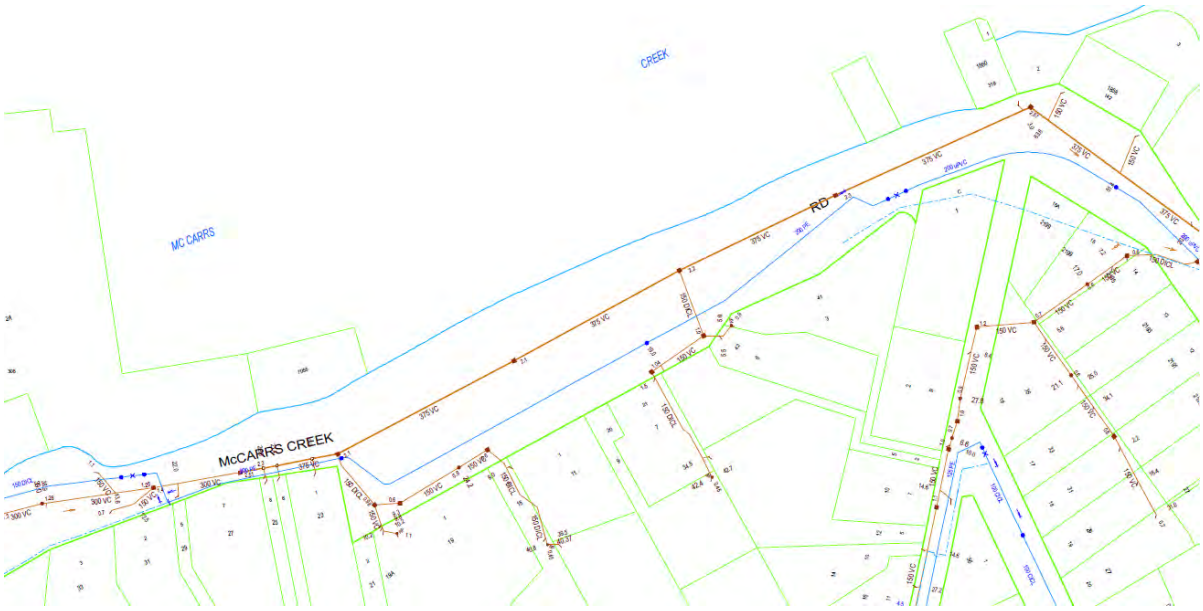

Figure 3-1 Existing sewer infrastructure

The location and depth of this line has been considered in the concept design for the proposed new carpark and road realignment works. See Figure 3.2 below for layout.

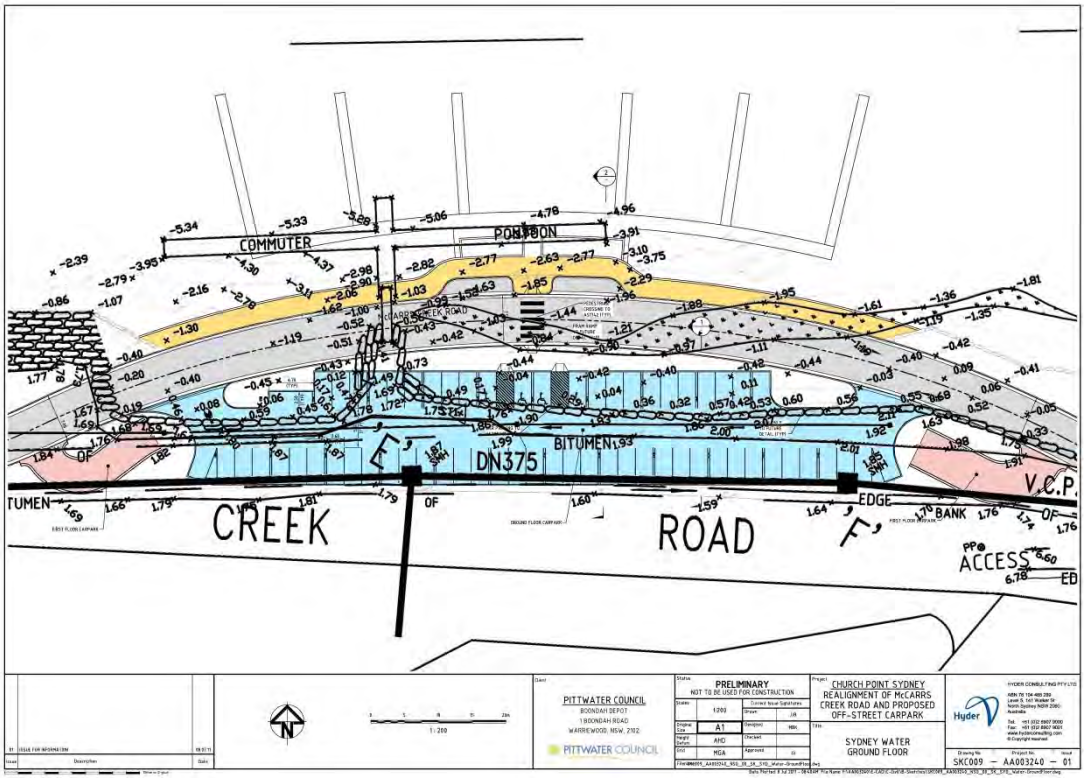

Figure 3-2 Overlay of sewer infrastructure and carpark structure

Preliminary advice from a Sydney Water Water Servicing Coordinator indicates that the concrete encasement of the line as part of the works is the most appropriate course of action. The estimated cost of these works has been included in the preliminary costing undertaken by Hyder.

Further approval for the encasement works will be required as part of the detailed design process, and will be undertaken with the assistance of a Sydney Water Water Servicing Coordinator to ensure compliance with Sydney Water standards.

The proposed works are not anticipated to create any further demand for sewer servicing.

3.2 WATER

There is an existing 200mm diameter Sydney Water polyethylene water supply line traversing the site.

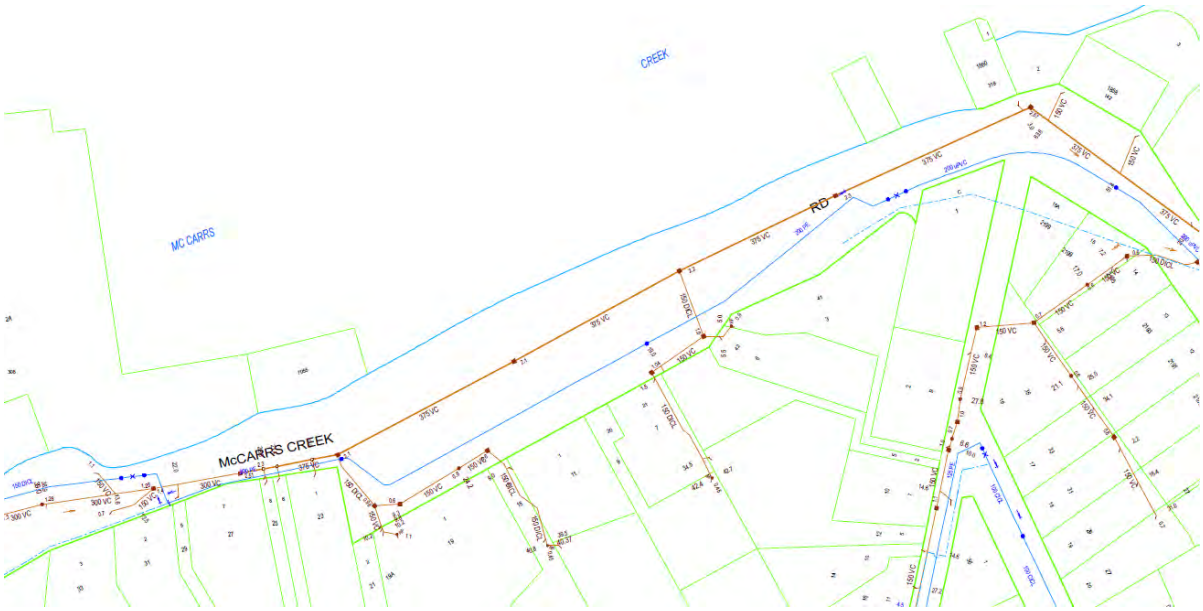

Figure 3-3 Existing water infrastructure

The location and depth of this line has been considered in the concept design for the proposed new carpark and road realignment works.

Preliminary advice from a Sydney Water Water Servicing Coordinator indicates that the location and depth of this service will not be of concern in the detailed design for the carpark or road realignment works.

Final advice from a Sydney Water Water Servicing Coordinator will be sought as part of the section 73 approval process required for works adjacent to Sydney Water assets, and incorporated into the final detailed design to ensure compliance with Sydney Water standards.

The proposed works are not anticipated to create any significant demand for mains water supply in the vicinity.

3.3 TELECOMMUNICATIONS

3.3.1 OPTUS UNDERGROUND CABLE

Optus have confirmed via the DBYD process that there is an existing underground duct and cable network in the vicinity of the proposed works.

Figure 3-4 Existing Optus infrastructure

Preliminary advice from a suitably qualified telecommunications consultant has indicated that depending on the specific requirements for the networks and the detailed design of the McCarrs Creek Road realignment works, including depth of cover over the cables, locations of any joints or pits, the system could either be concrete encased in-situ or relocated in accordance with Optus requirements.

The estimated cost of relocation of these assets has been included in the preliminary costing undertaken by Hyder. Concrete encasement of the assets is expected to represent a significant saving compared to the relocation option and has not been separately costed.

3.3.2 TELSTRA AERIAL CABLE

Telstra have confirmed via the DBYD process that there is an existing aerial cable network in the vicinity of the proposed works.

This networks provides service to the adjacent businesses and dwellings, and connects to the wider Telstra network that services Church Point and Scotland Island.

These cables will require relocation as part of the realignment of McCarrs Creek Road. The estimated cost of relocation of these assets has been included in the preliminary costing undertaken by Hyder.

Advice from a suitably qualified telecommunications consultant and Telstra will be sought as part of the approvals process and incorporated into the detailed design of the works

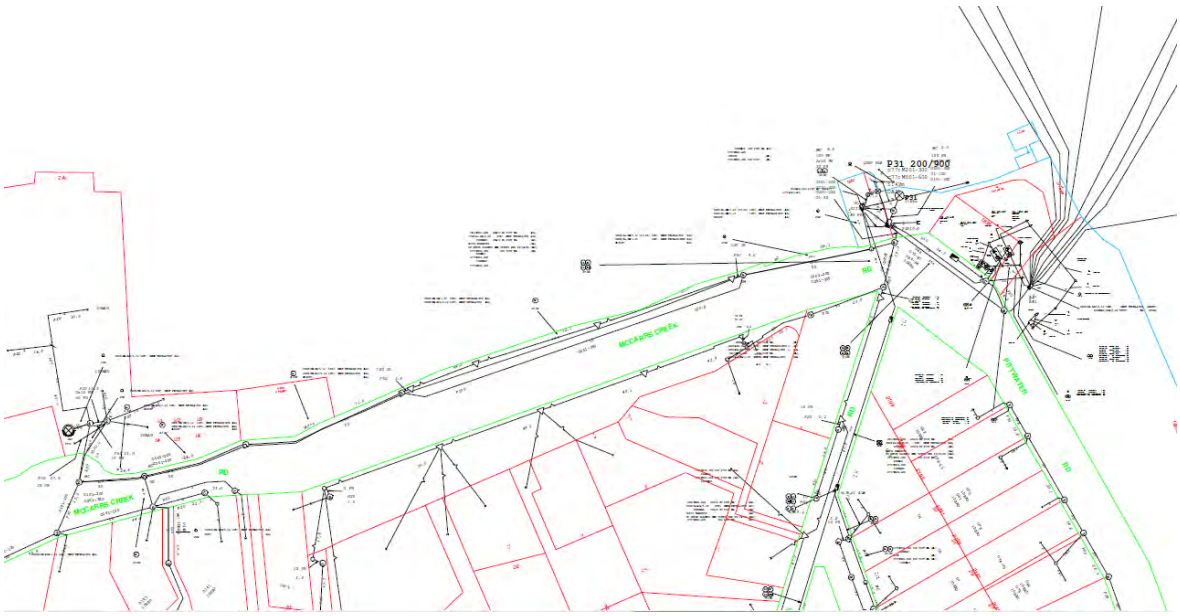

Figure 3-5 Existing Telstra infrastructure

3.4 ELECTRICITY

Ausgrid has confirmed via the DBYD process that there is an existing overhead cable network in the vicinity of the proposed works.

The cable networks services the local network area and adjacent properties, connecting to the larger network that serves Church Point and provides service to Scotland Island.

The overhead cable network will require relocation as part of the realignment of McCarrs Creek Road. The estimated cost of relocation of these assets has been included in the preliminary costing undertaken by Hyder.

The proposed carpark and road realignment work will require additional street and property lighting. . The estimated cost of supply of additional street lighting poles and carpark lighting has been included in the preliminary costing undertaken by Hyder.

The detailed design of the relocation and supply works will be undertaken following further advice from Ausgrid.

APPENDIX F

VISUAL ASSESSMENT REPORT

McCarrs Creek Road, Church Point
Realignment & New Car Park

VISUAL IMPACT ASSESSMENT

prepared by

Corkery Consulting

August 2015

Addendum to REF prepared by Hyder Consulting

1. Introduction

This Visual Assessment Report has been prepared by Corkery Consulting in relation to the proposed development of a new commuter car park adjoining McCarrs Creek Road east of Church Point jetty. The Visual Assessment forms an Addendum to the REF prepared by Hyder Consulting.

The project site is located at Church Point in the southern portion of Pittwater east of Ku-ring-gai National Park and south of Scotland Island. The high scenic quality of the area is created by the strongly undulating topography with forest-covered steep slopes extending to the waterfront and contrasting with the horizontal plane of the reflective water surface.

Views from the foreshore are dominated by the water surface with numerous boats either moored or moving on it. Residential buildings located on the slopes and ridges at Church Point, Scotland Island and Elvina Bay are partly visible through the extensive tree canopy cover. Views to the west from Church Point are dominated by the forest covered slopes and ridgeline in Ku-ring-gai National Park. The visual character of the foreshore at Church Point is defined by a combination of boat moorings, jetties, sea wall, commercial buildings, car parks and road side parking along McCarrs Creek Road.

The proposed development will involve realignment of a section of McCarrs Creek east of Church Point to create space for the construction of the new car park that is to be located at the base of an existing tree-covered steep natural slope. A deck is to be constructed above the ground level parking to provide a second level of parking that will be accessed by ramps from McCarrs Creek Road.

The new road alignment will bring McCarrs Creek Road closer to the exiting floating boat mooring pontoon. A shared path is to be constructed along the waterfront alongside the new roadway.

The location and regional context of the project site are shown on Figure 1.

Figure 1 – Regional Context

2. Local Context

2.1 Urban and Landscape Character

The project site has a strong maritime character with views from the foreshore being focused on the adjoining water surface and floating pontoon with moored boats in the foreground and views across open water beyond to the forest covered slopes and skylined ridges of Ku-ring-gai National Park in the distance.

The proposed car park is to be located along a section of waterfront at the base of a steep slope immediately east of Church Point where McCarrs Creek Road forms a clear interface between land and water. A sandstone sea wall supports the road edge and pedestrian path with small areas of sand exposed at low tide. The existing visual character of the foreshore context of the new car park reflects a combination of built and natural elements that are shown on Figure 2.

Figure 2 – Local Context of project site

2.2 Key View Points

A detailed site analysis was carried out to identify a series of key view points from which the proposed car park will be visible. The view situations, which are shown on Figure 3, include:

1. McCarrs Creek Road near Church Point shops at the northeast end of the project site
2. Church Point public jetty
3. Boats off shore from the project site
4. The floating pontoon adjoining the project site
5. McCarrs Creek Road at southeast end of the project site
6. Public foreshore reserve

Local access drive to residences above project site Views from these locations have been assessed to determine the extent to which the proposed car park will be visible.

Figure 3 – Key View Points

View Point 1 – view southwest along McCarrs Ck Rd towards proposed car park with shop/cafe and tree-covered slope in foreground, pedestrian path, bollards and moored boats in mid-distance.

View Point 2 – view southwest from public jetty at Church Point towards project site showing the adjoining jetty and outdoor dining deck in foreground and moored boats in mid-distance.

View Point 3 – view south towards proposed car park site showing moored boats along waterfront and steep tree-covered slope above McCarrs Ck. Rd.

View Point 4 – view from floating pontoon towards proposed car park showing sea wall, vehicles travelling along McCarrs Creek Road and steep tree-covered slope above rock cut.

View Point 5 – view northeast along McCarrs Ck Rd towards proposed car park with pedestrian path, bollards, powerlines, tree-covered slope, moored boats, floating pontoon and Scotland Island.

View Point 6 – View northeast from public reserve with stone sea wall, marine works depot in mid-distance, moored boats beyond and Scotland Island in the distance.

View Point 7 – view north from local access road to residences above proposed car park site with floating pontoon and access ramp in mid-distance and moored boats on open water beyond.

3. Visual Impact Assessment

3.1 Methodology

The potential Visual Impact Assessment (VIA) of the proposed development has been carried out by applying the RMS Visual Assessment Guideline EIA-04. The assessment process involved combining the sensitivity of the viewer with the magnitude of the visible change resulting from the proposed works to determine the predicted level of visual impact at each key viewpoint in accordance with the following matrix.

SENSITIVITY \ MAGNITUDE	High	Moderate	Low	Negligible
High	High	Mod / High	Moderate	Negligible
Moderate	Mod / High	Moderate	Mod / Low	Negligible
Low	Moderate	Mod / Low	Low Impact	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Visual Impact Assessment Matrix (Source: RMS Guidelines EIA-N04)

Sensitivity refers to the type of viewers and how sensitive they are to the changes that will result from the proposed development.The sensitivity of viewers varies significantly depending on context of the view and activity of the viewer (e.g. residence, workplace, shops, recreation/open space) and importance of the view to the viewer.

Viewers with the highest levels of sensitivity typically include:

- Residents who would have existing attractive views affected by the proposed development
- Users of public open space where their attention is focused on visual landscape values, such as scenic view points or natural landscape areas with attractive views

Viewers with moderate visual sensitivity are most like to be:

- Motorists and cyclists travelling along McCarrs Creek Road
- Pedestrians walking along the foreshore
- Recreation boating

Viewers with the lowest visual sensitivity are most likely to be:

- Those engaged in work where their attention is focused on a particular task
- People engaged in active recreation such as yacht racing or rowing.

Magnitude refers to the scale, form and character of the proposed development. In the case of visual impact assessment, it also takes account of the view distance or how far the viewer is from the proposed development. The categories of magnitude are defined as:

- **High** – total loss of key elements/features/characteristics of the existing landscape and/or introduction of elements considered to be totally uncharacteristic of the existing landscape character.
- **Moderate** – partial loss of/or alteration to one or more key elements/features/characteristics of the existing landscape and/or introduction of elements that may be prominent but not considered to be substantially uncharacteristic of the existing landscape.
- **Low** – minor loss of/or alterations to one or more key elements/features/characteristics of the existing landscape and/or introduction of elements that are consistent with the existing landscape

- **Negligible** – very minor alteration to one or more key element/features/characteristics and/or introduction of new elements that are consistent with the existing landscape (i.e. approximating to the 'no change' situation).

Visual Impact Levels

The various levels of visual impact that are identified through the combination of sensitivity and magnitude visual impact assessment matrix are defined as:

- **High -** The proposed works would be seen as a significant and immediately apparent feature in the landscape and will significantly affect and change its overall character in either a positive or negative way
- **Moderate -** The proposed works would be readily noticed as a new element in the landscape and recognisable within the overall scene
- **Low -** The proposed works would constitute only a minor change to the existing view and might be missed by the casual observer; awareness of the development would not have a marked effect on the overall quality of the view
- **Negligible -** Only a small part of the proposed works would be discernible or would be at such a distance that a change to the current view would scarcely be perceived.

3.2 Visual Impact Assessment

The potential visual impact of the proposed works at each of the key viewpoints identified and described in section 2 has been assessed by applying the criteria defined in section 3.1. The results of the assessment are presented in the following table.

Table 1 - Visual Impact Assessment Results

Key Viewpoints	Sensitivity	Magnitude	Visual Impact	Comment
1. McCarrs Ck Rd near Church Point shops, northeast of project site	Moderate	Moderate	Moderate	Car park structure will be seen at very close distance but for short period
2. Church Point public jetty & outdoor dining deck	Low	Moderate	Mod/Low	Attention focused on boarding/alighting boats or enjoying water views
3. Boats off shore from the project site	Low	Low	Low	Attention focused on boating activities & view partly blocked by moored boats along foreshore
4. Floating pontoon adjoining project site	Low	Moderate	Mod/Low	Car park structure will be seen at very close distance from pontoon & boats
5. McCarrs Ck Rd at southeast end of the project site	Moderate	Moderate	Moderate	Car park structure will be seen at very close distance but for short period
6. Public foreshore reserve	Moderate	Low	Mod/Low	View substantially blocked by marine works depot
7. Driveway & residences above project site	Moderate	Negligible	Negligible	View partly blocked by vegetation & focused on water and boat activity

4. Mitigation Measures

The potential visual impacts identified in section 3 will be mitigated through the application of a series of measures described in the following table. These mitigation measures include both structural elements as well as landscape works that are to be incorporated in the detailed design and documentation of the proposed development.

Key Viewpoints	Mitigation Measures
1. McCarrs Ck Rd near Church Point shops at northeast of project site	• planting design and use of a visual screening element are to prevent views directly along the vehicle ramp to the upper parking deck • vertical concrete surfaces are to be treated to visually integrate them with the adjoining natural rock outcrops and sandstone seawall through the use of coloured concrete and surface texture
2. Church Point public jetty & outdoor dining deck	• vertical concrete surfaces to be treated to visually integrate them with the adjoining natural rock cut slope and sandstone seawall
3. Boats off shore from the project site	• the proposed vertical timber slats will visually screen parked cars at ground level and on the deck; detailed design should include variation in widths & lengths • planting in front of the car park should include tall tree species growing on the slope above the car park • detailed design should ensure the front edge of parking deck is not visible from off shore
4. Floating pontoon adjoining project site	• the proposed vertical timber slats will visually screen parked cars at ground level and on the deck; detailed design should include variation in widths & lengths • planting in front of the car park should include shrubs to reduce the apparent height and bulk of the car park deck structure
5. McCarrs Ck Rd at southeast end of the project site	• planting design and use of a visual screening element should prevent views directly along the vehicle ramp to the upper parking deck • vertical concrete surfaces should be treated to visually integrate them with the adjoining natural rock outcrops and sandstone seawall through the use of coloured concrete and surface texture
6. Public foreshore reserve	• the proposed vertical timber slats will visually screen parked cars at ground level and on the deck • planting in front of the car park should include tall growing tree species similar to those growing on the slope above
7. Local access drive & residences above project site Residents in houses on slope above proposed car park site	• potential views of the parking deck surface with parked cars from the residences and edge of the access drive should be screened by additional planting on the slope below the access drive • a detailed analysis to be carried out with cross sections to determine visibility of parking deck & mitigation options (planting and/or structural screen)

5. Conclusion

The built form of the proposed car park will generally be compatible with the visual character of the foreshore area in which it is to be developed. The existing visual character reflects a combination of built and natural elements that include McCarrs Creek Road, commercial buildings at Church Point, car parking areas, jetties, stone sea wall, moored and moving boats, private marina, marine works depot and a tree covered slope with residential buildings above.

The visual impact assessment presented in this report has evaluated the likely impact of the proposed car park development adjoining McCarrs Creek Road at Church Point at each of the seven key view points identified. The assessment concludes that the visual impact will range from low to moderate at the various key view points.

Proposed mitigation measures will reduce the potential visual impact over time as the landscape planting matures and the timber screen facade weathers to a natural grey colour. The proposed mitigation measures are to be integrated in to the detailed design and documentation of the structural and landscape components of the project.

APPENDIX G

SEVEN PART TEST

TEST OF SIGNIFICANCE—ENDANGERED ECOLOGICAL COMMUNITIES

PITTWATER SPOTTED GUM FOREST ENDANGERED ECOLOGICAL COMMUNITY - McCarrs Creek Rd. Realignment and New Carpark

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

A "threatened species" is defined under the TSC Act as a species specified in Part 1 or 4 of Schedule 1, Part 1 of Schedule 1A or Part 1 of Schedule 2. Pittwater Spotted Gum Forest (PSGF) is an endangered ecological community not a threatened species.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

A "threatened population" is defined under the TSC Act as a population specified in Part 2 of Schedule 1. PSGF is an endangered ecological community not an endangered population.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

There is approximately 395 hectares of PSGF in the Pittwater LGA with approximately 0.38 hectares of which occurs in the thin corridor adjacent to the proposed car park site on McCarrs Creek Road. The PSGF vegetation location is not proposed for removal, but the following locally native vegetation will be removed:

- Large 10 m plus

2 x Pittwater Spotted Gum (*Corymbia maculata*) (note: one of the trees should be removed regardless of carpark construction as in the long-term they will cause problems to wall stability).

- Medium under 10 m

4 x *Acacia longifolia* – Wattle currently in poor condition
2 x *Corymbia maculata* – Pittwater Spotted Gum - (note: should be removed regardless of carpark construction as in the long-term they will cause problems to rock wall stability).

- Small 0-5 m

7 x *Corymbia maculata* – Pittwater Spotted Gum (note: should be removed regardless of carpark construction as in the long-term they will cause problems to rock wall stability)
6 x *Acacia longifolia* – Wattle currently in poor condition
1 x *Allocasuarina torulosa* - Forest Oak

This remnant corridor consists of *Corymbia maculata* (Spotted Gum) as the dominate tree species with an understorey dominated by environmental and noxious weeds. The bushland is considered severely degraded. Of the trees present less than 10 per cent will be removed with only 2 mature trees to be removed.

The proposed works will not have an adverse impact effect on the extent of the ecological community so that its local occurrence is placed at risk of extinction. The proposed works will only minimally modify the PSGF Community. Post construction weeding will reduce weed propagules and improve regeneration of native species therefore its local occurrence will not be placed at risk of extinction instead it will have a positive impact on the local occurrence of this community. Additionally, there will be compensatory planting on site.

d) in relation to the habitat of a threatened species, population or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, an
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The proposed works will not isolate this PSGF community from the rest occurring within the reserve or surrounding areas. These works (i) will not lead to the reduction of any PSGF habitat on site; (ii) the proposal will not lead to the area becoming fragmented or isolated from other areas of PSGF habitat; and (iii) no significant PSGF habitat will be removed, modified, fragmented or isolated impacting on the long-term survival of this ecological community in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitat has not yet been defined for this community.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan / threat abatement plan has not yet been prepared for this community. The Department of Environment and Climate Change (DECC) have identified 16 priority actions for the PSGF Endangered Ecological Community recovery.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Land clearing is classed as threatening processes. However, it is not proposed to clear the site but to remove several trees. No other works will provide a key threatening process.